Globalization and U.S. Corporate Tax Policies: Evidence from Import Competition

Tao Chen, Chen Lin and Xiang Shao

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Abstract

This paper studies how globalization affects the corporate tax policies of U.S. manufacturing firms. Using U.S. granting China Permanent Normal Trade Relations as a quasi-natural experiment, we find a significant increase in tax reduction activities for firms facing higher exposure to Chinese imports. The effect is more pronounced for firms with higher managerial slack. We also find that the effect is stronger for firms in less diversified products market and faster changing industries. We also show that U.S. firms facing higher Chinese import competition are more likely to engage in other tax-motivated activities: acquisition of subsidiaries in low-tax regions and suspected transfer pricing. Furthermore, we explore the 2017 tax cut and the recent U.S.-China trade dispute, and find that firms engage less in tax reduction activities after the 2017 tax cut and after the tariff increase for Chinese imports.

Keywords: Globalization; Tax planning; Natural experiment; Chinese import competition; Permanent Normal Trade Relations.

1. Introduction

Globalization has had large benefits for the world economy in many aspects,[1] but the recent Brexit, criticisms of globalization from candidates in the 2016 U.S. presidential election, and the 2018 trade war between the world's largest economies—the United States and China[2]—have drawn public attention to rethinking the costs and benefits of globalization. Particularly, the recent wave of globalization unleashed by China's accession to the World Trade Organization has been shown to cast various adverse effects on U.S. society: for example, a surge in manufacturing unemployment (e.g., Acemoglu et al., 2016; Pierce and Schott, 2016a) and deterioration in public health (McManus and Schaur, 2016; Pierce and Schott, 2016b). However, as Joseph Stiglitz notes: "Globalization isn't just about profits. It's about taxes too."[3] Understanding the link between tax reduction activities, including tax avoidance, and globalization is a crucial issue for policy makers around the world.[4] In this paper, utilizing the variation in policy shock to U.S. industries after the United States granted China Permanent Normal Trade Relations (PNTR), we explore how the import competition shock of globalization affects corporate tax reduction activities.

The policy shock from the United States granting China PNTR in 2000 offers an ideal setting to study the import competition effect of globalization on corporate tax reduction activities. The United States and China are two of the world's largest trading partners, and the tension between the two economies plays a crucial role in the world economy. Although Chinese imports lower consumer prices in the United States, they

[1] For example, previous studies have shown that globalization promotes productivity growth (e.g., Bernard et al., 2006), reduces monopoly power (e.g., Lu and Yu, 2015), and enhances technology development (Bloom et al., 2016).

[2] See "US-China trade battle: Catch up here," *CNN Money* (April 8, 2018); "What's at stake in the looming US-China trade war: The full list," *Financial Times* (April 18, 2018).

[3] Joseph Stiglitz, "Globalization Isn't Just about Profits. It's about Taxes Too." *The Guardian* (May 27, 2013).

[4] There are two main dimensions of globalization: capital liberalization and trade liberalization. Previous research linking tax avoidance and globalization mainly focuses on how capital liberalization enhances firms' ability to avoid corporate taxes (e.g., tax haven sheltering (Dyreng and Lindsey, 2009)). In this paper, we show that the import competition effect of globalization due to trade liberalization can also materially affect the incentives for corporate tax reduction.

also introduce a significant impact on the U.S. domestic market. Handley and Limão (2017) find that the passage of PNTR accounted for one-third of the growth of U.S. imports from China during 2000-05. Pierce and Schott (2016a) and Greenland et al. (2020) also find that industries and firms with higher exposure to Chinese imports because of PNTR experienced a larger decline in employment, investment, and survival rates. The dearth of research on the globalization and tax reduction nexus might be partially driven by potential endogeneity concerns. For instance, confounding factors, such as incumbent firms' lobbying activities, may affect firms' tax reduction ability and their exposure to globalization. As discussed in the next section, the United States granting China PNTR generated differential shocks to U.S. firms and was immune to confounding corporate behaviors, such as trade policy lobbying, offering a quasi-natural experiment for causally identifying the impact of the China trade shock on U.S. corporates.

We expect that the import competition shock from globalization could increase firms' engagement in tax reduction for several reasons. First, Bertrand and Mullainathan (2003) show that managers without external predatory pressure tend to enjoy a quiet life and avoid difficult business activities. Tax reduction is one of these difficult tasks, since it involves direct and indirect costs for managers, such as time, effort, and reputation concerns (e.g., Graham and Tucker, 2006; Cheng et al., 2012; Graham et al., 2014),[5] which deter firms from maximizing tax efficiency.[6] This may also explain the observed low levels of tax avoidance in many U.S. firms (e.g., Cheng et al., 2012). Therefore, firms may not fully utilize their tax planning capacity without the presence of external pressure on managers.

[5] More specifically, direct costs include time and effort inputs and the risk of being detected by tax authorities, and indirect costs include reputation costs and financing costs. For reputation costs, Graham et al. (2014) find that corporate executives rate reputation concerns and the risk of adverse media attention as important or very important factors in their decisions not to engage in aggressive tax planning. In terms of financing cost, Shevlin et al. (2013) find that tax reduction activities increase the cost of public debt.

[6] In theory, firms are expected to maximize shareholders' value by reducing tax liabilities, as long as the incremental benefit exceeds the incremental cost as it reduces tax burdens and minimizes cash outflows. For instance, Armstrong et al. (2012) find that tax managers are compensated to reduce effective tax rates.

Second, it has been well established that competition shock decreases managerial slack (e.g., Hart, 1983; Nickell, 1996; Giroud and Mueller, 2010, 2011), which pushes effort-averse managers to devote more time and effort to maintaining competitiveness in the marketplace. In our context, globalization lowers the entry barriers for foreign firms into domestic markets and makes the domestic market more competitive with lower-priced foreign goods (Tybout, 2001). Thus, the profit margins and market shares of domestic firms decline significantly. Firms often view the tax department as a profit center (Robinson et al., 2010), and greater tax savings increase cash flows and strengthen firms' position to compete with rivals. Therefore, managers are more motivated to utilize tax-planning techniques and capacity after experiencing competition from Chinese imports. This is consistent with the argument in Robinson et al. (2010) that "competitive industry might push managers to seek innovative ways (including tax strategies) to increase firm value."[7]

PNTR pushed the U.S. market to be more open to Chinese products by eliminating the threat of large tariff increases on Chinese imports. Prior to PNTR, since 1980, Chinese imports have already enjoyed the Normal Trade Relations (NTR) tariff rate, but the tariff rate had to be renewed every year by the Congress. If the Congress did not approve the renewal in any particular year, a much higher tariff rate (non-NTR rate) would be applied to imports from China. For example, in 1999, the average NTR rate was only 4 percent, but the average non-NTR rate was 37 percent. Pierce and Schott (2016a) show that every year large uncertainty surrounded the renewal of the lower NTR tariff rate on Chinese imports before the passage of PNTR. Voting against the

[7] We also notice that there might be countervailing effects because of the disciplining effect of greater competitive pressure. Firms may adopt a precautionary choice as competition lowers firms' prospects, which results in a more uncertain business environment. With more uncertainties, the marginal cost of the potential penalty imposed by the Internal Revenue Service will be higher, and firms may choose to engage less in tax reduction activities. Moreover, some tax reduction activities, such as tax avoidance, create concerns about the credibility of financial statements and signal low quality of disclosed information, potential diversion of rents, and other aspects of the firm's operations (e.g., Desai and Dharmapala, 2006). In sum, trade liberalization might make tax reduction more costly and, as a consequence, diminish the firms' tax planning incentives. Therefore, whether trade liberalization encourages or reduces firms' incentive to engage in tax reduction activities is an empirical question we will explore in this paper.

renewal of NTR for China was introduced to legislators every year from 1990 to 2001. The average House of Representatives vote to support increasing the tariff rate to the non-NTR rate was as high as 38 percent. Pierce and Schott (2016a) provide abundant evidence from government reports and media coverage that the uncertainty in the U.S.-China tariff led to the unwillingness of U.S. firms to import from China or establish business ties with Chinese firms. Therefore, the passage of PNTR reduced a great amount of the uncertainty in importing goods from China, which then caused substantial import competition pressure in the United States.

To measure each industry's exposure to PNTR, we use the NTR gap—the difference between the NTR and non-NTR tariff rates. We exploit the interindustry differences in exposure to PNTR and conduct a difference-in-differences (DID) analysis to study the effect of Chinese import competition on tax reduction activities. As discussed in section 2.2, a good attribute of the NTR gap is exogeneity, as the non-NTR rate was established 70 years prior to the passage of PNTR. This alleviates the concern about endogenous tariff rate reduction (e.g., tariff lobbying) in the existing literature.

We first follow the literature and use the effective tax rate and book-tax difference to measure tax reduction activities in the main analysis.[8] For the effective tax rate, we use the cash effective tax rate (CETR), as cash savings is one of the primary benefits of tax avoidance for shareholders (Graham et al., 2014). For the book-tax difference, we use Desai and Dharmapala's (2006) residual book-tax difference (DDBTD), which adjusts for earnings management. The DID results are robust to both measures and various empirical specifications. We find that firms in industries with greater exposure to the passage of PNTR reduce taxes more aggressively. The effect is not only statistically significant, but also economically significant. Compared with a hypothetical industry with zero exposure to the passage of PNTR, the implied effect on CETR is -0.029, 13.0 percent of its standard deviation; and the implied effect on DDBTD is 0.051, 12.8 percent of its standard deviation.

We further examine the factors that influence the link between globalization and corporate tax reduction, to explore the channels through which the associated tax reduction incentives induced by the passage of PNTR can be exacerbated or mitigated.

[8] We also use three alternative measures of the effective tax rate and two alternative measures of the book-tax difference in robustness checks.

As pointed out by Rajan and Zingales (1998), "the 'smoking gun' in the debate about causality" is to focus on the details of theoretical mechanisms and document how they work. To provide further support that the import competition effect of globalization increases tax planning incentives through reducing managerial slack, we test how corporate governance influences the effect of PNTR on tax reduction activities. As firms with weaker corporate governance are associated with higher managerial slack (Bertrand and Mullainathan, 2003; Giroud and Mueller, 2010, 2011), entrenched managers who previously enjoyed a quiet life are more motivated to use tax planning techniques after being exposed to Chinese imports. Therefore, the effect of PNTR on tax reduction is expected to be stronger for firms with weaker corporate governance. Utilizing Gompers et al.'s (2003) G-index, we confirm that firms with weaker corporate governance indeed reduce taxes more aggressively after being exposed to shocks from PNTR. In an additional test, we use changes in the states' anti-trust statutes as an exogenous shock to corporate governance. Interacting the two exogenous shocks (i.e., PNTR and anti-trust law), triple-difference analysis provides further supporting evidence.

