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

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Abstract

This paper studies how globalization affects corporate tax planning strategies of U.S. manufacturing firms. Using U.S. granting China Permanent Normal Trade Relations as a quasi-natural experiment, the paper finds a significant increase in tax avoidance for firms facing higher exposure to Chinese imports. The effect is more pronounced for firms with higher managerial slack. The paper also finds that the effect is stronger for firms in less diversified products and faster-changing industries, but is mitigated by local social capital. Further, the findings show that U.S. firms that face higher Chinese import competition are more likely to acquire subsidiaries in low-tax regions as well as to engage in suspected transfer pricing activities.

Keywords: Globalization; Tax avoidance; Natural experiment; Chinese Import Competition; Permanent Normal Trade Relations.

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1. Introduction

Globalization has largely benefited the world economy in many aspects,[1] but the recent Brexit and criticisms of globalization from candidates in the 2016 U.S. presidential election have drawn public attention to rethinking the costs and benefits of globalization. Particularly, the recent wave of globalization unleashed by China's entry 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."[2] Understanding the link between tax avoidance and globalization is a crucial issue for policy makers around the world.[3] 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 avoidance decisions.

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 tax avoidance. 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, they 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.

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

[2] "Joseph Stiglitz, *The Guardian*, May 27, 2013.

[3] 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 avoidance.

Pierce and Schott (2016a) also find that industries with higher exposure to Chinese imports because of PNTR experienced a larger decline in employment. The dearth of research on the globalization and tax avoidance nexus might be partially driven by potential endogeneity concerns. For instance, confounding factors, such as incumbent firms' lobbying ability, may affect firms' tax avoidance ability and their exposure to globalization. As is 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 to identify causally the impact of the China trade shock on U.S. corporates.

We expect that the import competition shock from globalization could increase tax avoidance 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 avoidance is one of these difficult tasks, since it involves direct costs for managers, such as time, effort, and reputation concerns (e.g., Graham and Tucker, 2006; Cheng et al., 2012; Graham et al., 2014), which deters firms from maximizing tax efficiency. 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.

Second, it has been well established that competition shock decreases managerial slack (e.g., Hart, 1983; Nickell, 1996; Giroud and Mueller, 2010), which pushes effort-averse managers to devote more effort to maintain competitiveness in the marketplace. In our context, globalization lowers 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."

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 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 China's imports. 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 renewal of NTR for China was introduced to legislators every year from 1990 to 2001. The average House 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 with US-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 analysis to study the effect of Chinese import competition on tax avoidance. As discussed in Section 2.2, a good attribute of the NTR gap is exogeneity, as 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 follow the literature and use the effective tax rate and book-tax difference to measure tax avoidance in the main analysis.[4] 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 difference-in-differences (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 avoid 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 avoidance to explore the channels through which the associated tax avoidance incentives induced by the passage of PNTR can be exacerbated or mitigated. 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 avoidance through reducing managerial slack, we test how corporate governance influences the effect of PNTR on tax avoidance. As firms with weaker corporate governance are associated with higher managerial slack (Bertrand and Mullainathan, 2003; Giroud and Mueller, 2010), 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 avoidance 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 avoid

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

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 avoidance 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 avoidance is indeed greater for firms with less diversified products and in fast-changing industries.

We then turn to social capital as a monitoring mechanism and examine how it affects the link between globalization and corporate tax avoidance. Following Woolcock (2001), we define social capital as the norms and networks that facilitate collective action. Researchers believe that social capital as "a good culture" (Guiso et al., 2008) facilitates cooperation and helps monitor people's behavior (Coleman, 1994). Therefore, higher social capital increases the cost of tax avoidance. Hasan et al. (2017) find that firms with headquarters in counties with higher levels of social capital are less engaged in tax avoidance. Using data from the Northeast Regional Center for Rural Development to measure the levels of social capital across U.S. counties, we find strong and consistent evidence that the effect of PNTR on tax avoidance is indeed more pronounced for firms whose headquarters are in low social capital areas.

In addition to measuring tax avoidance using data from firms' financial statements, we also use nonfinancial measures of tax avoidance: (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 avoidance and sheltering activities; and (2) input offshoring from the Hoberg and Moon (2017) offshoring database as a proxy for suspected transfer pricing activities. Using these two alternative measures of tax avoidance, we also find strong evidence that firms that face higher Chinese import

competition are more likely to acquire subsidiaries in low-tax regions as well as engage in suspected transfer pricing activities.

This paper contributes to the following strands of literature. Primarily, it adds to the tax avoidance literature (e.g., Slemrod and Yitzhaki, 2002; Crocker and Slemrod, 2005; Desai and Dharmapala, 2006; Kim et al., 2011; Beck et al., 2014) by investigating new potential driving factors of firms' tax avoidance activities. Despite the massive amount of tax avoidance and its policy importance, little is known on what fundamentally drives firms to avoid taxes. Moreover, the literature focuses on the institutional environment and points out that tax avoidance might be induced by bureaucracy, corruption, weak legal institutions, and inefficient public services (e.g., Johnson et al., 2000; Friedman et al., 2000). In particular, Johnson et al. (2000) show that firms are more inclined to hide output in countries with poor market-supporting institutions, as they gain little benefit from being formal. Recently, Beck et al. (2014) show that information sharing and financial sector outreach could reduce the incentives of firm managers to avoid taxes. However, these factors do not explain why tax avoidance is still prevalent in developed countries with well-functioning financial, legal, and economic institutions. This paper is among the first to document that competitive pressure caused by globalization materially and causally affects firms' incentives to engage in tax avoidance activities.[5] In this regard, the paper also contributes to the broader literature on tax avoidance.

Moreover, the research adds to the literature on the impacts of globalization, for example, on markup (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 effect on

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

manufacturing unemployment (e.g., Acemoglu et al., 2016; Pierce and Schott, 2016a), public health (McManus and Schaur, 2016; Pierce and Schott, 2016b), and firms' innovation (Bloom et al., 2016; Hombert and Matray, 2017).

