The Indirect Effect of Import Competition on Corporate Tax Avoidance

Baptiste Souillard[1]

[1]*ECARES, SBS-EM, Université Libre de Bruxelles*

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Abstract: The role of competition in corporate tax avoidance is theoretically unclear in the existing literature. This paper empirically examines this role, with a focus on import competition. I exploit financial statements to measure tax avoidance of US-listed firms and the conferral of Permanent Normal Trade Relations status on China as a quasi-natural experiment to establish causality. The results reveal that import competition fosters corporate tax avoidance. However, the effect is heterogeneous across firms. The average effect is driven by multinational enterprises, and more specifically by those implanted in tax havens. In response to the China shock, these firms invested in intangible assets to escape competition, but these intangibles also allowed them to intensify their profit shifting activities. These findings shed light on the determinants of corporate tax avoidance. More generally, they help understand the decline in the average effective tax rate of US-listed firms and the backlash against large corporations and globalization.

Keywords: Corporate tax avoidance, import competition, multinational firms, profit shifting, intangibles.

JEL codes: F14, F60, H25, H26, L60.

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1 Introduction

Aggressive tax planning has become a salient policy concern in a context marked by tax scandals, budget deficits, and rising income inequalities. A specific group of enterprises is often accused of large-scale tax avoidance: multinational enterprises (MNEs). Some MNEs exploit legal technicalities to artificially shift profits to low- or no-tax jurisdictions and thereby reduce their effective tax rate (Dharmapala, 2014; Beer, de Mooij, and Liu, 2020). Given that MNEs are major actors in the global economy, losses in corporate income tax revenues arising from profit shifting could be substantial. Recent estimations suggest that they could reach $100 billion annually in the US (Clausing, 2016). [1] Therefore, identifying the factors influencing profit shifting, and more broadly corporate tax avoidance, is of foremost interest to both researchers and policy makers.

In this paper, I delve into the determinants of corporate tax avoidance and more particularly into the role played by competition. The effect of competition is still an unresolved question in the literature. Existing theories argue that corporate tax avoidance could either increase or decrease as competition toughens (Marrelli and Martina, 1988; Goerke and Runkel, 2011). I clarify this through an empirical study. I provide evidence that import competition has a positive impact on corporate tax avoidance. I further show that the average effect is essentially driven by MNEs present in tax havens. Concretely, competitive pressures prompt these firms to invest in intangible assets to escape competition and limit revenue losses. However, these assets also fuel their income shifting activities.

To come to these conclusions, I exploit the rise of exports from China and financial statement information of US-listed firms. In economics, a strand of research pioneered by Autor, Dorn, and Hanson (2013) explores the aftermath of the rapid surge in Chinese exports initiated in the 1990s, referred to as the China shock. The China shock was a sizable import competition shock. Within 15 years, the penetration ratio of US imports from China in manufacturing increased sixfold, with notable disparities across sectors. An advantage of focusing on this episode lies in the possibility of using a quasi-natural experiment. The US granting Permanent Normal Trade Relations (PNTR) status to China in 2000 provides exogenous variations in Chinese import competition crucial to establishing

1. See Crivelli, De Mooij, and Keen (2016), Cobham and Janskỳ (2018), and Tørsløv, Wier, and Zucman (2018) for other quantification exercises.

causality. In parallel, a stream of research in accounting tries to measure corporate tax avoidance. Quantifying corporate tax avoidance is a challenging task by nature because firms do not disclose to what extent they avoid taxes. Scholars then gauge tax avoidance using balance sheets, income statements, and cash flows (Hanlon and Heitzman, 2010). [2] Building on this literature, I construct four indicators of tax aggressiveness for US-listed manufacturing firms between 1990 and 2005. I scrutinize the evolution of (i) the ratio of income taxes to pre-tax income (effective tax rate), (ii) the ratio of current (i.e., non-deferred) income taxes to pre-tax income, (iii) the ratio of cash income taxes paid to pre-tax income, and (iv) the ratio of cash income taxes paid to operating cash flows. These variables are standard in the accounting, economics, and financial literatures (e.g., Dyreng, Hanlon, Maydew, and Thornock, 2017; Suárez Serrato, 2019), and lower values are associated with higher tax avoidance. Moreover, when taken together, they account for conforming, non-conforming, permanent, and temporary strategies. They thus encompass many tax avoidance techniques.