We also expect the effect of PNTR on tax reduction to be more profound for firms whose products are less diversified or in a faster-changing product market, since they face higher competitive pressure from Chinese imports. Using text-based measures of the Hoberg and Phillips (2010, 2016) product similarity index and the Hoberg et al. (2014) fluidity index, we find that the effect of PNTR on corporate tax reduction is indeed greater for firms with less diversified products and in fast-changing industries.

In addition to measuring tax reduction activities using data from firms' financial statements, we study other nonfinancial dimensions of tax reduction activities: (1) firms' merger and acquisition (M&A) deals, targeting firms in tax havens or places with lower tax rates than the United States as a proxy for potential tax reduction and sheltering activities; (2) input offshoring from the Hoberg and Moon (2017) offshoring

database, as a proxy for suspected transfer pricing activities[9]; and (3) relocation of firms' headquarters to states with lower state corporate tax rates. Using these three alternative measures of tax reduction activities, we find strong evidence that firms that face higher Chinese import competition are more likely to acquire subsidiaries in low-tax regions, to engage in suspected transfer pricing activities, and to relocate to states with lower state corporate income tax rates.

This paper contributes to the following strands of literature. First, it adds to the corporate tax planning literature (e.g., Slemrod and Yitzhaki, 2002; Hanlon and Heitzman, 2010) by investigating new potential driving factors of firms' tax reduction activities.[10] For instance, despite the massive amount of tax reduction activities and its policy importance, little is known on what fundamentally drives firms to avoid taxes (Hanlon and Heitzman, 2010). Moreover, the literature focusing on the institutional environment points out that tax reduction might be induced by bureaucracy, corruption, weak legal institutions, and inefficient public services (e.g., Johnson et al., 2000; Friedman et al., 2000), yet these factors do not explain why aggressive tax planning is still prevalent in developed countries with well-functioning financial, legal, and economic institutions. In this regard, the paper also contributes to the broader literature on tax planning policies.

Second, this paper is among the first to document that competitive pressure caused by globalization materially and causally affects firms' incentives to engage in

[9] There is a concern that the classical tax reduction measures based on financial statements do not necessarily capture firms' intentional tax reduction activities. Using these three more activity-based measures, we can gauge how actively the managers are seeking tax-saving strategies in response to increased competition.

[10] The recently documented factors include common firm characteristics (e.g., Wilson, 2009; Lisowsky et al., 2013), corporate governance (e.g., Desai and Dharmapala, 2006), ownership structure (e.g., Chen et al., 2010; McGuire et al., 2014), executives (e.g., Dyreng et al., 2010), financial constraints (Edwards et al. 2015), hedge fund activism (e.g., Cheng et al., 2012), information asymmetry (Chen and Lin, 2017), customers and suppliers (Cen et al., 2017), and cultural norms (DeBacker et al., 2015), among others.

tax reduction activities.[11] In a related paper, Cai and Liu (2009) focus on Chinese firms and study the relationship between competition and corporate tax avoidance in China. Their study measures competition using an industry concentration index (the Herfindahl-Hirschman Index (HHI)). While the concentration index and industry policies can be endogenous (e.g., due to government industry protection preference), the PNTR setting in our paper is unpredictable and its exposure to each industry was mainly determined 70 years before the shock. Furthermore, Cai and Liu (2009) measure tax avoidance as the difference between firms' reported accounting profits and their imputed profits based on the national income accounts, because book incomes are not available for their sample of Chinese firms. Our study measures tax reduction activities not only by more complete financial data, but also by firms' M&A and transfer pricing activities.

Moreover, the research adds to the literature on the impacts of globalization, for example, on markups (e.g., Lu and Yu, 2015), capital intensity (Bernard et al., 2006), and skill content (e.g., Lu and Ng, 2013). Particularly, we contribute to the bourgeoning literature on the consequences of Chinese import competition, such as the effects on manufacturing unemployment (e.g., Acemoglu et al., 2016; Pierce and Schott, 2016a), public health (McManus and Schaur, 2016; Pierce and Schott, 2016b), corporate innovation (Bloom et al., 2016; Hombert and Matray, 2018), relative decline of investment, operation profit and employment of small U.S. firms (Gutierrez and Philippon, 2017; Greenland et al., 2020), and the increased prices of inputs and consumer products in United States (Wang et al. 2018; Amit et al., 2020).

The remainder of the paper is organized as follows. Section 2 presents our identification strategy and the construction of the sample. Section 3 reports the main

[11] We also provide new evidence on how globalization affects corporate tax-saving behavior. The limited previous research linking tax reduction and globalization mainly focuses on how globalization enhances firms' ability to save corporate taxes (e.g., tax haven sheltering (Dyreng and Lindsey, 2009)). In this paper, however, we find that globalization can also change managers' incentives in tax saving. More specifically, the competitive pressure induced by Chinese imports reduces managerial slack and managers are more motivated to utilize their unused tax-planning capacity.

results. Section 4 studies the influence of corporate governance and product market characteristics on the relation between Chinese import competition and tax reduction activities. We also investigate other tax reduction activities via offshoring and M&A activities. In section 5, we explore three alternative natural experiments (staggered state tax cuts, the 2017 U.S. tax cut, and the U.S.-China trade dispute) to study the impact of competition on corporate tax planning policies. Section 6 concludes.

2. Identification, Sample, and Data

This section introduces the identification strategy by exploring the United States granting PNTR status to China in 2000 as a natural experiment for Chinese import competition. The section also describes the construction of the sample and major variables.

2.1. Identification

In attempting to study the effect of globalization (i.e., Chinese import competition) on corporate tax policies, a major concern is that competition is likely endogenous. Unobservable firm and industry characteristics that are correlated with both competition and corporate tax strategy could bias the estimation results. To overcome the potential endogeneity concern, we use the United States granting PNTR to China as a natural experiment for Chinese import competition. Specifically, we employ a DID specification in estimating the impact of PNTR on tax reduction and examine whether firms in industries exposed to larger import competition due to PNTR save taxes more aggressively. Following Pierce and Schott (2016a), we quantify the differential impact of PNTR on U.S. industries, using the NTR gap—the difference between the non-NTR and NTR rates of industry *j*.

(1)

As the $NTR\ Gap_j$ of industry *j* represents the increased tariff rate if the renewal fails, it measures the intensity of the Chinese import competition shock to which industry *j* is exposed after PNTR.

A good attribute of the NTR gap is its exogeneity, as discussed in Pierce and Schott (2016a). Of the variation in the NTR gap, 79 percent is from the non-NTR tariff rate, which was set 70 years prior to the passage of PNTR and is less susceptible to tariff lobbying. If the NTR rate was set to protect industry, it would only lower the NTR gap and make the results of our analysis less significant. Therefore, there is little concern about the endogeneity that government may set the tariff rate according to the industry's

current situation, compared with previous literature using tariff reductions. Appendix Table B1 lists the top and bottom 20 industries ranked by their NTR gaps.

We begin with a standard DID specification to examine whether firms in industries with a higher NTR gap are more involved in tax reduction activities. The estimation strategy proceeds as follows:

, (2)

where is the tax reduction measure of firm *i* in industry *j* at time *t.* is the difference between the NTR and non-NTR tariff rates of 6-digit North American Industry Classification System (NAICS) industry *j* in 1999,[12] and is a dummy variable that equals 1 for years after PNTR (). is a set of control variables for firm characteristics that are related to taxes, as documented in the literature.[13] The control variables include firm size, Tobin's q, multinational, leverage, profitability, tangibility, research and development expenditure, and capital expenditure. For example, we control for research and development expenditure as studies find that it has a large influence on corporate policies (e.g., Liu and Wong, 2011). and are firm and year fixed effects, respectively. Since there may exist correlations in regression errors across firms in the same industry, we cluster by industry in constructing the standard errors.

2.2. Sample Construction

To construct the sample, we extract financial and accounting data from Compustat's North America Fundamentals Annual database from 1990 to 2007 (before the recession). We eliminate firm-year observations for which information on total assets is not available. We also exclude observations with negative cash holdings, sales, and total assets. We classify the firm industry at the 6-digit NAICS level. To have consistent industry classification over time, we convert all the NAICS codes to the NAICS 1997 version, using historical NAICS codes before 2002 from Compustat. For firms without historical codes or if their codes are fewer than 6 digits, we use their current NAICS codes and convert them to NAICS 1997 codes, using the concordance table from the U.S. Census.[14] For the remaining firms without 6-digit current industry codes, we search for their 6-digit NAICS codes in historical NAICS from Compustat and convert them to NAICS 1997 codes using relevant concordance tables from the Census.[15] We restrict the sample to manufacturing firms (NAICS codes ranging from 310000 to 339999) headquartered in the United States. To make the sample representative, we also exclude 6-digit NAICS industries with fewer than three firms.

[12] Our baseline results are robust if we use the 4-digit NAICS NTRGap. See Appendix B, Table B10.
[13] See a review in Graham (2003).
[14] The concordance table can be downloaded here:
https://www.census.gov/eos/www/naics/concordances/concordances.html.
[15] In the end, there are still 21 firms for which we cannot find their 6-digit NAICS code in Compustat or a unique match for the industry code in the concordance table. We had to drop these firm-year observations, which account for 0.3 percent of our sample.

The historical NTR and non-NTR tariff data come from Feenstra et al. (2002),[16] classified in Harmonized System codes. We convert the NTR gap to the NAICS 1997 6-digit level using the concordance table from the Bureau of Economic Analysis (BEA),[17] and merge with the Compustat financial data. We drop all the observations with missing financials for the firm-level control variables and trim all the accounting data at the 0.5 and 99.5 percent levels to eliminate outliers. In the end, the sample consists of 3,921 U.S. traded firms and 27,309 firm-year observations.

2.3. Measure of Tax Reduction Activities

Following the literature, we focus on two financial measures of tax reduction: the cash effective tax rate (CETR, following Chen et al. (2010), and Desai and Dharmapala's (2006) residual book-tax difference (DDBTD).

We use CETR because cash saving is the major benefit of tax reduction for shareholders. Graham et al. (2014) find that top management in U.S. public firms cares about the cash effect of tax avoidance. CETR is calculated as cash taxes paid (*txpd*) divided by pre-tax income (*pi*). Following Chen et al. (2010), CETR is set to missing when the denominator is zero or negative. We winsorize CETR to the range [0, 1]. A lower CETR indicates higher tax reduction.

As argued by Desai and Dharmapala (2006), the total book-tax gap does not necessarily reflect tax-saving activities and might partially capture earnings management activities. We follow Desai and Dharmapala (2006) and adjust the book-tax difference for earnings management with an accruals proxy to isolate the component of the gap that is due to earnings management. Specifically, the residual book-tax difference (DDBTD) equals the residual from the following fixed effects regression:

$$, \quad (3)$$

where *BTD* is the total book-tax difference and *TACC* is total accruals. Both variables are scaled by lagged total assets. We also remove observations with total assets less than $1 million and observations with negative taxable income (*txfed* < 0). A higher DDBTD indicates greater tax reduction.