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 results. Section 4 studies the influences of corporate governance, product market characteristics, and social capital on the relation between Chinese import competition and tax avoidance. Section 5 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 avoidance, a major concern is that competition is likely to be endogenous. Unobservable firm and industry characteristics that are correlated with 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 avoidance and examine whether firms in industries exposed to larger import competition due to PNTR avoid 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*.

$$NTR\ Gap_j = Non\ NTR_j - NTR_j, \quad (1)$$

As the *NTR Gap*$_j$ of industry *j* represents the increased tariff rate if the renewal failed, 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 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, which is less susceptible to tariff lobbying. In addition, 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.

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

$$TaxAvoid_{i,j,t} = \alpha + \beta\left(NTRGap_j * post_t\right) + X_{i,t}\varphi + \gamma_i + \theta_t + \varepsilon_{i,j,t}, \quad (2)$$

where $TaxAvoid_{i,t}^{j}$ is the tax avoidance measure of firm *i* in industry *j* at time *t*. $NTRGap_j$ is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999, and $post_t$ is a dummy variable that equals 1 for years after PNTR ($\text{post} = \text{I}\{\text{year} \geq 2001\}$). $\text{X}_{\text{i,t}}\varphi$ is a set of control variables for firm characteristics that are related to taxes, as documented in the literature.[6] The control variables include firm size, Tobin's q, multinational, leverage, profitability, tangibility, research and development expenditure, and capital expenditure. γ_i and θ_t are firm and year fixed effects,

[6] See a review in Graham (2003).

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 classif the firm industry at the 6-digit North American Industry Classification System (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 less 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.[7] 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.[8] 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 industries with fewer than three firms.

The historical NTR and non-NTR tariff data come from Feenstra et al. (2002),[9] 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

[7] The concordance table can be downloaded here: https://www.census.gov/eos/www/naics/concordances/concordances.html.
[8] 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.
[9] Tariff data can be downloaded from here: http://www.johnromalis.com/publications/.

(BEA),[10] 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 Avoidance

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

We use cash effective tax rate (CETR), because cash savings is the major benefit of tax avoidance 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 avoidance.

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

$$BTD_{\mathrm{i,t}} = \beta_1 TACC_{i,t} + \mu_{\mathrm{i}} + \varepsilon_{i,t}, \quad (3)$$

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 avoidance.

[10] Available on the BEA website: http://www.bea.gov/industry/zip/NDN0317.zip.

[Insert Table 1 Here]

As shown in Table 1, the means 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

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

Columns 1 and 2 in Table 2, panel B, show the economic significance of the baseline results. We calculate the implied effect of PNTR following Pierce and Schott (2016a). First, we multiply β 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 2 and 3 in Table 2, the implied effect on CETR is -0.029, 13.0 percent of its standard deviation, while the implied effect on DDBTD is 0.051, 12.8 percent of its 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 Avoidance

In this section, we test the robustness of the results with five alternative measures of tax avoidance. The first is the generally accepted accounting principles (GAAP) 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) and Kim et al. (2011).

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

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:

$$\text{TaxAvoid}_{\text{i,j,s,t}} = \alpha + \beta\left(NTRGap_j * post_t\right) + \text{X}_{\text{i,t}}\varphi + \gamma_i + \theta_t + \sigma_{s,t} + \sum \emptyset_j (Iind_j * t) + NTR_{i,j} + \varepsilon_{i,j,t}. \quad (4)$$

To capture time-varying changes at the state level (for example, state regulation changes), we add firms' incorporation state cross-year fixed effects ($\sigma_{s,t}$). 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* $\left(Iind_j * t\right)$. We also take into account the impact of contemporary tariff changes by including the time-varying NTR tariff rate.[11]

Columns 1 and 2 in Table B1 in Appendix B report the results with additional state-year fixed effects. Columns 3 and 4 report the results when we add industry-specific time trends and the NTR tariff rate. All these results are consistent with the baseline results.

3.2.3. Dynamic Effects

If the increase in tax avoidance is indeed caused by PNTR as we expect, the NTR gap should be correlated with tax avoidance 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:

$$\text{TaxAvoid}_{\text{i,j,s,t}} = \alpha + \sum \beta_t\left(NTRGap_j * Iyear_t\right) + \text{X}_{\text{i,t}}\varphi + \gamma_i + \theta_t + \sigma_{s,t} + \sum \emptyset_j (Iind_j * t) + \varepsilon_{i,j,t}, \quad (5)$$

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

where we replace $NTRGap_j * Post_t$ in Equation (2) with a set of interactions between $NTRGap_j$ and the dummy variables of each NAICS 6-digit industry ($Iyear_t$) (except 2000, which serves as the benchmark year). In Figure B1 in Appendix B, the y-axis plots the coefficients for the year-specific effect of PNTR (β_t) 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 for firms' exposure to PNTR may be noisy, as different segments within firms may be exposed to different shocks due to PNTR. Therefore, instead of using firms' primary historical NAICS industry code to construct their exposure to PNTR, we use the average of the NTR gap weighted by the sales share of each segment. Specifically, we use Compustat Business Segments data. The data provide information about the industry classification and net sales of each segment within firms. We construct the firm-level, segment-based NTR gap as follows:

$$\text{NTR gap\_Seg}_i = \sum w_{i,j} * NTR\ gap_j, \quad (6)$$

where $w_{i,j}$ is the sales share of the segment in 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 that are 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 (2017), who also use a segment-based measure in their robustness check.

3.2.5 Import Penetration

Using real trade data, we construct the import penetration ratio as another alternative measure of Chinese import competition. We construct the China-U.S. import penetration ratio following Acemoglu et al. (2016) and Hombert and Matray (2017):

$$\mathrm{IP}_{\mathrm{jt}}^{\mathrm{UC}} = \frac{M_{j,t}^{UC}}{Emp_{j,91}} * 1000$$

where $M_{j,t}^{UC}$ is the value of imports to the United States from China at time *t* in Standard Industrial Classification (SIC) 4-digit industry *j*; $Emp_{j,91}$ is production worker employment in industry *j* in 1991.