The analysis starts with three stylized facts. First, Chinese import competition and corporate tax avoidance exhibit a positive correlation. While the penetration ratio of US imports from China continuously increased between 1990 and 2005, the indicators of corporate tax avoidance fell throughout that period. Second, the China shock accentuated the sales slump of domestic firms and slowed the rise in sales generated by MNEs. Third, sales, pre-tax income, and effective tax rates are positively correlated. It implies that a positive correlation between changes in Chinese import competition and changes in corporate tax avoidance variables could in fact be spurious.

These observations naturally raise the question: Did Chinese import competition really drive corporate tax avoidance upward? I first regress each of the four tax avoidance variables on the penetration ratio of US imports from China in the output market with ordinary least squares, controlling for a wide range of confounding factors. All other things being equal, the baseline estimates indicate that a 1 percentage point increase in the penetration ratio of US imports from China leads to a decrease of about 0.2 percentage point for each of the four tax avoidance variables. Next, I show that these results are highly robust. Removing potential outliers, adopting different econometric models, and perfor-

2. See also Frank, Lynch, and Rego (2009), Henry and Sansing (2018), Badertscher, Katz, Rego, and Wilson (2019), and De Simone, Nickerson, Seidman, and Stomberg (2019).

ming falsification tests yield comparable estimates. On the same note, leveraging imports from China of eight alternative high-income countries as an instrument to better capture the supply-driven changes in import competition and repeating the analysis with Mexican import competition deliver analogous findings. Importantly, I draw the same conclusions by integrating the US conferral of PNTR status on China in October 2000 in a difference-in-differences (DiD) exercise. The motive for this approach is fivefold. (i) The granting was unanticipated (Pierce and Schott, 2016; Greenland, Ion, Lopresti, and Schott, 2020). (ii) This event alone is responsible for a third of the boom in China's exports to the US between 2000 and 2005 (Handley and Limão, 2017). (iii) The conferral exposed manufacturing sectors to Chinese import competition in a different way; (iv) this exposure mostly depended on non-normal trade relations tariff rates, set seventy years earlier in 1930, so the treatment is plausibly exogenous (Pierce and Schott, 2016). (v) There are no pre-existing trends: Before the shock, the evolution of tax avoidance variables is similar in the least and most impacted sectors.

To gain insights into this positive effect, I proceed in two steps. In the first step, I allow for heterogeneous effects and distinguish between MNEs and domestic firms. MNEs, and especially those having subsidiaries in tax havens, have greater possibilities for dodging taxes because they can transfer profits from their affiliates based in high-tax countries to those located in tax-friendly jurisdictions. The results show no significant effect for domestic firms. In addition, the fact that the effect is more pronounced for MNEs located in tax havens is reminiscent of profit shifting. In the second step, I investigate how MNEs intensified their tax avoidance practices in response to the China shock. On the one hand, Heckemeyer and Overesch (2017) place the use of intra-firm royalty payments as a prominent profit shifting technique. In short, MNEs locate intellectual property rights in no- or low-tax countries and deflate the profits registered in high-tax countries through royalties. On the other hand, Bloom, Draca, and Van Reenen (2016), Gutiérrez and Philippon (2017), and Hombert and Matray (2018) conclude that the China shock increased innovation, technical change, product differentiation, and investments in intangibles by industry leaders. Drawing on these papers, I examine whether import competition fosters tax aggressiveness indirectly through intangible assets, and I provide strong evidence to support this. (i) The effect of Chinese import competition on tax avoidance becomes statistically insignificant when I control for intangible assets, suggesting that the China shock had no direct impact on tax avoidance conditional on intangibles. (ii) Intangible