[Insert Table 1 Here]

As shown in Table 1, the mean values of CETR and DDBTD are 0.286 and 0.022, respectively, and both measures have significant variation, as shown by large standard deviations: 0.223 and 0.400, respectively.

3. Empirical Results

3.1. Baseline Results

[16] Tariff data can be downloaded from here: http://www.johnromalis.com/publications/.
[17] Available on the BEA website: http://www.bea.gov/industry/zip/NDN0317.zip.

Table 2 shows the baseline results. Columns 1 and 2, in Panel A, report the results without control variables, and Columns 3 and 4 report the results with control variables. The major variable of interest is the DID estimator . For both sets of results, negative (positive) coefficients of for estimation with CETR (DDBTD) provide consistent evidence that firms in the industries that are more exposed to Chinese imports reduce taxes more aggressively after PNTR.

Panel B of Table 2 shows the economic significance of the baseline results. We calculate the implied effect of PNTR following Pierce and Schott (2016a). First, we multiply by the NTR gap in each industry, which represents the implied effect of PNTR in each industry relative to an industry with zero PNTR. We then average the implied effects of each industry with weights of the total assets in each industry in 1990. The result represents the overall implied effect of PNTR relative to years before PNTR. As shown in Columns 3 and 4, in Panel B of Table 2, the implied effect on CETR is -0.029, 13.0 percent of its sample standard deviation, while the implied effect on DDBTD is 0.051, 12.8 percent of its sample standard deviation. Therefore, the effect is not only statistically but also economically significant.

[Insert Table 2 Here]

3.2. Robustness Checks

3.2.1 Alternative Measures of Tax Reduction

In this section, we test the robustness of the baseline results with five alternative measures of tax-saving activities. The first is the generally accepted accounting principles effective tax rate (GETR). GETR is calculated as total tax expense minus the change in deferred taxes and investment tax credit divided by pretax income. The second alternative measure is the cash flow effective tax rate (CFETR). CFETR is defined as cash taxes paid divided by operating cash flows; it is winsorized to the range [0, 1]. The third measure is the book-tax difference based on Manzon and Plesko (2002) (MPBTD). MPBTD is calculated from the U.S. domestic book income, less U.S. domestic taxable income, less state tax income, less other tax income, less equity in earnings, and scaled by lagged assets. The fourth measure is the book-tax difference (BTD). BTD is calculated by book income less taxable income scaled by lagged assets. The fifth alternative measure is the effective tax rate difference (ETRDIFF). ETRDIFF is calculated following Frank et al. (2009).

More details about variable construction are provided in Appendix A. A lower GETR or CFETR indicates greater tax saving. A higher MPBTD, BTD, or ETRDIFF indicates greater tax saving.

The DID estimation model is the same as equation (2), and the results are shown in Table 3. All the results are consistent with the baseline findings.

[Insert Table 3 Here]

3.2.2. Controlling for Potential Confounding Effects

A potential problem with the DID specification is that the effect of PNTR may be confounded with dynamic effects of location (e.g., state tax regulation changes in response to import competition). Therefore, we add state-year fixed effects in the estimation model. Additionally, preexisting differences in the time trends of each industry or other time-varying industry characteristics may affect the validity of the DID estimation. We tackle this problem by adding industry-specific time trends. Therefore, we extend our specification as follows:

. (4)

As seen from the model, to capture time-varying changes at the state level (for example, state regulation changes), we add firms' incorporation state cross-year fixed effects (). To capture the effects of time-varying industry characteristics, we add a set of industry dummy variables (NAICS 6-digit level) multiplied by time trend t . We also take into account the impact of contemporary tariff changes by including the time-varying NTR tariff rate.[18]

The grant of PNTR might also be confounded with other industry-wise shocks, such as the reduction of China's barrier to foreign investment and other notable events such as the burst of the tech bubble. Columns 1 and 2 in Table B2 in Appendix B report the results with state-year fixed effects and additional controls for contract intensity (Nunn, 2007), impacts on high-technology industry, and the NTR tariff rate, following Pierce and Schott (2016a). Columns 3 and 4 report the results when we further add industry-specific time trends. All these results are consistent with our baseline findings.

3.2.3. Dynamic Effects

If the increase in tax reduction activities is indeed caused by PNTR as we expect, the NTR gap should be correlated with tax reduction measures after 2000 but not before. To confirm the validity of our specification, we plot the coefficients for the year-specific effect of PNTR by estimating the following model:

, (5)

where we replace in equation (2) with a set of interactions between and the dummy variable of each year (except 2000, which serves as the benchmark year). In Figure B1 in Appendix B, the y-axis plots the coefficients of the year-specific effect of PNTR (with 90 percent confidence interval. The figure clearly shows that the line is relatively stable before 2001, and then the coefficients of CETR (DDBTD) decrease (increase) significantly after 2001.

3.2.4 Segment-Based Exposure to PNTR

Firms may operate in more than one business segment. Therefore, our measure of firms' exposure to PNTR may be noisy, as different segments within firms may be

[18] As NTR tariff rates from Feenstra et al. (2002) are only available up to 2001, we follow Pierce and Schott (2016a) and keep the later tariff rates equal to those in 2001.

exposed to different shocks due to PNTR. Therefore, instead of using firms' primary historical NAICS industry code to construct their exposure to PNTR, we try using the average of the NTR gap weighted by the sales share of each segment. Specifically, we use Compustat Business Segments data, which provide information about the industry classification and net sales of each segment within firms, and construct the firm-level, segment-based NTR gap as follows:

, (6)

where is the sales share of the segment in each 6-digit NAICS industry *j* of firm *i*. For a segment outside manufacturing, we set its NTR gap to zero. We also drop firms with segments outside manufacturing industries that constitute more than 25 percent of sales. We present the results in Table 4.

[Insert Table 4 Here]

The results in Table 4 are similar to the baseline results, albeit with smaller magnitudes, which is consistent with our previous argument that segment-based measures are less noisy. This is also consistent with the results from Hombert and Matray (2018), who also use a segment-based measure in their robustness check.

3.2.5 Import Penetration

Alternatively, we use U.S. imports from China as trade shocks to U.S. industries, following Acemoglu et al. (2016) and Hombert and Matray (2018). One concern is that imports from China may be driven by not only increased productivity of Chinese industries, but also the decreasing productivity of some U.S. industries. To alleviate such a concern, we use an instrumental variable (IV) approach to filter out factors related to U.S. productivity, following Acemoglu et al. (2016).

Using real trade data, we construct the import penetration ratio as an alternative measure of Chinese import competition:

where is the value of U.S. imports from China at time *t* in Standard Industrial Classification (SIC) 4-digit industry *j*; is production worker employment in industry *j* in 1991.

U.S. imports from China are driven by supply-side shocks (e.g., Chinese productivity) from China and demand-side shocks from the United States, which could cause endogeneity and bias our results because we only want to test the effect of the supply-side shock, that is, China's increased competitiveness. Therefore, to isolate the supply-side shock from China, we use Chinese imports in eight other developed countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland) and construct an analogous measure as an instrumental variable:

, (7)

where is the value of imports from China in the eight other developed economies at time *t* in industry *j*. is production worker employment in industry *j* in 1980. We use

employment at 10 years before the initial year (1980) as the absorption to mitigate the error covariance between the two measures. We instrument China-U.S. import penetration by regressing the China-U.S. import penetration ratio on the ratio for the eight other developed countries, with industry and year fixed effects, and calculate the predicted value of the import penetration ratio.

The trade data are obtained from the UN Comtrade database. The industry employment data are from the National Bureau of Economic Research–U.S. Census Bureau's Center for Economic Studies Manufacturing Industry Database. As the trade data for the nine countries are more complete after 1991 (Acemoglu et al., 2016), we use the sample from 1991 to 2007 in this test. Panel A of Table 5 shows the results of the first-stage estimation. The standard errors are clustered by industry. The statistically significant coefficient of and the F-test show that the first stage is valid. In the second stage, by replacing the *NTRGap*post* term with the predicted value of the import penetration ratio, we then run an empirical model similar to the baseline model. The second-stage results shown in Panel B of Table 5 are consistent with our baseline results that increased Chinese import competition is associated with increased tax reduction activities.[19] The IV strategy assumes that import demand shocks are not correlated across the United States and the other eight counties, which may not be true. As an additional robustness check, we drop certain industries (i.e., construction, computers, and clothing) to deal with the potential invalidity problem of the IV. As shown in Table B3 of Appendix B, the results are qualitatively similar.

[Insert Table 5 Here]

3.2.6 Intermediate Goods

The increase in U.S. imports from China makes cheaper intermediate goods more accessible for U.S. firms, which could possibly mitigate the direct effect of Chinese import competition. To address this concern, we construct the PNTR exposure of each industry to its upstream industries. Specifically, following Pierce and Schott (2016a), we calculate the upstream NTR gap for each industry as the weighted average of the NTR gap of its upstream industries, using the BEA input-output table.[20] We use the coefficients from the input-output table as weights and set the weights of industries within 3-digit NAICS sector zero, following Bernard et al. (2010).[21] We add the upstream PNTR exposure to our baseline regression as an additional control variable. The results in Table B4, in Appendix B, show that the coefficient of the interaction between upstream exposure and *post* is not statistically significant, but the coefficient of the interaction between direct exposure and *post* remains qualitatively the same. The

[19] We also test our results using the first-differencing model with an instrumental variable as in Acemoglu et al. (2016). The results are consistent.
[20] Refer to http://www.bea.gov/industry/zip/NDN0310.zip.
[21] Manufacturing firms within 3-digit NAICS sectors often produce the same clusters of products (Bernard et al., 2010; Pierce and Schott, 2016a).

evidence suggests that our main results are not undermined by the more accessible cheaper Chinese intermediate goods.

3.2.7 Import Competition Inferred from Stock Market Reaction

Our measurement of NTRGap may not cover all aspects of PNTR, such as changes in non-tariff barriers after PNTR (e.g., new regulation of new product standards and intellectual property rights); therefore, we follow Greenland et al. (2020) and use the short-term stock market reaction to PNTR as a proxy for exposure to PNTR. More specifically, we calculate the five-day average abnormal returns (AARs) relative to the market two days before and two days after five PNTR-related events. We then calculate the industry AAR (PNTR AAR) by taking the market value–weighted average of all firms in the NAICS-6 industry. A more negative PNTR AAR indicates a larger adverse effect of PNTR. As shown in Table B5, in Appendix B, lager negative reaction to PNTR is positively related to tax reduction.

4. Further Explorations of PNTR Effects

In our main result, we find that PNTR increases firms' tax reduction activities. This section studies the moderating factors that influence the relationship between PNTR and tax reduction. In addition, we explore whether firms would engage in other tax reduction activities (cross-border M&A, transfer pricing, and relocation) and cost reduction activities (outsourcing) due to PNTR.