However, Chinese imports to the United States 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 supply side shock——China's increased competitiveness. Therefore, to isolate the supply-side shock from China, we use Chinese imports to eight other developed countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland) and construct an analogous measure as an instrumental variable:

$$\mathrm{IP}_{\mathrm{jt}}^{\mathrm{OTHER}} = \frac{M_{j,t}^{OTHER}}{Emp_{j,80}} * 1000, \quad (7)$$

where $M_{j,t}^{OTHER}$ is the value of imports to the eight other developed economies from China at time *t* in industry *j*. $Emp_{j,80}$ is production worker employment in industry *j* in 1980. We use employment at 10 years before the initial year (1980) as the absorption here to mitigate the error covariance between the above 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. Table 5, panel A, shows the results of the first stage. The standard errors are clustered by industry and year. The statistically significant coefficient of IP_{jt}^{OTHER} 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 are shown in Table 5, panel B, and are consistent with our baseline results that increased Chinese import competition is associated with increased tax avoidance.[12]

[Insert Table 5 Here]

3.2.6 Intermediate Goods

The increase in imports from China also makes U.S. firms more accessible to cheaper intermediate goods, 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.[13] 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).[14] We add the upstream PNTR exposure to our baseline regression. The results in Table B2 in

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

Appendix B show that the coefficient of upstream exposure is not statistically significant, but the coefficient of direct exposure remains qualitatively the same.

4. Further Exploration of PNTR Effects

In the previous section, we found that PNTR increases firms' tax avoidance activities. This section studies the moderating factors that influence the relationship between globalization and tax avoidance.

4.1 Managerial Slack

Competition increases tax avoidance 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 (using corporate governance as a proxy) affects the effect of Chinese import competition on tax avoidance. Previous research has found that weak corporate governance increases managerial slack (e.g., Bertrand and Mullainathan, 2003; Giroud and Mueller, 2010). We expect the effect of PNTR to be more pronounced for firms with weaker corporate governance.

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 G-indexes for single-class firms over the 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 between 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 G-index portfolio. The DID estimator for CETR is smaller in absolute value (0.126) and statistically insignificant for firms in bottom quintile portfolio of G-index. The DID estimator for DDBTD is 0.110 with 5 percent statistical significance for firms in the top quintile G-index portfolio. The DID estimator for DDBTD is -0.351 and statistically insignificant for firms in the bottom quintile 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.

We utilized firms' susceptibility to take-over as a proxy for corporate governance. We use the Cain et al. (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 cooperate governance—we estimate the following equation:

$$\begin{aligned}\text{TaxAvoid}_{\text{i,j,t}} = \alpha &+ \beta_1\left(NTRGap_j \cdot post_t \cdot TakeoverIndex_{i,t}\right) \\ &+ \beta_2\left(NTRGap_j \cdot post_t\right) + \beta_3\left(post_t \cdot TakeoverIndex_{i,t}\right) \\ &+ \varphi \cdot \text{X}_{\text{i,t}} + \gamma_i + \theta_t + \varepsilon_{i,j,t}, \qquad (8)\end{aligned}$$

where $\text{TaxAvoid}^{\text{j}}_{\text{i,t}}$ is the tax avoidance measure of firm *i* in industry *j* at time *t*. $NTRGap_j$ is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999, and $post_t$ is a dummy variable that equals 1 for years after PNTR ($\text{post} = \text{I}\{\text{year} \geq 2001\}$). $TakeoverIndex_{i,t}$ is the takeover index for firm *i* at time *t*. $\text{X}_{\text{i,t}}$ is a set of control variables for firm characteristics. γ_i and θ_t are firm and year fixed effects, respectively. $\varepsilon_{i,t}$ is the error term.

The results are shown in Table B3 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 avoidance, which is consistent with our previous results using the G-index.

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 (Philips, 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 two measures. First, we measure product diversification using the Hoberg and Philips (2016) product similarity score, which is the total score of word similarity in the firm's product description 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.

As complete electronic filings from the SEC are available since 1996, we use the sample from 1996 to 2007 in this subsample test. We first take the average of each product competition measure over the sample period for each firm. For the similarity and fluidity indexes, we then place firms in the higher product market competition sample if their average similarity score or average fluidity index 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.

Table 7 presents the results. In each panel, columns 1 and 3 show the DID estimations for firms with less diversification and higher market fluidity; columns 2 and 4 show the DID estimations for firms with more diversification and less market

fluidity; and the last two rows show the test results of the difference between the two DID estimators with seemingly unrelated estimation. Panel A presents the results for diversification and panel B shows the results for fluidity. 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 5 percent (10 percent) level.

[Insert Table 7 Here]

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

4.3 Social Capital

This subsection examines how the social capital in firms' headquarters could mitigate the effect of PNTR on tax avoidance. In the first step, we construct a county-level social capital index and match it to each individual firm according to the zip code of its headquarters. We collected county-level social capital information from the Northeast Regional Center for Rural Development,[15] which provided a wide range of measures related to social capital for each county in 1990, 1997, and 2005.

Following Rupasingha and Goetz (2008) and Jha (2013), we use principal component analysis to construct our social capital index. We use four inputs (Assn, Nccs, Pvote, and Respn)[16] in the principal component analysis and calculate the first

[15] http://aese.psu.edu/nercrd/community/social-capital-resources.

[16] Assn is the average of the bowling centers, civic and social associations, physical fitness facilities, public golf courses, religious organizations, sports clubs, managers and promoters, religious

principal component as the social capital index. We take the average score of each county's average social capital index available before 2007 (1990, 1997, and 2005). Next, we match the historical zip codes of firms' headquarters addresses to the sample data using 10-K header data from Bill McDonald.[17] We then identify the zip code to which each county corresponds.[18] Finally, we assign the social capital index to each of the sample firms according to the county of their headquarters.

In the second step, we divide the sample into two subgroups by local social capital index over the years. We place a firm in the low social capital subsample if the corresponding social capital index is in the bottom quintile of the sample, and in the high social capital subsample if the index is in the top quintile of the sample. We repeat the baseline estimation and compare the difference between the DID coefficient estimates of the subsamples using seemingly unrelated estimation. Table 8 presents the results.

[Insert Table 8 Here]

We find that the CETR and DDBTD results confirm our hypothesis that firms in low social capital regions avoid taxes more aggressively than those in high social capital regions after PNTR.