assets reduce MNEs' corporate income taxes and not those of domestic firms – yet domestic companies are also eligible for R&D tax deductions and similar tax relief proposed by public authorities –, which confirms the use of intangibles as a tool to shift profits. (iii) I demonstrate that the China shock made MNEs invest in intangible assets, in line with the aforementioned papers. The investments are more remarkable for MNEs present in tax havens. This asymmetry is coherent with the view that MNEs in tax havens are the top performers. Avoiding taxes is costly (Jones, Temouri, and Cobham, 2018). Firms need to recruit numerous tax experts to implement such strategies, and not all MNEs can set a physical presence in tax havens. (iv) Finally, I find that sales of firms that were intensive in intangibles suffered from the China shock to a lesser extent and that MNEs operating in the most import-competitive sectors did not expand their network of subsidiaries in tax havens, despite a sharp increase in US-listed firms' activities in tax havens during the period (Souillard, 2021). All in all, these results mean that the China shock pushed MNEs to invest in intangible assets in order to escape competition, and these assets facilitated their income shifting activities. In a way, the rise in tax avoidance seems to be a side effect of import competition.

These findings carry policy implications. They shed light on the decline in the average effective tax rate of US-listed firms (Dyreng et al., 2017). Back-of-the-envelope computations show that the tax avoidance effect caused by the China shock contributed 17 percent to the decline in the average effective tax rate observed between 1990 and 2005. More generally, this paper underscores a flip side of globalization. Globalization has led to the emergence of MNEs. Accompanied by the digitalization of economic activities and the development of the offshore industry, it has encouraged tax avoidance. This paper unveils a new mechanism whereby globalization nurtures corporate tax avoidance. Relatedly, globalization stimulates innovation of leading firms close to the technological frontier, and this pro-competitive effect is mostly perceived as one of the bright sides of globalization. However, it also indirectly accentuates the tax-dodging behavior of these firms. The findings could then partly explain the current backlash against globalization and large corporations (Helpman, 2017; Ravallion, 2018; Rodrik, 2018; Walter, 2021). Finally, the paper emphasizes that import competition and corporate taxes are closely connected. The current international tax system has been designed long before the recent globalization. The inadaptation generates loopholes and other opportunities to aggressively save taxes. From this perspective, the paper reaffirms the need to jointly pursue trade and fiscal po-

licies.

Related literature This paper lies at the intersection of two separate lines of research. A fast-growing literature studies the causes, methods, and consequences of corporate tax avoidance. In particular, evidence shows that MNEs transfer part of their profits to low-tax countries by manipulating transfer prices (Swenson, 2001; Clausing, 2003; Cristea and Nguyen, 2016; Davies, Martin, Parenti, and Toubal, 2018), strategically locating intellectual property rights (Dischinger and Riedel, 2011; Karkinsky and Riedel, 2012; Griffith, Miller, and O'Connell, 2014; Alstadsæter, Barrios, Nicodème, Skonieczna, and Vezzani, 2018), recording sales in low-tax jurisdictions (Laffitte and Toubal, 2019), and by means of intra-firm loans (Egger, Eggert, Keuschnigg, and Winner, 2010; Buettner and Wamser, 2013), treaty shopping (Hong, 2018), and corporate inversions (Desai and Hines, 2002). I refer to Dharmapala (2014) and Beer et al. (2020) for surveys on profit shifting and to Alm (2019) and Wang, Xu, Sun, and Cullinan (2020) for reviews on the determinants of corporate tax avoidance. The present paper adds to this literature in two different ways. The impact of competition on corporate tax avoidance is theoretically unclear. Marrelli and Martina (1988) predict a negative effect, while Goerke and Runkel (2011) predict an opposite effect. Against this background, I provide empirical and systematic evidence that competition stimulates tax avoidance. [3] Furthermore, the paper complements the findings of Martin, Parenti, and Toubal (2020). They find that tax avoidance gives large firms a competitive edge and amplifies industry concentration. Consequently, the relationship between competition and corporate tax avoidance is two-way.