4.1 Managerial Slack

Competition increases tax-saving incentives by reducing managerial slack and thus pushing managers to devote more effort to tax planning. To test this channel directly, we examine how managerial slack affects the effect of Chinese import competition on tax reduction activities. However, we cannot directly observe managerial slack. Previous research has found that weak corporate governance increases managerial slack (e.g., Bertrand and Mullainathan, 2003; Giroud and Mueller, 2010); therefore, we use corporate governance as a proxy for managerial slack. We expect the effect of PNTR to be more pronounced for firms with weaker corporate governance.[22]

To test this hypothesis, we first divide the sample into weak and strong corporate governance subsamples. We measure firms' corporate governance using the G-index from Gompers et al. (2003). A higher G-index indicates weaker corporate governance. We take the average of the G-indexes for single-class firms over the

[22] Our results can also be explained by the theory from Desai and Dharmapala (2006). Managers may not optimize tax planning when corporate governance is weak without a competition shock. However, when competition is intensified, the marginal benefits of tax planning exceed the potential risk of firm value discount from managerial diversion.

sample years. Firms are placed in the weak corporate governance subsample if their average G-index measure is in the top quintile of the sample; firms are placed in the strong corporate governance subsample if it is in the bottom quintile of the sample. We repeat the baseline estimations and test the statistical significance of the differences between the two DID coefficients in the subsamples using seemingly unrelated estimation. Table 6 reports the results.

[Insert Table 6 Here]

The results in Table 6 show that the DID coefficients of CETR (DDBTD) in the subsamples with weak corporate governance are generally lower (higher) relative to those for firms with strong corporate governance. The DID estimator for CETR is -0.330 with 5 percent statistical significance for firms in the top quintile of the G-index portfolio. The DID estimator for CETR is smaller in absolute value (0.126) and statistically insignificant for firms in the bottom quintile portfolio of the G-index. The DID estimator for DDBTD is 0.110 with 5 percent statistical significance for firms in the top quintile of the G-index portfolio. The DID estimator for DDBTD is -0.351 and statistically insignificant for firms in the bottom quintile of the G-index portfolio. Testing both subsamples with seemingly unrelated estimation, the difference in the coefficients for CETR (DDBTD) is statistically significant at the 5 percent (10 percent) level.

In addition, we explore firms' susceptibility to takeover as a proxy for corporate governance. We use Cain et al.'s (2017) takeover index, which captures exogenous change in the takeover environment. A higher takeover index indicates higher probability of being taken over and, thus, stronger corporate governance (Bertrand and Mullainathan, 2003). Using triple differences by interacting two exogenous changes—competition and corporate governance—we estimate the following equation:

, (8)

where is the tax reduction measure of firm *i* in industry *j* at time *t*. is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999, and is a dummy variable that equals 1 for years after PNTR (). is the takeover index for firm *i* at time *t*. is a set of control variables for firm characteristics. and are firm and year fixed effects, respectively. is the error term.

The results are shown in Table B6, in Appendix B. A positive (negative) sign of the triple interaction term for CETR (DDBTD) shows that strong corporate governance mitigates the effect of PNTR on corporate tax reduction, which is consistent with our previous results using the G-index. We also calculate the average effect of PNTR and

the F-test shows that our main effects still hold and PNTR increases corporate tax-saving incentives.

4.2 Product Market Characteristics

We further explore how the results vary by product market characteristics. Product market factors may influence corporate capital structure and, thus, tax planning (Phillips, 1995; Graham, 2000). Moreover, firms that are less diversified and in a faster-changing industry may face higher market threats and could respond more strongly when they are exposed to globalization shocks. Therefore, we employ a subsample analysis with three measures. First, we measure product diversification using Hoberg and Phillips' (2016) product similarity score, which is the total score of word similarity in the firm's product description compared with peer firms in the annual reports required by the U.S. Securities and Exchange Commission (SEC) (10-K reports). Second, also based on product descriptions in the 10-K reports, we use the product market fluidity index constructed by Hoberg et al. (2014) to measure the intensity of product evolution for firms' rivals. Third, we use the traditional HHI index.

As complete electronic filings from the SEC are available since 1996, we use the sample from 1996 to 2007 in this subsample test. For the similarity and fluidity indexes, we place firms in the higher product market competition sample if their similarity score or fluidity index before PNTR is in the top quintile of the sample. Firms for which the two indexes are in the bottom quintile of the sample are placed in the less product market competition subsample. Firms with HHI in the bottom quintile of the sample are placed in the higher competition subsample, and firms with HHI in the top quintile of the sample are placed in the lower competition subsample.

Table 7 presents the results. In each panel, Columns 1 and 3 show the DID estimations for firms with less diversification, higher market fluidity, and lower HHI index; Columns 2 and 4 show the DID estimations for firms with more diversification, less market fluidity, and higher HHI; and the last two rows show the test results of the difference between the two DID estimators with seemingly unrelated estimation. Panels A, B, and C show the results for diversification, fluidity, and HHI index, respectively. For example, in Panel A, the DID estimator for CETR is -0.353, with 1 percent statistical significance, for firms in the top quintile portfolio of the product similarity index. The DID estimator for CETR is smaller in absolute value (-0.010) and statistically insignificant for firms in the bottom quintile portfolio of the product similarity index. Testing both subsamples with seemingly unrelated estimation, the difference between the coefficients for CETR (DDBTD) is statistically significantly different from zero at the 1 percent (5 percent) level. The results are consistent when we examine market fluidity and HHI index.

[Insert Table 7 Here]

Consistent with our expectation, Table 7 shows that firms with less diversification and higher market fluidity are involved in more tax reduction activities when they are exposed to Chinese imports.

4.3 Other Tax Reduction Activities

Firms may also use tax shelters, transfer pricing, or relocation as alternative ways to lower their tax payments (Graham and Tucker, 2006; Dyreng and Lindsey, 2009). In this section, we use firms' cross-border M&As in tax havens, offshoring activities, and relocation of state tax jurisdiction in addition to financial measures of tax reduction.

4.3.1 Cross-Border Mergers and Acquisitions

We explore whether U.S. firms engage in more M&As in tax havens and low-tax regions when the firms face competitive pressure from Chinese imports. We define a region as a low-tax region if it has a lower corporate tax rate than that in the United States or is identified as a tax haven in Dyreng and Lindsey (2009). We identify a panel of low-tax regions among 98 countries or regions from 1990 to 2007, using the corporate tax rate from KPMG's Corporate and Indirect Tax Rate Survey 2007 for 1993–2007 and the Organization for Economic Cooperation and Development's corporate income tax database for 1990–93.

As expected, Table 8 shows that firms that face higher competition caused by PNTR are indeed engaged in more M&A deals targeting low-tax regions. The evidence includes the higher probability of acquiring companies in low-tax regions (Column 1), greater total number of deals targeting low-tax regions (Column 2), and greater number of low-tax regions where companies acquire new firms (Column 3). It is possible that the passage of PNTR may drive U.S. firms to acquire more Chinese firms for offshoring, and this could increase M&A deals targeting Chinese firms. To take this potential confounding effect into account, as a robustness check, we exclude deals targeting China and the results still hold (Columns 4 to 6). It is also possible that our

results are driven by the change in the overall trend of U.S. firms' M&A activities overseas. Therefore, Columns 7 to 9 report the results of all the non-U.S. target deals from our sample firms. The result shows no evidence that PNTR affects the overall trend of M&A deals by U.S. companies.

[Insert Table 8 Here]

4.3.2 Transfer Pricing

We then use firms' offshoring activities to identify suspected transfer pricing activities. Taking advantage of tax benefits in certain countries, some companies use transfer pricing as a way to reduce tax payment, such as Apple's transfer pricing arrangement with Ireland. Firms may purchase from overseas subsidiaries with over-priced inputs and leave the profits in countries where they have tax benefits. Therefore, we use firms' offshoring activities to detect suspected transfer pricing. Specifically, we use the Hoberg and Moon (2017) offshoring database, which counts the mentions of firms' input purchasing activities with different sourcing countries in the 10-K reports from 1998 to 2015. The input offshoring activities in the dataset are categorized into two types: (1) internal offshoring, where the firm purchases inputs from the given nation when the firm also owns assets in the given nation; and (2) external offshoring, where the firm purchases inputs from the given nation when the firm does not own assets in the given nation. As internal offshoring gives firms opportunities to keep their profits overseas, it is more likely to be related to transfer pricing. We expect that PNTR would have increased firms' internal offshoring activities. As the offshoring dataset starts from 1998, we use the sample from 1998 to 2007. Table 9 reports the results.

[Insert Table 9 Here]

Columns 1 to 3, in Table 9, report the results when we calculate the number of countries for total input offshoring (Column 1), internal input offshoring (Column 2), and external input offshoring (Column 3). The results show that, after the passage of

PNTR, firms increase their intensity of offshoring. More importantly perhaps, the results are only significant for internal offshoring, which is related to transfer pricing. To confirm that offshoring activities are related to the tax benefits of transfer pricing, we calculate the numbers of low- and high-tax offshoring countries. Low- and high-tax countries are coded using the same method as in section 4.3.1, where low-tax countries are those with a lower tax rate than the United States and vice versa. As we have tax rate data for only 98 countries, the number of observations is slightly reduced. Columns 4 to 6 report the results for low-tax countries, and Columns 7 to 9 report the results for high-tax countries. We find that the coefficients of internal offshoring are economically and statistically significant only for low-tax countries. This provides further evidence that PNTR causes firms to engage in more tax reduction activities through suspected transfer pricing.

4.3.3 Relocation

We then test whether firms will move to states with lower corporate income tax rates due to fiercer competition triggered by PNTR. We first supplement our sample with states of historical business address from the Compact Disclosure database and Company Header History (Comphist) database and identify companies that have been relocated. We then match each state with the historical corporate tax rate derived from Heider and Ljungqvist (2015). Finally, we construct two dummy variables for relocation. *LowerTaxState* equals 1 after a firm is relocated to a state with a lower state corporate income tax rate. *LowerTaxState_Median* equals 1 after a firm is relocated to a state with a lower state corporate income tax rate that is below the median state tax rate across the United States in that year. We restrict our sample to firms existing in our baseline sample before 2000. Table B7, in Appendix B, shows that PNTR increases the probability of firms moving to states with lower state corporate income tax.

4.3.4 Outsourcing

PNTR increases competition; thus, it pushes firms to reduce costs. PNTR also provides firms opportunities to purchase cheaper inputs from China. Both factors may drive firms to engage in outsourcing. Therefore, we test whether firms would engage more in outsourcing to reduce cost as they face increased competition due to PNTR. We use the outsourcing dataset from Moon and Phillips (2020), who calculate firms' outsourcing activities from 2004 to 2017 as the value of purchase contracts divided by the cost of goods sold. Table B8, in Appendix B, reports the results. Column 1 examines the relationship between outsourcing and NTRGap. Column 2 examines the relationship between outsourcing and the SIC 3-digit import penetration ratio, which is U.S. imports from China divided by number of production workers. Both results indicate a positive relationship between import competition and outsourcing activities, suggesting that Chinese import competition indeed drives firms to engage more in outsourcing activities to reduce cost.