4.4 International Tax Planning

Although our research focuses on the trade liberalization effect of globalization, the capital liberalization effect of globalization can provide an alternative measure of corporate tax avoidance. Firms may use tax shelters or transfer pricing as an alternative

organizations, business associations, political organizations, professional organizations, membership sports and recreation clubs (no data for 2005 or 2009), political organizations, professional organizations, business associations, labor organizations, and membership organizations not elsewhere classified (no data for 2005 or 2009) and then scaled by the population of the county (per 10,000 people). Nccs is the number of not-for-profit organizations, scaled by the population (per 10,000 people). Pvote is the number of votes cast scaled by the population above 18 years old (measured per 10,000 people). Respn is the census response rate.

[17] We are very grateful to Bill McDonald for sharing the data on his website. Header data are matched with Compustat using the historical cik-gvkey link table from WRDS.

[18] We use the census's ZIP Code Tabulation Areas to identify the county and its FIPS code.

way to lower their tax payments (Graham and Tucker, 2006; Dyreng and Lindsey, 2009). This section uses firms' cross-border M&As in tax havens and offshoring activities as an alternative measure of corporate tax avoidance, instead of solely relying on information from firms' financial statements.

4.4.1 Cross-Border Mergers and Acquisitions

We explore whether U.S. firms will 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 Organisation for Economic Co-operation and Development's corporate income tax database for 1990–93.

As expected, Table 9 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 4-6).

[Insert Table 9 Here]

4.4.2 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 avoid taxes, 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 10-K reports from 1998 to 2015. The input offshoring activities in the data set are categorized into two types. (1) Internal offshoring: the firm purchases inputs from the given nation when the firm also owns assets in the given nation. (2) External offshoring: the firm purchases inputs from the given nation when the firm does not also own assets in the given nation. Internal offshoring is more likely to be related to transfer pricing. We expected that PNTR would have increased firms' activities in internal offshoring. As the offshoring data set starts from 1998, we use the sample from 1998 to 2007. Table 10 reports the results.

[Insert Table 10 Here]

Columns 1 to 3 in Table 10 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. For further proof 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 4.4.1, 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 avoidance through transfer pricing.

5. Concluding Remarks

Globalization creates wealth, but it can sometimes cause inequality. Taxation is one of the major tools for mitigating the distributional effects of globalization. Therefore, the issue of tax avoidance has increased in importance in the context of globalization. This paper studies the import competition effects of globalization on tax avoidance. Building on a natural experiment—the United States granting China PNTR—we explore how larger exposure to Chinese imports affects the tax avoidance activities of U.S. firms. Using a DID approach, we find that U.S. firms engage significantly more in tax avoidance activities following PNTR. The effect is stronger for firms with weaker corporate governance, with less diversified products, and in a faster-changing industry. We also find that social capital helps reduce the impacts of globalization on tax avoidance. Using cross-border M&A and offshoring activities as alternative measures of tax avoidance, we also find that firms are more likely to acquire targets in low-tax regions as well as to engage in suspected transfer pricing activities. Taken together, our results support the hypothesis that the import competition shock of globalization motivates firms to increase their tax avoidance behavior.

References

Acemoglu, D., Autor, D., Dorn, D., Hanson, G.H., Price, B., 2016. Import competition and the great US employment sag of the 2000s. Journal of Labor Economics 34, S141-S198

Beck, T., Lin, C., Ma, Y., 2014. Why do firms evade taxes? The role of information sharing and financial sector outreach. The Journal of Finance 69, 763-817

Bernard, A.B., Jensen, J.B., Schott, P.K., 2006. Survival of the best fit: Exposure to low-wage countries and the (uneven) growth of US manufacturing plants. Journal of International Economics 68, 219-237

Bernard, A.B., Redding, S.J., Schott, P.K., 2010. Multiple-product firms and product switching. American Economic Review 100, 70-97

Bertrand, M., Mullainathan, S., 2003. Enjoying the quiet life? Corporate governance and managerial preferences. Journal of Political Economy 111, 1043-1075

Bloom, N., Draca, M., Van Reenen, J., 2016. Trade induced technical change? The impact of Chinese imports on innovation, IT and productivity. The Review of Economic Studies 83, 87-117

Cain, M.D., McKeon, S.B., Solomon, S.D., 2017. Do takeover laws matter? Evidence from five decades of hostile takeovers. Journal of Financial Economics 124, 464-485

Chen, S., Chen, X., Cheng, Q., Shevlin, T., 2010. Are family firms more tax aggressive than non-family firms? Journal of Financial Economics 95, 41-61

Cheng, C.A., Huang, H.H., Li, Y., Stanfield, J., 2012. The effect of hedge fund activism on corporate tax avoidance. The Accounting Review 87, 1493-1526

Coleman, J. 1994. Foundations of social theory Cambridge, MA: Harvard University Press.

Crocker, K.J., Slemrod, J., 2005. Corporate tax evasion with agency costs. Journal of Public Economics 89, 1593-1610

Desai, M.A., Dharmapala, D., 2006. Corporate tax avoidance and high-powered incentives. Journal of Financial Economics 79, 145-179

Dyreng, S.D., Lindsey, B.P., 2009. Using financial accounting data to examine the effect of foreign operations located in tax havens and other countries on US multinational firms' tax rates. Journal of Accounting Research 47, 1283-1316

Feenstra, R.C., Romalis, J., Schott, P.K., 2002. US imports, exports, and tariff data, 1989-2001. National Bureau of Economic Research, 9387

Frank, M.M., Lynch, L.J., Rego, S.O., 2009. Tax reporting aggressiveness and its relation to aggressive financial reporting. The Accounting Review 84, 467-496

Friedman, E., Johnson, S., Kaufmann, D., Zoido-Lobaton, P., 2000. Dodging the grabbing hand: the determinants of unofficial activity in 69 countries. Journal of Public Economics 76, 459-493

Giroud, X., Mueller, H.M., 2010. Does corporate governance matter in competitive industries? Journal of Financial Economics 95, 312-331

Gompers, P., Ishii, J., Metrick, A., 2003. Corporate governance and equity prices. The Quarterly Journal of Economics 118, 107-156

Graham, J.R., 2000. How big are the tax benefits of debt? The Journal of Finance 55, 1901-1941