Another range of papers investigate the consequences of the China shock. They document the labor market effects (Autor et al., 2013; Mion and Zhu, 2013; Utar and Ruiz, 2013; Utar, 2014; Acemoglu, Autor, Dorn, Hanson, and Price, 2016; Pierce and Schott, 2016) and induced changes in firm product scope, factor reallocation (Iacovone, Rauch, and Winters, 2013; Chakraborty and Henry, 2019), innovation (Bloom et al., 2016; Hombert and Matray, 2018), productivity (Chen and Steinwender, 2019), and prices (Bai and

3. It is worth noting that tax evasion greatly differs from tax avoidance insofar as it is illegal. Hence, the strategies adopted and the companies involved are not the same in the case of tax evasion. Small and medium-sized enterprises are more prone to tax evasion because they have limited knowledge of tax systems (Jones et al., 2018), they have a lower probability of being audited (Hanlon, Hoopes, and Shroff, 2014), and they are more likely to turn to informality (Dabla-Norris, Gradstein, and Inchauste, 2008; De Paula and Scheinkman, 2011; Galiani and Weinschelbaum, 2012; Ulyssea, 2018). Cai and Liu (2009) and Gokalp, Lee, and Peng (2017) look at the effect of competition on tax evasion. Here, the focus is on tax avoidance and large corporations.

Stumpner, 2019; Amiti, Dai, Feenstra, and Romalis, 2020). In this regard, my findings resonate with those of Bloom et al. (2016), Gutiérrez and Philippon (2017), and Hombert and Matray (2018). At the same time, my work highlights one of the "dark sides" of the China shock and trade-induced competition. It proves that although import competition encourages firms to innovate and move up the quality ladder, it also exacerbated MNEs' profit shifting practices.

The article is organized as follows. Section 2 introduces the data and section 3 lays out three stylized facts. Section 4 assesses the average effect of import competition on corporate tax avoidance, section 5 casts light on the mechanism, and section 6 concludes.

2 Data

To conduct the analysis, I build an unbalanced panel dataset of public manufacturing firms headquartered in the US operating between 1990 and 2005. I explain in this section where the data originate from and how the key variables and the final sample are defined.

2.1 Data sources and key variables

The dataset comprises firm- and industry-level data. The former are obtained from Compustat North America, and the latter are sourced from the NBER-CES Manufacturing Industry Database and Schott (2008).

Firm-level data Compustat North America gives rich information on balance sheets (assets, liabilities, and equity), income statements (revenues, costs, and expenses), and cash flows of publicly held companies in North America since 1950. Therefore, it includes the largest enterprises located in the US. Albeit few in number, they represent around 30 percent of employment, 40 percent of sales, and 50 percent of aggregate pre-tax profits (Asker, Farre-Mensa, and Ljungqvist, 2014). They are the most productive, so they are the most likely to engage in multinational activities and aggressive tax planning (Helpman, Melitz, and Yeaple, 2004; Jones et al., 2018).

This information is used to construct four firm-year-specific indicators of corporate tax avoidance: (i) the ratio of income taxes to pre-tax income (effective tax rate, ETR), (ii)

the ratio of current income taxes to pre-tax income ($ETR2$), (iii) the ratio of cash income taxes paid to pre-tax income ($CASHETR$), and (iv) the ratio of cash income taxes paid to operating cash flows (CFM). Lower ETR, $ETR2$, $CASHETR$, and CFM values are associated with higher tax avoidance. Exact formulas with Compustat codes are attached in Appendix A Table AT1. The rationale for using cash income taxes in addition to tax expense is that accounting rules (e.g., Generally Accepted Accounting Principles [GAAP] and International Financial Reporting Standards [IFRS]) are generally different from tax rules. This is why cash income taxes do not always align with income tax expense. Information on taxes paid is a crucial advantage of Compustat over Orbis, another database widely used in the tax avoidance literature, where only accounting effective tax rates can be computed. Operating cash flows, for their part, give a sense of firms' economic activities. As such, they can be compared to GAAP earnings to determine whether earnings might be manipulated.