5. Alternative Natural Experiments

In this section, we provide additional analysis on the effect of import competition on tax reduction activities using three alternative experiments: state tax cuts, the 2017 U.S. Tax Cuts and Jobs Act, and the U.S.-China trade dispute.

5.1 Competition Shocks from Tax Policy Change

We first utilize the competition shocks from staggered state tax law changes. Firm may face stronger competition when the states of competitors in the same industry impose tax cuts. Heider and Ljungqvist (2015) use the number of tax cuts that firms experienced as a proxy for firms' exposure to tax policy shock. Similarly, we construct firms' competition exposure due to competitors' state tax cuts as follows:

, (9)

For firm *i* in industry *j* at time *t*, tax cut competition exposure () is the summation

of the number of state tax cuts imposed on other firms *k* up to year *t-1* () in the same Text-based Network Industry Classifications (TNIC) (Hoberg and Phillips, 2016) industry *j*. To incorporate the closeness of competition between the firm and each of its competitors, we also weight each firm pair by the similarity score of firm *i* related to competitor firm *k*. Records of state tax policy changes are derived from Heider and Ljungqvist (2015) and we calculate the number of tax cuts for each firm according to its historical business address from the Compact Disclosure database and Comphist dataset. TNIC and the similarity score derived from Hoberg and Phillips (2016) are available starting from 1996. As shown in Table B9, in Appendix B, firms increase their tax reduction activities as competitors have more tax cuts. Column 1 shows that increased exposure to competitors' tax cuts is statistically significantly related to lower CETR. Column 2 shows that competitors' tax cuts are related to higher DDBTD, albeit the result is not statistically significant.

5.2 2017 U.S. Tax Cuts and Jobs Act

The U.S. Tax Cut and Jobs Act (TCJA) was passed on December 22, 2017 and went into effect in January 2018. TCJA reduced the top corporate income tax rate from 35 to 21 percent. Naturally, the tax burden is largely reduced after TCJA, and firms affected by PNTR do not need to reduce tax so aggressively as before. We test the heterogenous effects of TCJA on firms with different levels of import competition. Specifically, we estimate the following model:

, (10)

where is a dummy variable equal to 1 if industry *j*'s import competition measure is higher than the sample average in 2015. The import competition measure is defined as the total value of U.S. imports of industry *j* divided by the value added of domestic production of industry *j*, following Bertrand (2004). equals 1 for fiscal years 2018 and 2019. The sample period is from 2015 to 2019. Columns 1 and 2 of Table 10 report the

empirical results. The results indicate that firms that are affected by import competition engage in less tax reduction activities after the 2017 TCJA.

[Insert Table 10 Here]

5.3 U.S.-China Trade Dispute

In 2018, the U.S government started investigations on tariffs applied to Chinese products. In 2018, 11,207 products with a total value of $247 billion in Chinese imports were targeted. It offers an ideal reverse experiment to check whether firms would reduce tax reduction activities when the tariff rates for Chinese imports are raised.

In Columns 3 and 4, in Table 10, we examine how tariffs imposed on Chinese imports affect the tax planning incentives of U.S. listed firms. Specially, we estimate:

, (11)

where is an dummy variable for NAICS 4-digit industries affected by non-zero tariff increases of Chinese imports in 2018, derived from Fajgelbaum et al. (2020). The estimation shows that firms engage less in tax reduction activities when their industries are target industries for tariff increases on Chinese imports.

6. Concluding Remarks

This paper studies the import competition effects of globalization on tax reduction activities. Building on a natural experiment—the United States granting China PNTR—we explore how greater exposure to Chinese imports affects the tax reduction activities of U.S. firms. Using a DID approach, we find that U.S. firms engage significantly more in tax reduction activities following PNTR. The effect is stronger for firms with weaker corporate governance, with less diversified products, and in faster-changing industries. Using cross-border M&A and offshoring activities as alternative measures of tax reduction, we find that firms are more likely to acquire targets in low-tax regions, engage in suspected transfer pricing activities, as well as relocate to states

with lower tax rates. Our results also show that firms reduced their aggressive tax-saving activities when tariffs on imports from China were increased during the recent U.S.-China Trade Dispute and firm with higher import competition reduced more tax reduction activities after the 2017 tax cut.

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Table 1
Summary Statistics

This table presents descriptive statistics on measures of tax avoidance and firms' characteristics for the sample in the regression analysis. The sample includes firms in manufacturing industries headquartered in the United States. We exclude firms in industries with fewer than three firms based on the NAICS 6-digit classification. The sample consists of 27,309 firm-years for 3,921 U.S. publicly traded companies from 1990 to 2007. CETR = cash effective tax rate, based on Chen et al. (2010), calculated as cash taxes paid divided by pre-tax income; DDBTD = Desai and Dharmapala's (2006) residual book-tax difference; NTR gap = intensity of the industry-level trade liberalization shock, which is the difference between the ad valorem equivalent tariff rates between Normal Trade Relation (NTR) countries and non-NTR countries, as provided by Feenstra et al. (2002). Other variable definitions are provided in Appendix A.

	Obs.	Mean	Std.	P25	Median	P75
	(1)	(2)	(3)	(6)	(7)	(8)
Measures of tax reduction						
CETR	15,908	0.286	0.223	0.123	0.271	0.381
DDBTD	21,937	0.022	0.400	-0.052	0.006	0.074
Industry Exposure to Imports from China						
NTR Gap	27,309	0.333	0.133	0.316	0.350	0.364
Firm and Industry Characteristics						
Firm Size (SIZE)	27,309	4.692	2.165	3.211	4.605	6.100
Q (Market-Book Ratio)	27,309	2.612	2.547	1.220	1.772	2.957
Foreign Income Indicator (DFI)	27,309	0.315	0.464	0	0	1
Foreign Income Ratio (FI)	27,309	0.006	0.045	0	0	2.24e-05
Leverage (LEV)	27,309	0.138	0.189	0	0.060	0.218
ROA	27,309	-0.085	0.448	-0.175	0.049	0.143
Tangibility (PPE)	27,309	0.445	0.360	0.194	0.369	0.608
R&D Expenditure Ratio (RD)	27,309	0.127	0.198	0.007	0.054	0.157
Capital Expenditure Ratio (CAPEX)	27,309	0.050	0.047	0.018	0.037	0.066

Table 2

Baseline Results

This table reports the results of difference-in-differences analysis examining the effect of PNTR on firms' tax reduction activities. Specifically, we estimate

where is the tax reduction measure of firm *i* in industry *j* at time *t*; is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999; and is a dummy variable that equals 1 for years after PNTR (). is a set of control variables for firm characteristics. and are firm and year fixed effects, respectively. Panel A reports the estimation results with two tax avoidance measures. Panel B shows the economic significance of the results. Row (1) shows the implied effect of PNTR relative to a hypothetical industry with zero NTR gap, where we first multiply by the NTR gap in each industry and average the products weighted by the total assets of each industry in 1990. Rows (2) and (3) show the mean and standard deviation of each tax avoidance measure. Standard errors are clustered at the NAICS 6-digit industry level and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: Difference-in-Differences Estimation Results

	CETR	DDBTD	CETR	DDBTD
	(1)	(2)	(3)	(4)
	-0.069**	0.154***	-0.092**	0.159***
	(-1.977)	(4.225)	(-2.281)	(5.465)
SIZE			0.015***	-0.010**
			(3.355)	(-2.109)
Q			-0.008***	-0.005
			(-3.174)	(-1.547)
DFI			0.023**	0.001
			(2.485)	(0.147)
FI			-1.073***	0.109
			(-8.126)	(1.440)
LEV			-0.025	0.072*
			(-1.134)	(1.758)
ROA			-0.395***	0.419***
			(-12.735)	(16.593)
PPE			-0.051***	0.062***
			(-3.530)	(2.873)
RD			0.278***	-0.187**
			(4.255)	(-2.413)
CAPEX			0.436***	-0.114
			(7.574)	(-1.341)
Constant	0.310***	0.030***	0.304***	0.111***
	(40.741)	(4.202)	(12.729)	(4.733)
Firm Fixed	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes
Observations	15,908	21,937	15,908	21,937
R-squared	0.354	0.314	0.390	0.407

Panel B: Economic Significance of the Difference-in-Differences Coefficients

		CETR (1)	DDBTD (2)	CETR (3)	DDBTD (4)
(1)	Counterfactual Effect relative to zero tariff gap (weight on total asset in 1990)	-0.022	0.049	-0.029	0.051
(2)	Mean of Tax Reduction Measure	0.286	0.022	0.286	0.022
(3)	S.d. of Tax Reduction Measure	0.223	0.400	0.223	0.400

Table 3

Alternative Measures of Tax Reduction

This table reports the results of difference-in-differences analysis examining the effect of PNTR on firms' tax reduction activities, using five alternative measures of tax reduction. Specifically, we estimate

where is the tax reduction measure of firm *i* in industry *j* at time *t*; is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999; and is a dummy variable that equals 1 for years after PNTR (). is a set of control variables for firm characteristics. and are firm and year fixed effects, respectively. is the error term. Standard errors are clustered at the NAICS 6-digit industry level, and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	GETR	CFETR	MPBTD	BTD	ETRDIFF
	(1)	(2)	(3)	(4)	(5)
	-0.138**	-0.097**	0.046*	0.208***	0.058**
	(-2.341)	(-2.192)	(1.702)	(3.674)	(2.437)
Control Variables	Yes	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes
Observations	16,066	21,469	21,433	23,494	23,263
R-squared	0.410	0.386	0.607	0.440	0.616

Table 4

Alternative Measures of Import Competition: Segment-Based Exposure to PNTR

This table reports the results of difference-in-differences analysis examining the effect of PNTR on firms' tax reduction, using a segment-based measure of exposure. Specifically, we estimate

where is the tax reduction measures of firm *i* in industry *j* at time *t*; is the average difference between the NTR and non-NTR tariff rates weighted by the sales share of each segment in firm *i* in 1999; and is a dummy variable that equals 1 for years after PNTR (). is a set of control variables for firm characteristics. and are firm and year fixed effects, respectively. is the error term. Standard errors are clustered at the NAICS 6-digit industry level, and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	CETR	DDBTD
	(1)	(2)
	-0.024*	0.042***
	(-1.848)	(3.405)
Control Variables	Yes	Yes
Firm Fixed	Yes	Yes
Year Fixed	Yes	Yes
Observations	11,333	15,818
R-squared	0.353	0.380

Table 5

Alternative Measures of Import Competition: Import Penetration Ratio

We use the China-U.S. import penetration ratio as an alternative measure for import competition from China. The China-U.S. import penetration ratio in is the amount of imports from China to the United States in industry *j* scaled by the number of workers employed in industry *j* in 1991. We instrument the China-U.S. import penetration by the imports from China to eight other developed countries, scaled by the number of workers employed in 1980. Panel A reports the results of the first-stage regression with year and industry fixed effects. Standard errors are clustered by year and 4-digit SIC industry.