Graham, J.R., 2003. Taxes and corporate finance: A review. The Review of Financial Studies 16, 1075-1129

Graham, J.R., Tucker, A.L., 2006. Tax shelters and corporate debt policy. Journal of Financial Economics 81, 563-594

Graham, J.R., Hanlon, M., Shevlin, T., Shroff, N., 2014. Incentives for tax planning and avoidance: Evidence from the field. The Accounting Review 89, 991-1023

Handley, K., Nuno, L., 2017. Policy Uncertainty, Trade and Welfare: Theory and Evidence for China and the US. American Economic Review 107, 2731–2783

Hart, O.D., 1983. The market mechanism as an incentive scheme. The Bell Journal of Economics, 366-382

Hasan, I., Hoi, C.K.S., Wu, Q., Zhang, H., 2017. Does social capital matter in corporate decisions? Evidence from corporate tax avoidance. Journal of Accounting Research 55, 629-668

Hoberg, G., Moon, S.K., 2017. Offshore activities and financial vs operational hedging. Journal of Financial Economics 125, 217-244

Hoberg, G., Phillips, G., 2010. Product market synergies and competition in mergers and acquisitions: A text-based analysis. The Review of Financial Studies 23, 3773-3811

Hoberg, G., Phillips, G., 2016. Text-based network industries and endogenous product differentiation. Journal of Political Economy 124, 1423-1465

Hoberg, G., Phillips, G., Prabhala, N., 2014. Product market threats, payouts, and financial flexibility. The Journal of Finance 69, 293-324

Hombert, J., Matray, A., 2017. Can innovation help US manufacturing firms escape import competition from china? HEC Paris Research Paper No. FIN-2015-1075

Jha, A., 2013. Financial reports and social capital. Journal of Business Ethics, 1-30

Johnson, S., Kaufmann, D., McMillan, J., Woodruff, C., 2000. Why do firms hide? Bribes and unofficial activity after communism. Journal of Public Economics 76, 495-520

Kim, J.-B., Li, Y., Zhang, L., 2011. Corporate tax avoidance and stock price crash risk: Firm-level analysis. Journal of Financial Economics 100, 639-662

Lu, Y., Ng, T., 2013. Import competition and skill content in US manufacturing industries. Review of Economics and Statistics 95, 1404-1417

Lu, Y., Yu, L., 2015. Trade liberalization and markup dispersion: evidence from China's WTO accession. American Economic Journal: Applied Economics 7, 221-253

Manzon Jr, G.B., Plesko, G.A., 2002. The relation between financial and tax reporting measures of income. Tax Law Review 55, 175

McManus, T.C., Schaur, G., 2016. The effects of import competition on worker health. Journal of International Economics 102, 160-172

Nickell, S.J., 1996. Competition and corporate performance. Journal of Political Economy 104, 724-746

Phillips, G.M., 1995. Increased debt and industry product markets an empirical analysis. Journal of financial Economics 37, 189-238

Pierce, J.R., Schott, P.K., 2016. The surprisingly swift decline of US manufacturing employment. The American Economic Review 106, 1632-1662

Pierce, J.R., Schott, P.K., 2016. Trade liberalization and mortality: Evidence from US counties. National Bureau of Economic Research, 22849

Rajan, R.G., Zingales, L., 1998. Financial dependence and growth. The American Economic Review 88, 559-586

Robinson, J.R., Sikes, S.A., Weaver, C.D., 2010. Performance measurement of corporate tax departments. The Accounting Review 85, 1035-1064

Rupasingha, A., Goetz, S.J., 2008. US county-level social capital data, 1990-2005. The northeast regional center for rural development, Penn State University, University Park, PA

Slemrod, J., Yitzhaki, S., 2002. Tax avoidance, evasion, and administration. Handbook of Public Economics 3, 1423-1470

Tybout, J.R., 2001. Plant-and firm-level evidence on" new" trade theories. National Bureau of Economic Research. 8418

Woolcock, M., 2001. The place of social capital in understanding social and economic outcomes. Canadian journal of Policy Research 2, 11-17

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 from 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 avoidance						
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 avoidance. Specifically, we estimate:

$$\text{TaxAvoid}_{i,j,t} = \alpha + \beta\left(NTRGap_j \cdot post_t\right) + \varphi \cdot \text{X}_{i,t} + \gamma_i + \theta_t + \varepsilon_{i,j,t}$$

where $\text{TaxAvoid}^{j}_{i,t}$ is the tax avoidance measure of firm i in industry j at time t; $NTRGap_j$ is the difference between the NTR and non-NTR tariff rates of industry j in 1999; and $post_t$ is a dummy variable that equals 1 for years after PNTR ($\text{post} = \text{I}\{\text{year} \geq 2001\}$). $\text{X}_{i,t}$ is a set of control variables for firm characteristics. γ_i and θ_t 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 β 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)
$NTRGap \cdot post$	-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 (3)	DDBTD (4)	CETR (5)	DDBTD (6)
(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 Avoidance Measure	0.286	0.022	0.286	0.022
(3)	S.d. of Tax Avoidance Measure	0.223	0.400	0.223	0.400

Table 3

Alternative Measures of Tax Avoidance

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

$$\text{TaxAvoid}_{i,j,t} = \alpha + \beta\left(NTRGap_j \cdot post_t\right) + \varphi \cdot \text{X}_{i,t} + \gamma_i + \theta_t + \varepsilon_{i,j,t}$$

where $\text{TaxAvoid}^{j}_{i,t}$ is the tax avoidance measure of firm i in industry j at time t; $NTRGap_j$ is the difference between the NTR and non-NTR tariff rates of industry j in 1999; and $post_t$ is a dummy variable that equals 1 for years after PNTR ($\text{post} = \text{I}\{\text{year} \geq 2001\}$). $\text{X}_{i,t}$ is a set of control variables for firm characteristics. γ_i and θ_t are firm and year fixed effects, respectively. $\varepsilon_{i,j,t}$ 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)
$NTRGap \cdot post$	-0.138**	-0.097**	0.046	0.208***	0.055**
	(-2.341)	(-2.192)	(1.637)	(3.514)	(2.208)
Control Variables	Yes	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes
Observations	14,429	19,650	20,411	22,235	22,001
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 avoidance, using a segment-based measure of exposure. Specifically, we estimate