Using the predicted import penetration ratio from the first stage, we run the second-stage regression as follows:

where is the tax reduction measure of firm *i* in industry *j* at time *t*. is the predicted import penetration from China to the United States estimated in the first stage for industry *j* at time *t*. is a set of control variables for firm characteristics. and are firm and year fixed effects, respectively. is the error term. Results are reported in Panel B. Standard errors are clustered at the SIC 4-digit industry level and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: First-Stage Regression

	(1)
(Other eight)	1.877***
	(8.47)
Industry Fixed	Yes
Year Fixed	Yes
Observations	6,412
R-squared	0.88
F-statistics	118.03

Panel B: Second-Stage Regression

	CETR	DDBTD
	(1)	(2)
	-0.168**	0.177***
	(-2.351)	(3.799)
Control Variables	Yes	Yes
Firm Fixed	Yes	Yes
Year Fixed	Yes	Yes
Observations	11,637	16,559
R-squared	0.396	0.395

Table 6
PNTR and Tax Reduction: Conditional on Corporate Governance

This table presents the results of difference-in-differences estimation of the baseline model conditional on the quality of corporate governance. We measure corporate governance using the G-Index (Gompers et al., 2003). The sample is partitioned into top and bottom quintiles according to the average G-Index over the sample years. The estimation model is the same as the one for the baseline results in columns 3 and 4 in Table 2. Columns 1 and 2 report the estimation results of CETR in each subsample. Columns 3 and 4 report the estimation results of DDBTD in each subsample. We also test the differences of DID estimators between subsamples using seemingly unrelated estimation and report the chi-square statistics and p-values in the last two rows. In all the tests in the table, standard errors are clustered at the NAICS 6-digit industry level and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	CETR		DDBTD	
	High G-index	Low G-index	High G-index	Low G-index
	(1)	(2)	(3)	(4)
	-0.271**	0.255	0.110**	-0.351
	(-2.454)	(1.528)	(2.316)	(-1.272)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes
Observations	1,648	1,323	1,502	1,420
Test Difference of Coefficients				
Chi2	5.135		3.140	
p-value	0.0234***		0.0764*	

Table 7
PNTR and Tax Reduction: Conditional on Product Market Characteristics

This table presents the results of difference-in-differences estimation of the baseline model conditional on different product market characteristics. In panel A, we measure diversification using the average product similarity index by Hoberg and Phillips (2016). In panel B, we use the average product market fluidity index by Hoberg et al. (2014). In panel C, we use the Herfindahl-Hirschman index based on firms' sales data according to TNIC-3 industry classification (Hoberg and Phillips, 2016). As complete electronic filings from the SEC, on which the two measures are based, are available since 1996, we use the sample from 1996 to 2007 in this test. The sample is partitioned into top and bottom quintiles according to competition measures before PNTR. The estimation model is the same as the one for the baseline results in columns 3 and 4 in Table 2. Columns 1 and 2 report the estimation results of CETR in each subsample. Columns 3 and 4 report the estimation results of DDBTD in each subsample. We also test the differences of DID estimators between subsamples using seemingly unrelated estimation and report the chi-square statistics and p-values in last two rows. In all the tests in the table, standard errors are clustered at the NAICS 6-digit industry level and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: Product Similarity

	CETR		DDBTD	
	High Similarity	Low Similarity	High Similarity	Low Similarity
	(1)	(2)	(3)	(4)
	-0.353***	-0.010	0.308**	-0.082
	(-2.958)	(-0.133)	(2.517)	(-0.779)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes
Observations	1,906	1,907	2,794	2,793
Test Difference of Coefficients				
Chi2	6.064		3.588	
p-value	0.014***		0.058**	

Panel B: Product Market Fluidity

	CETR		DDBTD	
	High Fluidity	Low Fluidity	High Fluidity	Low Fluidity
	(1)	(2)	(3)	(4)
	-0.306***	0.013	0.245***	0.079**
	(-4.028)	(0.248)	(3.809)	(2.539)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes

Observations	1,893	1,894	2,774	2,779
Test Difference of Coefficients				
Chi2	13.08		5.327	
p-value	0.000***		0.021***	

Panel C: HHI

	CETR		DDBTD	
	Low HHI	High HHI	Low HHI	High HHI
	(1)	(2)	(3)	(4)
	-0.541***	-0.125	0.256***	-0.092
	(-4.579)	(-1.491)	(3.277)	(-0.798)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes
Observations	1,905	1,905	2,792	2,793
Test Difference of Coefficients				
Chi2	8.268		6.748	
p-value	0.004***		0.009***	

Table 8

PNTR and Cross-Border M&A

This table presents the coefficients of the difference-in-differences estimator (Post*NTRGap) of the cross-border M&A deals with non-U.S. targets in a low-tax regions. A region is defined as a *low-tax region* if its corporate tax rate is lower than that of the United States in that year or if it is a tax haven, as defined by Dyreng and Lindsey (2009). dLowTax is a dummy variable indicating whether firms have acquired companies in low-tax regions in each year (column 1). nLowTax is the total number of deals of the target firm that are in low-tax regions (column 2). nCntyLowTax is the number of low-tax regions where target firms locate (column 3). We derive data on cross-border M&A deals from Thomas Reuters SDC. In the same fashion, we construct dLow_ExCN (column 4), nLow_ExCN (column 5), and nCntyLow_ExCN (column 6) after excluding deals targeting firms in China and columns 7 to 9 report the results for all the non-U.S target deals from the sample U.S companies. Data on the corporate tax rate come from KPMG's Corporate and Indirect Tax Rate Survey 2007, supplemented by the OECD corporate income tax database. Standard errors are clustered at the NAICS 6-digit industry level and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	dLow	nLow	nCntydLow	dLow_ExCN	nLow_ExCN	nCntydLow_ExCN	dMA	dMA	nCntydMA
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	0.063**	0.085**	0.073**	0.056**	0.091**	0.075**	0.033	0.055	0.049
	(2.576)	(2.128)	(2.074)	(2.397)	(2.203)	(2.156)	(0.988)	(0.867)	(0.876)
	-0.055***	-0.079***	-0.072***	-0.053***	-0.075***	-0.068***	-0.057***	-0.095***	-0.085***
	(-4.483)	(-4.158)	(-4.339)	(-4.657)	(-4.314)	(-4.518)	(-3.662)	(-3.749)	(-3.737)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27,309	27,309	27,309	27,309	27,309	27,309	27,309	27,309	27,309
R-squared	0.255	0.273	0.273	0.250	0.267	0.267	0.301	0.325	0.328

Table 9

Transfer Pricing

This table presents the coefficients of difference-in-differences estimator (Post*NTRGap) on firm offshore activities. We use Hoberg and Moon's (2017) offshoring database, which counts the mentions of firms' input purchasing activities with different countries from 1998 to 2007. *Offshore_All* indicates the firm's overall purchasing inputs from the given nation; *Offshore Internal* indicates the firm's purchasing inputs from the given nation when the firm also mentions owning assets in the given nation; and *Offshore_External* indicates the firm's purchasing inputs from the given nation when the firm does not also mention owning assets in the given nation. Columns 1-3 report the results when we calculate the number of countries in each offshoring type. Columns 4-6 report the results of the number of offshoring activities for countries in which the corporate tax rate is lower than that in the United States. Columns 7-9 report the results of the number of offshoring activities for countries in which the corporate tax rate is higher than that in the United States. Country tax rate data are from KPMG's Corporate and Indirect Tax Rate Survey 2007 and the OECD corporate income tax database. Standard errors are clustered at the NAICS 6-digit industry level and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Number of Countries			Number of Low-Tax Countries			Number of High-Tax Countries		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Offshore_All	Offshore _Internal	Offshore _External	Offshore _All	Offshore _Internal	Offshore _External	Offshore _All	Offshore _Internal	Offshore _External
	1.200**	1.111***	0.115	1.243***	1.296***	0.071	-0.023	0.023	-0.022
	(2.416)	(2.790)	(0.465)	(2.937)	(3.903)	(0.293)	(-0.146)	(0.154)	(-0.286)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,119	14,119	14,119	13,898	13,898	13,898	13,898	13,898	13,898
R-squared	0.859	0.863	0.691	0.818	0.819	0.661	0.660	0.655	0.554

Table 10
2017 U.S. Tax Cuts and Jobs Act and U.S.-China Trade Dispute

This table reports the analysis of the effect of import competition from the 2017 U.S. tax cut and the U.S.-China trade dispute. The sample period is from 2015 to 2019. is a dummy variable equal to 1 if industry *j*'s import competition ratio in 2015 is higher than average. The import competition measure is the total value of U.S. imports from China of industry *j* divided by the value added of domestic production of industry *j*. is the targeted industry of tariff increases on Chinese imports, from Fajgelbaum et al. (2020). equals 1 for fiscal years of 2018 and 2019. Columns 1 and 2 report the results of the 2017 tax cut, and columns 3 and 4 report the results of the U.S.-China trade dispute. Standard errors are clustered at the industry level, and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	CETR	DDBTD	CETR	DDBTD
	(1)	(2)	(3)	(4)
	0.045***	-0.115*		
	(2.817)	(-1.747)		
			0.095***	-0.037*
			(6.018)	(-1.682)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes
Observations	2,865	5,200	2,865	5,200

Appendix A
Variable Definitions

Variable	Definition (Compustat data codes are italicized)
Measures of Tax Avoidance	
Cash effective tax rate (CETR)	Calculated as cash taxes paid (*txpd*) divided by pre-tax income (*pi*). Based on Chen et al. (2010). CETR is set to missing when the denominator is zero or negative. We winsorize CETR to the range [0, 1]. Source: Compustat.
Desai and Dharmapala (2006) residual book-tax difference (DDBTD)	Desai and Dharmapala (2006) residual book-tax difference is calculated as the residual from the following fixed effects regression: where BTD is the total book-tax difference and TACC is the total accruals measured using the cash flow method per Hribar and Collins (2002). Both variables are scaled by lagged total assets. We remove observations with total assets less than $1 million and observations with negative taxable income (*txfed<0*). Source: Compustat.
Generally accepted accounting principles effective tax rate (GETR)	Calculated as total tax expense (*txt)* minus change in deferred taxes and investment tax credit divided by pretax income (*pi*).
Cash flow effective tax rate (CFETR)	Calculated as cash taxes paid (*txpd*) divided by operating cash flows (*oancf*). We winsorize CFETR to the range [0, 1]. Source: Compustat.
Manzon and Plesko (2002) book-tax difference (MPBTD)	U.S. domestic book-tax difference is calculated by U.S. domestic book income less U.S. domestic taxable income less state tax income (*txs*) less other tax income (*txo*) less equity in earnings (*esub*) scaled by lagged assets (*at*). U.S. domestic book income is domestic pre-tax income (*pidom*)

	in year t. U.S. domestic taxable income is calculated by the current federal tax expense (*txfed*) divided by the statutory tax rate (STR). We remove observations with total assets less than $1 million and observations with negative taxable income (*txfed*<0). Based on Manzon and Plesko (2002). Source: Compustat.
Book-tax difference (BTD)	Calculated as book income less taxable income scaled by lagged assets (*a*t). Book income is pre-tax income (*pi*) in year t. Taxable income is calculated by summing the current federal tax expense (*txfed*) and current foreign tax expense (*txfo*) and dividing by the statutory tax rate (STR) and then subtracting the change in net operating loss (NOL) carryforwards (*tlcf*) in year t. If the current federal tax expense is missing, the total current tax expense equals the total income taxes (txt) less deferred taxes (*txdi*), state income taxes (*txs*), and other income taxes (*txo*). We remove observations with total assets less than $1 million and observations with negative taxable income (*txfed*<0). Source: Compustat.
ETRDIFF	Calculated as PI – ((TXFED + TXFO)/STR), scaled by lagged assets (*at*). PI is pre-tax book income (*pi*); TXFED is the current federal tax expense (*txfed*); TXFO is the current foreign tax expense (*txfo*). Based on Frank et al. (2009). Source: Compustat.
Industry Exposure to Imports from China	
NTRGap	Difference of ad valorem equivalent tariff rates between Normal Trade Relation (NTR) countries and non-NTR countries. Source: Feenstra et al. (2002).
Firm Characteristics	

Firm Size (SIZE)	Log of the book value of total assets (*at*). Source: Compustat.
Tobin's Q (Q)	Market value of assets over book value of assets: (*at – ceq + csho* x *prcc_f)/at.* Source: Compustat.
Foreign income dummy (DFI)	Equals one if firms have foreign income. Source: Compustat.
Foreign income (FI)	Foreign income (*pifo*) divided by total assets. Source: Compustat.
Leverage (LEV)	Market leverage, defined as long-term debt (*dltt*) plus debt in current liabilities (*dlc*) divided by market value of assets: (*at – ceq + csho* x *prcc_f).* Source: Compustat.
ROA	Return on assets, measured as operating income (*pi – xi*) divided by lagged assets. Source: Compustat.
Tangibility (PPE)	Property, plant, and equipment (*ppegt*) divided by total assets (*at*). Source: Compustat.
R&D expenditure (RD)	Research and development (*rd*) divided by lagged total assets (*at*).
Capital expenditure (CAPEX)	Capital expenditure (*capx*) divided by lagged total asset (*at*).
Other Variables	
Product Market Similarity	The index is constructed by calculating the firm-by-firm similarity score by parsing the product descriptions from firms 10K reports. See Hoberg and Phillips (2016) for details about the index construction.
Product Market Fluidity	The index measures how intensively the market around the firm is changing each year. See Hoberg et al. (2014) for details.

Low-Tax Region M&A Deals (dlow)	A dummy variable that equals one if the firm acquires at least one target firm in a low-tax region which is defined as a region with corporate tax rate lower than that of the United States or a tax haven according to Dyreng and Lindsey (2009). Source: Dyreng and Lindsey (2009), KPMG's Corporate and Indirect Tax Rate Survey 2007, and Thomas Reuters SDC.
Number of M&A Deals Targeting Low-Tax Regions (nLow)	Total number of deals targeting firms in a low-tax region defined as a region with corporate tax rate lower than that of the United States or a tax haven according to Dyreng and Lindsey (2009). Source: Dyreng and Lindsey (2009), KPMG's Corporate and Indirect Tax Rate Survey 2007, and Thomas Reuters SDC.
Number of Low-Tax Regions of M&A Deals (nCntydLow)	Total number of low-tax regions where firms' M&A deals are targeting at. A low-tax region is defined as a region with corporate tax rate lower than that of the United States or a tax haven defined by Dyreng and Lindsey (2009) Source: Dyreng and Lindsey (2009), KPMG's Corporate and Indirect Tax Rate Survey 2007, and Thomas Reuters SDC.
Oversea MA Deals (dMA)	A dummy variable that equals one if the firm acquires at least one target firm overseas.
Number of Overseas M&A Deals (nMA)	Total number of Non-U.S. target M&A deals
Number of Overseas Regions of M&A Deals (nCntyMA)	Total number of overseas regions where firms' M&A deals are targeting at.
Import Penetration Ratio	

from China to the United States	Defined as: *1000 where is the value of U.S. imports from China at time t in industry j, is production worker employment in industry j in 1991. Source: Acemoglu et al. (2016).
Import Penetration Ratio from China to eight other countries	Defined as : *1000. where is the value of imports from China in eight other developed economies at time t in industry j, is production worker employment in industry j in 1980. The eight countries are Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland, Source: Acemoglu et al. (2016).
Takeover Index	Firm-level takeover index measures probability of being taken over, from Cain et al. (2017).
Offshore Activities	The database from Hoberg and Moon (2017) counts the mentions of firms' input purchasing activities with different countries. *Offshore_All* indicates the firm's overall purchasing inputs from the given nation; *Offshore_Internal* indicates the firm's purchasing inputs from the given nation when the firm also mentions owning assets in the given nation; and *Offshore_External* indicates the firm's purchasing inputs from the given nation when the firm does not also mention owning assets in the given nation. Source: Hoberg and Moon (2017).
Contract Intensity	Proportion of intermediate inputs that require relationship-specific investments. Source: Nunn (2007).
Advanced Technology	Dummy variable for advanced technology products. Source: U.S. Census Bureau.

PNTRAAR	Market-value weighted average of PNTR-related AARs of all firms in NAICS 6-digit industry. AARs are calculated as relative average abnormal returns (AARs) relative to the market two days before and five days after PNTR-related events. See Greenland et al. (2020) for more details.
LowerTaxState	A dummy variable that equals 1 after the firm relocated to a state with a lower state corporate income tax rate.
Outsourcing	The value of purchase contracts divided by cost of goods sold. Source: Moon and Phillips (2020).
TaxCutExposure	Summation of the number of state tax cuts imposed on other firms k up to year t-1 in the same Text-based Network Industry Classifications industry.
HighImportCompetition	Dummy variable equal to 1 if the industry's import competition measure is higher than average in 2015. Import competition measure is defined as total value of U.S. imports divided by value added of domestic production.
TariffIndustry	Dummy variable of NAICS 4-digit industries affected by non-zero tariff increases on Chinese imports in 2018. Source: Fajgelbaum et al. (2020).

Appendix B

Table B1. Top and Bottom 20 Industries Ranked by NTR Gap

Panel A: Top 20 industries

NAICS Code	Industry Name	NTRGAP
334613	Magnetic and Optical Recording Media Manufacturing	0.800
325620	Toilet Preparation Manufacturing	0.744
339911	Jewelry (except Costume) Manufacturing	0.720
339931	Doll and Stuffed Toy Manufacturing	0.700
332211	Cutlery and Flatware (except Precious) Manufacturing	0.694
312221	Cigarette Manufacturing	0.671
311930	Flavoring Syrup and Concentrate Manufacturing	0.655
335921	Fiber Optic Cable Manufacturing	0.650
315233	Women's and Girls' Cut and Sew Dress Manufacturing	0.624
334612	Prerecorded Compact Disc (except Software), Tape, and Record Reproducing	0.619
334514	Totalizing Fluid Meter and Counting Device Manufacturing	0.601
339112	Surgical and Medical Instrument Manufacturing	0.600
326199	All Other Plastics Product Manufacturing	0.571
315239	Women's and Girls' Cut and Sew Other Outerwear Manufacturing	0.569
315223	Men's and Boys' Cut and Sew Shirt (except Work Shirt) Manufacturing	0.542
339932	Game, Toy, and Children's Vehicle Manufacturing	0.538
334513	Instruments and Related Mfg for Measuring, Displaying, and Controlling Industrial Process Variables	0.526
332991	Ball and Roller Bearing Manufacturing	0.520
327212	Other Pressed and Blown Glass and Glassware Manufacturing	0.491

Panel B: Bottom 20 industries

NAICS Code	Industry Name	NTRGAP
325312	Phosphatic Fertilizer Manufacturing	0.005
327420	Gypsum Product Manufacturing	0.006
325311	Nitrogenous Fertilizer Manufacturing	0.010
327310	Cement Manufacturing	0.026
311520	Ice Cream and Frozen Dessert Manufacturing	0.030
321113	Sawmills	0.038
311511	Fluid Milk Manufacturing	0.046
325414	Biological Product (except Diagnostic) Manufacturing	0.050
312111	Soft Drink Manufacturing	0.054
312112	Bottled Water Manufacturing	0.057
333111	Farm Machinery and Equipment Manufacturing	0.058
311920	Coffee and Tea Manufacturing	0.067
324110	Petroleum Refineries	0.071
311615	Poultry Processing	0.072

336213	Motor Home Manufacturing	0.075
336211	Motor Vehicle Body Manufacturing	0.075
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	0.097
325181	Alkalies and Chlorine Manufacturing	0.097
311111	Dog and Cat Food Manufacturing	0.100

Table B2. Robustness Checks for Baseline Results

This table reports the results of difference-in-differences analysis examining the effect of cross-industry (NAICS 6-digit level) trade liberalization shocks on firms' tax reduction activities. Specifically, we estimate:

where is the tax reduction measure of firm *i* in industry *j* in state *s* at time *t*. is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999 and is a dummy variable that equals 1 for years after PNTR (). is a dummy variable that equals one for industries with advanced technology according to the Census Burau. is the Nunn (2007) measure of contract intensity. is a set of control variables for firm characteristics. , and are firm, year, and state-year fixed effects, respectively. is a set of industry dummy variables (NAICS 6-digit level) multiplied by time trend *t* to control for the industry-specific preexisting trend. Panel A reports the estimation results with two tax reduction measures. Columns 1 and 2 report the baseline results with firm and year fixed effects. Columns 3 and 4 add state-year cross fixed effects to the baseline results. Finally, columns 5 and 6 report the results with additional controls on industry preexisting trend. Panel B shows the economic significance of the results. Row 1 shows the implied effect of PNTR relative to a hypothetical industry with zero NTR gap where we first multiply by the NTR gap in each industry and average the products weighted on the total asset of each industry in 1990. Rows 2 and 3 show the means and standard deviations of each tax reduction measure. Standard errors are clustered at the NAICS 6-digit industry level and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: Difference-in-Differences Estimation Results