$$\text{TaxAvoid}_{i,j,t} = \alpha + \beta(NTRGap\_Seg_i \cdot post_t) + \varphi \cdot \text{X}_{i,t} + \gamma_i + \theta_t + \varepsilon_{i,j,t}$$

where $\text{TaxAvoid}^{j}_{i,t}$ is the tax avoidance measure of firm i in industry j at time t; $NTRGap\_Seg_j$ 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 $post_t$ is a dummy variable that equals 1 for years after PNTR (post = I{year $\geq$ 2001}). $\text{X}_{i,t}$ is a set of control variables for firm characteristics. γ_i and θ_t are firm and year fixed effects, respectively. $\varepsilon_{i,j,t}$ 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)
$NTRGap\_Seg_i \cdot post_t$	-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:

$$\text{TaxAvoid}_{i,j,t} = \alpha + \beta PredictedImportPentration_{j,t} + \varphi \cdot \text{X}_{i,t} + \gamma_i + \theta_t + \varepsilon_{i,j,t}$$

where $\text{TaxAvoid}^{j}_{i,t}$ is the tax avoidance measure of firm *i* in industry *j* at time *t*. Predicted Import $Exposure_j$ is the predicted import penetration from China to the United States estimated in the first stage for industry *j* at time *t*. $\text{X}_{i,t}$ is a set of control variables for firm characteristics. γ_i and θ_t are firm and year fixed effects, respectively. $\varepsilon_{i,j,t}$ 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

	$Import\ Penetration_{j,t}\ (U.S)$
	(1)
$Import\ Penetration_{j,t}$ (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)
$Predicted\ Import\ Penetration_{j,t}$	-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 Avoidance: 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
	(1)	(2)		(1)
$NTRGap \cdot post$	-0.330**	0.126	$NTRGap \cdot post$	-0.330**
	(-2.537)	(0.773)		(-2.537)
Control Variables	Yes	Yes	Control Variables	Yes
Firm Fixed	Yes	Yes	Firm Fixed	Yes
Year Fixed	Yes	Yes	Year Fixed	Yes
Observations	1,762	1,413	Observations	1,762
Test Difference of $NTRGap \cdot post$ coefficients				
Chi2	4.439		3.031	
p-value	0.035**		0.082*	

Table 7

PNTR and Tax Avoidance: 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 Philips (2016). In panel B, we use the average product market fluidity index by Hoberg et al. (2014). 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 average competition measures 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 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.

Panel A: Product Similarity

	CETR		DDBTD	
	High Similarity	Low Similarity	High Similarity	Low Similarity
	(1)	(2)	(3)	(4)
$NTRGap \cdot post$	-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 $NTRGap \cdot post$ coefficients				
Chi2	6.064		3.588	
p-value	0.0138**		0.0582*	

Panel B: Product Market Fluidity

	CETR		DDBTD	
	High Fluidity	Low Fluidity	High Fluidity	Low Fluidity
	(1)	(2)	(3)	(4)
$NTRGap \cdot post$	-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 $NTRGap \cdot post$ coefficients				
Chi2	13.08		5.327	
p-value	0.000***		0.0210**	

Table 8

PNTR and Tax Avoidance: Conditional on Social Capital

This table presents the results of difference-in-differences estimation of the baseline model conditional on the social capital index of the county where the firm has its headquarters. Following Jha (2013), the social capital index is constructed by using principal component analysis with four measures (number of social organizations and clubs, voter turnout rate, census response rate, and number of nongovernmental organizations, from the Northeast Regional Center for Rural Development for 1990, 1997, and 2005). The sample from 1990 to 2007 is partitioned into two subsamples with the top quintile and bottom quintile of the average social capital index over the years for each county. 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 this 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	
	Low Social Capital	High Social Capital	Low Social Capital	High Social Capital
	(1)	(2)	(3)	(4)
$NTRGap \cdot post$	-0.255***	-0.035	0.456***	0.086**
	(-4.128)	(-0.349)	(2.711)	(2.267)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes
Observations	2,883	3,288	3,985	4,209
Test Difference of $NTRGap \cdot post$ coefficients				
Chi2	3.467		4.410	
p-value	0.0626*		0.0357**	

Table 9
PNTR and International Tax Planning

This table presents the coefficients of the difference-in-differences estimator (Post*NTRGap) of the cross-border M&A deals with non-U.S. target in a low-tax region. 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. 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% levels, respectively.

	dLow	nLow	nCntydLow	dLow_ExCN	nLow_ExCN	nCntydLow_ExCN
	(1)	(2)	(3)	(4)	(5)	(6)
$NTRGap \cdot post$	0.063**	0.085**	0.073**	0.056**	0.091**	0.075**
	(2.576)	(2.128)	(2.074)	(2.397)	(2.203)	(2.156)
Constant	-0.055***	-0.079***	-0.072***	-0.053***	-0.075***	-0.068***
	(-4.483)	(-4.158)	(-4.339)	(-4.657)	(-4.314)	(-4.518)
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	27,306	27,306	27,306	27,306	27,306	27,306
R-squared	0.255	0.273	0.273	0.250	0.267	0.267

Table 10

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% levels, respectively.

	Number of Countries			Number of Low Tax Countries			Number of High Tax Countries		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Offhsore_All	Offhsore_Internal	Offhsore_External	Offhsore_All	Offhsore_Internal	Offhsore_External	Offhsore_All	Offhsore_Internal	Offhsore_External
$NTRGap \cdot post$	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

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: $BTD_{it} = \beta_1 TACC_{it} + \mu_i + \varepsilon\_it$ 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.
GAAP 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) and Kim et al. (2011). 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 to 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 asset (*at*).
Capital Expenditure (CAPEX)	Capital Expenditure (*capx*) divided by lagged total asset (*at*).
Other Variables	
Product Market Similarity	The index is constructed by calculating firm-by-firm similarity score by parsing the product descriptions from firms 10Ks. See Hoberg and Phillips (2016) for details about the index construction.
Product Market Fluidity	The index measure how intensively the market around the firm is changing each year. See Hoberg et al. (2014) for details.
HHI	Herfindahl-Hirschman index based on firms' sales data according to TNIC-3 industry classification. Hoberg and Phillips (2016) provides details about the index classification.
Social Capital Index	First component of principal component analysis on four inputs (Assn, Nccs, Pvote and Respn). Assn is the average of the bowling centers, civic and social associations, physical fitness facilities, public golf courses, religious organizations, sports clubs, managers and promoters, religious

	organizations, business associations, political organizations, professional organizations, membership sports and recreation clubs (no data for 2005), political organizations, professional organizations, business associations, labor organizations, and membership organizations not elsewhere classified (no data for 2005) and then scaled by the population of the county (per 10,000 people). Nccs is the Number of not-for-profit organizations, scaled by the population (per 10,000 people). Pvote is the number of votes casted scaled by the population above 18 years old (measured per 10,000 people). Respn is the census response rate. We use the average of the index of all 1990, 1997 and 2005 in each county to construct the subsample. Source: Northeast Regional Center for Rural Development.
Low Tax Region M&A Deals	A dummy variable that equals to one if the firm acquire at least a 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.
Import Penetration Ratio from China to the United States	Defined as: $\mathrm{IP}_{\mathrm{jt}}^{\mathrm{UC}} = \frac{M_{j,t}^{UC}}{Emp_{j,91}}$*1000 Where $M_{j,t}^{UC}$ is the value of imports to U.S from China at time t in industry j, $Emp_{j,91}$ are production worker employment of industry j in 1991. Source: Acemoglu et al. (2016).
Import Penetration Ratio from China to eight other countries	Defined as : $\mathrm{IP}_{\mathrm{jt}}^{\mathrm{OTHER}} = \frac{M_{j,t}^{OTHER}}{Emp_{j,80}}$*1000. Where $M_{j,t}^{OTHER}$ is the value of imports to eight other developed economies from China at time t in industry j, $Emp_{j,80}$ are production worker employment of industry j in 1980. The eight countries are: Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland, Source: Acemoglu et al. (2016).
Offshore Activities	The database from Hoberg and Moon (2017) counts the mentions of firms' input purchasing activities with different countries. *Offshore_All* indicates firm' overall purchasing inputs from the given nation; *Offshore_Internal* indicates firm' purchasing inputs from the given nation when the firm does also mention owning assets in the given nation; and *Offshore_External* indicates firm' purchasing inputs from the given nation when the firm does not also mention owning assets in the given nation. Source: Hoberg and Moon (2017).

Appendix B

Table B1. Robustness Check 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 avoidance. Specifically, we estimate:

$$\text{TaxAvoid}_{i,j,s,t} = \alpha + \beta\left(NTRGap_j \cdot post_t\right) + \varphi \cdot \text{X}_{i,t} + \gamma_i + \theta_t + \sigma_{s,t} + \emptyset_j\left(Iind_j \cdot t\right) + \varepsilon_{i,j,t}$$

where $\text{TaxAvoid}^{j}_{i,t}$ is the tax avoidance measure of firm *i* in industry *j* in state *s* at time *t*. $NTRGap_j$ is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999 and $post_t$ is a dummy variable that equals 1 for years after PNTR ($\text{post} = \text{I}\{\text{year} \geq 2001\}$). $\text{X}_{i,t}$ is a set of control variables for firm characteristics. γ_i, θ_t and $\sigma_{s,t}$ are firm, year, and state-year fixed effects respectively. $(Iind_j * t)$ 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 avoidance 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 are 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 β 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 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% levels, respectively.

Panel A: Difference-in-Differences Estimation Results

	CETR	DDBTD	CETR	DDBTD
	(1)	(2)	(3)	(4)
$NTRGap \cdot post$	-0.088**	0.168***	-0.183***	0.104***
	(-2.213)	(6.206)	(-3.486)	(2.916)
SIZE	0.014***	-0.010*	0.014***	-0.008
	(3.079)	(-1.921)	(3.201)	(-1.615)
Q	-0.007***	-0.005	-0.006**	-0.005
	(-2.874)	(-1.462)	(-2.583)	(-1.432)
DFI	0.026***	0.000	0.028***	0.001
	(2.770)	(0.012)	(2.851)	(0.091)
FI	-1.096***	0.119	-1.148***	0.116
	(-8.529)	(1.546)	(-8.474)	(1.453)
LEV	-0.031	0.070	-0.038	0.075*
	(-1.400)	(1.637)	(-1.597)	(1.731)
ROA	-0.397***	0.413***	-0.408***	0.418***
	(-12.623)	(16.374)	(-12.988)	(16.472)
PPE	-0.053***	0.060***	-0.057***	0.061***
	(-3.481)	(2.852)	(-3.453)	(2.717)
RD	0.265***	-0.193**	0.248***	-0.190**
	(4.101)	(-2.510)	(3.836)	(-2.420)
CAPEX	0.417***	-0.116	0.423***	-0.110
	(7.143)	(-1.303)	(6.761)	(-1.202)
NTR			0.298	-0.057
			(1.243)	(-0.176)
Constant	-0.490***	0.132***	-0.197***	0.489***
	(-4.731)	(5.191)	(-3.441)	(10.774)
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	15,898	21,924	15,734	21,744
R-squared	0.421	0.418	0.434	0.422

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

		CETR (3)	DDBTD (4)	CETR (5)	DDBTD (6)
(1)	Counterfactual Effect (weight on total asset in 1990)	-0.028	0.054	-0.059	0.033
(2)	Mean of Tax Avoidance Measure	0.286	0.022	0.286	0.022
(3)	S.d. of Tax Avoidance Measure	0.223	0.400	0.223	0.400