	CETR	DDBTD	CETR	DDBTD
	(1)	(2)	(3)	(4)
	-0.088**	0.168***	-0.181***	0.080**
	(-2.213)	(6.206)	(-3.471)	(2.418)
	-0.010	0.018	-0.007	0.053***
	(-0.842)	(1.129)	(-0.405)	(2.866)
	-0.035*	0.019	0.009	0.044
	(-1.902)	(0.777)	(0.309)	(1.405)
SIZE	0.014***	-0.010*	0.014***	-0.008
	(3.004)	(-1.928)	(3.199)	(-1.563)
Q	-0.007***	-0.005	-0.006**	-0.005
	(-2.700)	(-1.426)	(-2.578)	(-1.397)
DFI	0.026***	-0.000	0.028***	0.001
	(2.782)	(-0.035)	(2.850)	(0.072)
FI	-1.111***	0.115	-1.149***	0.115
	(-8.359)	(1.476)	(-8.451)	(1.448)
LEV	-0.034	0.070	-0.038	0.074*
	(-1.503)	(1.624)	(-1.607)	(1.709)
ROA	-0.397***	0.413***	-0.408***	0.418***
	(-12.623)	(16.374)	(-12.978)	(16.452)
PPE	-0.053***	0.059***	-0.057***	0.061***
	(-3.380)	(2.780)	(-3.443)	(2.753)
RD	0.256***	-0.189**	0.248***	-0.187**
	(3.908)	(-2.462)	(3.832)	(-2.392)
CAPEX	0.416***	-0.112	0.423***	-0.115
	(7.009)	(-1.250)	(6.768)	(-1.261)
NTR	0.170	0.190	0.306	-0.146
	(0.826)	(0.842)	(1.276)	(-0.469)
Constant	0.917***	-0.247***	-0.197***	-0.537***
	(4.462)	(-4.121)	(-3.358)	(-2.885)
Firm Fixed	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes
State-year Fixed	Yes	Yes	Yes	Yes
Industry- Specific Time Trend	No	No	Yes	Yes
Observations	15,734	21,744	15,734	21,744
R-squared	0.421	0.418	0.434	0.422

Panel B: Economic Significance of Difference-in-Differences Coefficients

		CETR (1)	DDBTD (2)	CETR (3)	DDBTD (4)
(1)	Counterfactual Effect (weight on total asset in 1990)	-0.0218	0.0524	-0.0577	0.0256
(2)	Mean of Tax Reduction Measure	0.286	0.022	0.286	0.022
(3)	S.d. of Tax Reduction Measure	0.223	0.400	0.223	0.400

Table B3. Import Penetration Ratio: Selected Industries

This table reports the results of subsample analysis using the same model specifications as Table 5. Columns 1 and 2 report results without construction industries. Columns 3 and 4 report results without computer industries. Columns 5 and 6 report results without clothing industries. Standard errors are clustered at the SIC 4-digit industry level and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	CETR	DDBTD	CETR	DDBTD	CETR	DDBTD
	(1)	(2)	(3)	(4)	(5)	(6)
Dropped Industry	Construction		Computer		Clothing	
	-0.161**	0.175***	-0.180**	0.211***	-0.158**	0.176***
	(-2.248)	(3.735)	(-2.187)	(3.441)	(-2.259)	(3.789)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,407	16,358	10,993	15,608	11,580	16,509
R-squared	0.395	0.395	0.396	0.399	0.397	0.395

Table B4. Intermediate Inputs

This table reports the results of difference-in-differences analysis examining the effect of cross-industry (NAICS 6-digit level) Chinese import competition shocks on firms' tax reduction activities. Specifically, we estimate:

where is the tax reduction measure of firm *i* in industry *j* at time *t*. is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999 and is the weighted average of the industry's upstream industries constructed following Pierce and Schott (2016a). is a dummy variable that equals 1 for years after PNTR (). is a set of control variables for firm characteristics. and are firm and year fixed effects, respectively. Standard errors are clustered at the NAICS 6-digit industry level and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	CETR	DDBTD
	(1)	(2)
	-0.080*	0.154***
	(-1.848)	(4.927)
	-0.089	0.051
	(-0.708)	(0.457)
Control Variable	Yes	Yes
Firm Fixed	Yes	Yes
Year Fixed	Yes	Yes
Observations	15,908	21,937

Table B5. AAR

This table reports the results of difference-in-differences analysis examining the effect of PNTR on firms' tax reduction activities with stock market reaction of PNTR. Specifically, we estimate:

where is the tax reduction measure of firm *i* in industry *j* at time *t*; and is a dummy variable that equals 1 for years after PNTR (). is the market-value-weighted average abnormal return with a five-day window surrounding PNTR events (Greenland et al., 2020) of industry j. is a set of control variables for firm characteristics. and are firm and year fixed effects, respectively. Standard errors are clustered at the NAICS 6-digit industry level and t-statistics are reported in parentheses. * and *** indicate significance at the 10% and 1% level, respectively.

	CETR	DDBTD
	(1)	(2)
	2.696*	-3.720***
	(1.701)	(-3.077)
Control Variable	Yes	Yes
Firm Fixed	Yes	Yes
Year Fixed	Yes	Yes
Observations	11,251	14,742

Table B6. PNTR and Tax Reduction: Firm Takeover Susceptibility

This table reports the impact of corporate governance due to changes in the state of anti-takeover statutes on the relationship between PNTR and tax reduction. We use the takeover index from Cain et al. (2017). Specifically, we estimate the triple-difference model:

where is the tax reduction measure of firm *i* in industry *j* at time *t*. is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999 and is a dummy variable that equals one for years after PNTR (). is the takeover index for firm *i* at time *t*. A higher takeover index indicates a higher probability of being taken over. is a set of control variables for firm characteristics. and are firm and year fixed effects, respectively. is the error term. Standard errors are clustered at the NAICS 6-digit industry level and t-statistics are reported in parentheses. **, and *** indicate significance at the 5% and 1% level, respectively.

	(1)	(2)
VARIABLES	CETR	DDBTD
	0.966**	-0.602**
	(2.051)	(-2.161)
	-0.251**	0.204***
	(-2.531)	(3.444)
	-0.017	0.411*
	(-0.101)	(1.906)
	-0.290*	0.007
	(-1.738)	(0.062)
Control Variables	Yes	Yes
Firm Fixed	Yes	Yes
Year Fixed	Yes	Yes
Observations	15,429	21,258
R-squared	0.468	0.314
F test:		
	6.29**	18.06***

Table B7: Relocation

This table reports the results of difference-in-differences analysis examining the effect of PNTR on firms' relocation. The sample is restricted to firms existing in our baseline sample before 2000. The sample period is from 1990 to 2007. equals one after year *t* when the business address of firm *i* in industry *j* changed to a state with lower state corporate tax rate. equals one after year *t* when the business address of firm *i* in industry *j* changed to a state with state corporate tax rate below the median of the state tax rate across the United States in that year. Specifically, we estimate:

We use the most recent SIC 4-digit level import penetration ratio () from Acemoglu et al. (2016), defined as change in imports from China from 2007 to 2011 divided by employment. Standard errors are clustered at the industry level and t-statistics are reported in parentheses. *, and ** indicate significance at the 10% and 5% level, respectively.

	LowerTax	LowerTax_Median
	(1)	
	0.052*	0.057**
	(1.651)	(2.143)
Firm-level Control Variables	Yes	Yes
Firm Fixed	Yes	Yes
Year Fixed	Yes	Yes
Observations	16,742	16,742

Table B8: Outsourcing

This table reports the results of analysis examining the effect of import competition on outsourcing from 2004 to 2017. Our dependent variable is the value of purchase contracts (PC) within the closet fiscal year divided by the cost of goods sold (COGS), derived from Moon and Phillips (2020). Column 1 reports the result of NTRGap in 1999 as a proxy for import competition, and column 2 reports the result of the import penetration ratio at the SIC 3-digit level from 2004 to 2017. Standard errors are clustered at the industry level and t-statistics are reported in parentheses. ** and *** indicate significance at the 5% and 1% level, respectively.

	PC/COGS	PC/COGS
	(1)	(2)
	0.053***	
	(4.069)	
ImportPentrationCH		0.032**
		(2.168)
Control Variables	Yes	Yes
Industry Fixed	No	Yes
Year Fixed	Yes	Yes
Observations	12,119	13,793

Table B9. Competition Exposure to State Tax Policy Change

This table reports the results of analysis examining the effect of competition shock from competitors' state tax cuts on firms' tax reduction measures from 1996 to 2007. The measure for tax cut exposure is the summation of the number of state tax cuts imposed on other firms in the same TNIC industry weighted by the similarity score (Hoberg and Phillips, 2016). Specifically, we estimate:

where

Standard errors are clustered at the state level and t-statistics are reported in parentheses. ** indicates significance at the 5% level.

	CETR	DDBTD
	(1)	(2)
	-0.009**	0.002
	(-2.441)	(0.703)
Firm-level Control Variables	Yes	Yes
Firm Fixed	Yes	Yes
Year Fixed	Yes	Yes
State-Year Fixed	Yes	Yes
Observations	5,408	7,826

Table B10. NAICS 4-Digit

This table uses the same specification as the baseline results in Table 2, except that we use the NACIS 4-digit classification to construct the NTRgap. Standard errors are clustered at the NAICS 4-digit industry level and t-statistics are reported in parentheses. ** indicates significance at the 5% level.

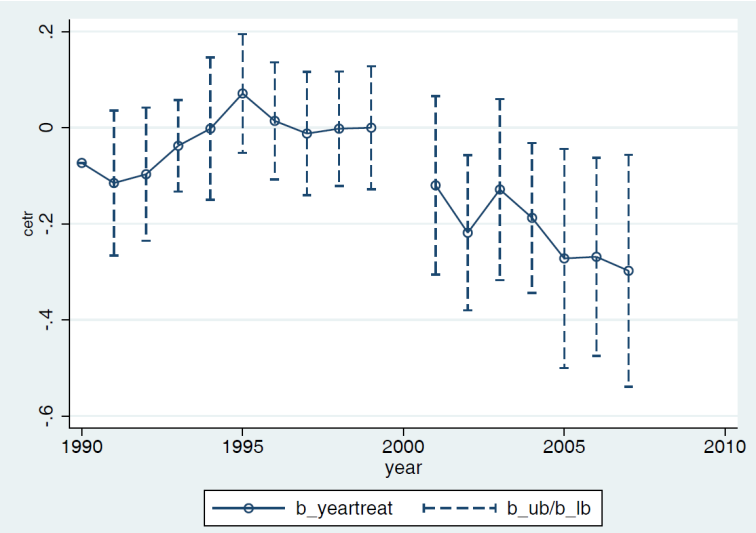
	CETR	DDBTD
	(1)	(2)
	-0.123**	0.135**
	(-2.209)	(2.521)
Control Variable	Yes	Yes
Firm Fixed	Yes	Yes
Year Fixed	Yes	Yes
Observations	16,985	23,534

Figure B1. Dynamic Time Trend

The graphs were created by estimating the following regression:

where is the tax reduction measure of firm *i* in industry *j* in state *s* at time *t.* is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999 and are the dummy variables for each year (except 2000, which serves as benchmark year). is a set of control variables for firm characteristics. , and are firm, year, and state-year fixed effects, respectively. is a set of industry dummy variables (NAICS 6-digit level) multiplied by time trend *t* to control for industry-specific preexisting trend. The y-axis plots coefficients for the year-specific treatment with 90% confidence interval.

CETR



DDBTD