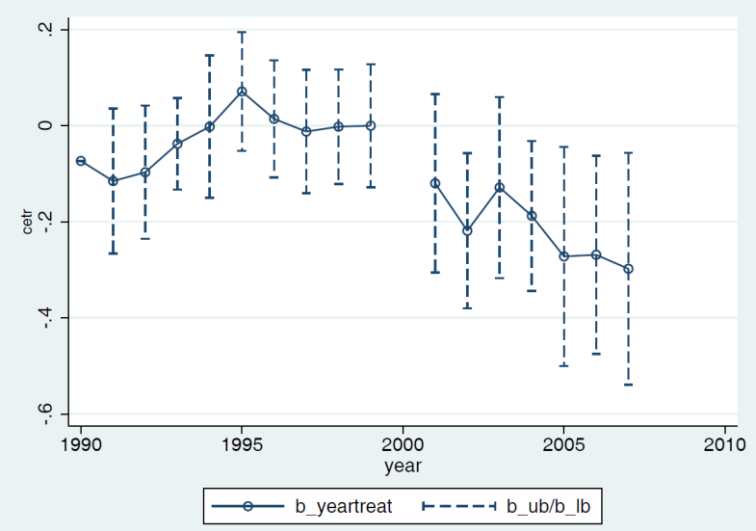
Figure B1. Dynamic Time Trend

The figures are created by estimating the following regression:

$$\text{TaxAvoid}_{i,j,s,t} = \alpha + \beta\left(NTRGap_j \cdot post_t\right) + \varphi \cdot \text{X}_{i,t} + \gamma_i + \theta_t + \sigma_{s,t} + \emptyset_j\left(Iind_j \cdot t\right) + \varepsilon_{i,j,t}$$

where $\text{TaxAvoid}^{j}_{i,t}$ is the tax avoidance measure of firm i in industry j in state s at time t. $NTRGap_j$ is the difference between the NTR and non-NTR tariff rates of industry j in 1999 and $Iyear_t$ are the dummy variables for each year (except 2000, which serves as benchmark year). $\text{X}_{i,t}$ is a set of control variables for firm characteristics. γ_i, θ_t and $\sigma_{s,t}$ are firm, year, and state-year fixed effects respectively. $(Iind_j * t)$ 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 β_t with 90% confidence interval.

CETR



DDBTD

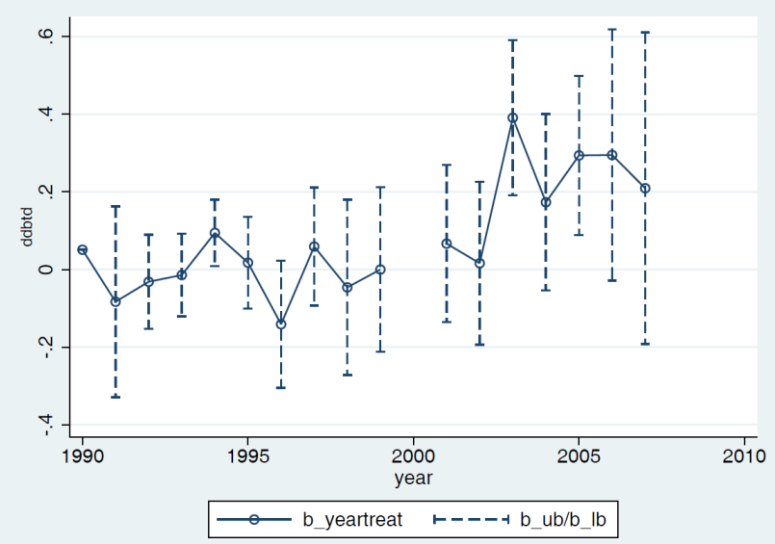


Table B2. Intermediate Input

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 avoidance. Specifically, we estimate:

$$\text{TaxAvoid}_{i,j,t} = \alpha + \beta_1\left(NTRGap_j \cdot post_t\right) + \beta_2\left(NTRGapUpstream_j \cdot post_t\right) + \varphi \cdot \text{X}_{i,t} + \gamma_i + \theta_t + \varepsilon_{i,j,t}$$

where $\text{TaxAvoid}^{j}_{i,t}$ is the tax avoidance measure of firm i in industry j at time t. $NTRGap_j$ is the difference between the NTR and non-NTR tariff rates of industry j in 1999 and $NTRGapUpstream_j$ is the weighted average of the industry's upstream industries constructed following Pierce and Schott (2016a). $post_t$ is a dummy variable that equals 1 for years after PNTR ($\text{post} = \text{I}\{\text{year} \geq 2001\}$). $\text{X}_{i,t}$ is a set of control variables for firm characteristics. γ_i and θ_t 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% levels, respectively.

	CETR	DDBTD
	(1)	(2)
$NTRGap \cdot post$	-0.080*	0.154***
	(-1.848)	(4.927)
$NTRGapUpstream \cdot post$	-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 B3. PNTR and Corporate Governance: Firm Takeover Susceptibility

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

$$\text{TaxAvoid}_{i,j,t} = \alpha + \beta_1\left(NTRGap_j \cdot post_t \cdot TakeoverIndex_{i,t}\right) + \beta_2\left(NTRGap_j \cdot post_t\right) + \beta_3\left(post_t \cdot TakeoverIndex_{i,t}\right) + \varphi \cdot \text{X}_{i,t} + \gamma_i + \theta_t + \varepsilon_{i,j,t}$$

where $\text{TaxAvoid}^{j}_{i,t}$ is the tax avoidance measure of firm *i* in industry *j* at time *t*. $NTRGap_j$ is the difference between the NTR and non-NTR tariff rates of industry *j* in 1999 and $post_t$ is a dummy variable that equals one for years after PNTR ($\text{post} = \text{I}\{\text{year} \geq 2001\}$). $TakeoverIndex_{i,t}$ is the takeover index for firm *i* at time *t*. A higher takeover index indicates a higher probability of being taken over. $\text{X}_{i,t}$ is a set of control variables for firm characteristics. γ_i and θ_t are firm and year fixed effects, respectively. $\varepsilon_{i,t}$ is the error term.

VARIABLES	(1) CETR	(2) DDBTD
$NTRGap_j \cdot post_t \cdot TakeoverIndex_{i,t}$	0.966**	-0.602**
	(2.051)	(-2.161)
$NTRGap \cdot post$	-0.251**	0.204***
	(-2.531)	(3.444)
$NTRGap \cdot TakeoverIndex$	-0.017	0.411*
	(-0.101)	(1.906)
$TakeoverIndex \cdot post$	-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