The four proxies have three advantages. First, they have an intuitive interpretation. ETR is the simplest and will be the preferred variable in the rest of the paper. Second, they appear most frequently in the accounting, economics, and financial literatures (e.g., Donohoe, 2015; Cen, Maydew, Zhang, and Zuo, 2017; Dyreng et al., 2017; Blaufus, Möhlmann, and Schwäbe, 2019; Suárez Serrato, 2019). [4] Lastly, they cover conforming, non-conforming, permanent, and temporary tax avoidance strategies, [5] thus giving an overall snapshot of corporate tax avoidance. Table 1 confirms this complementarity: It shows that the metrics simultaneously absorb a mix of common and uncommon features of corporate tax avoidance. Nevertheless, one caveat is that the metrics can vary regardless of tax-dodging

4. Alternative measures of tax avoidance are book-tax differences, tax shelter scores, and unrecognized tax benefits. Note that measures based on book-tax differences are, by construction, similar to those used in this article (De Simone et al., 2019), and US firms are required to report unrecognized tax benefits as of 2006, which make ETR, $ETR2$, $CASHETR$, and CFM even more relevant. In addition, although firms with negative profits are almost systematically excluded from the accounting literature, potentially biasing the results (Henry and Sansing, 2018), these firms are not excluded from in my analysis as long as their corporate tax avoidance indicator lies between 0 and 1. As a result, 75 percent of loss-making firms remain in my sample. More extensive discussions on the measurement of corporate tax avoidance can be found in Hanlon (2003), Lev and Nissim (2004), Dyreng, Hanlon, and Maydew (2008), Dyreng, Hanlon, and Maydew (2010), Hanlon and Heitzman (2010), Guenther (2014), Henry and Sansing (2018), Badertscher et al. (2019), and De Simone et al. (2019).

5. Non-conforming tax avoidance refers to strategies affecting taxable income but not financial income. It can be seen as the deviation of tax position from what is expected based on book pre-tax income and the statutory tax rate. In contrast, conforming tax avoidance impacts taxable and financial income. ETR, for example, cannot capture the tax benefits of interest deductibility, since it reduces taxable and financial income and, more broadly, conforming tax avoidance.

TABLE 1 – Correlation between tax avoidance variables

	ETR	*ETR2*	*CASHETR*	*CFM*
ETR	1.00			
ETR2	0.53	1.00		
CASHETR	0.26	0.41	1.00	
CFM	0.20	0.27	0.64	1.00

Notes: This table reports the average Pearson's correlation coefficients between the four tax avoidance variables (within firms). For a firm-year observation to be included in the computation of a correlation coefficient, the two tax avoidance variables must lie in the [0,1] interval. See section 2 for more details.

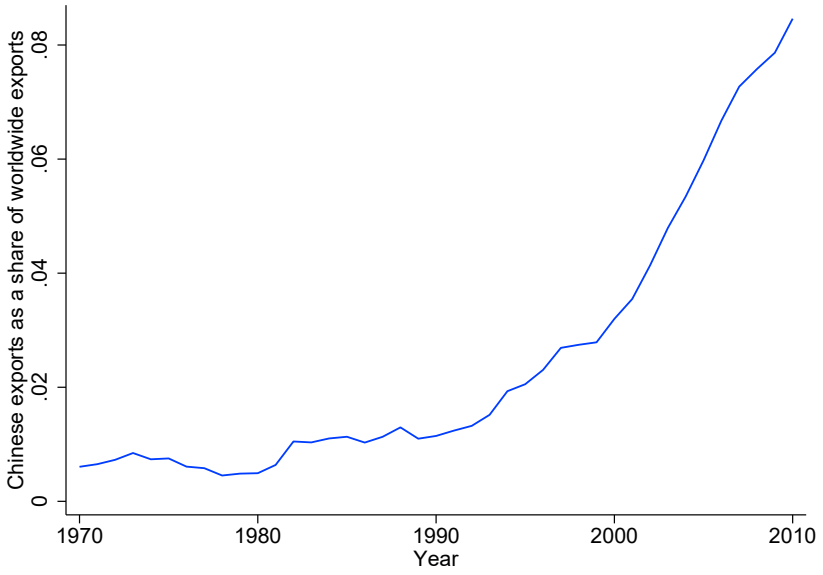
strategies. To identify the effect of import competition on aggressive tax planning, I will therefore control for factors determining tax liability like tax loss carry forward in the econometric exercise.

Industry-level data I supplement these data with industry data at the 4-digit 1987 SIC level from the NBER-CES Manufacturing Industry Database and Schott (2008). The NBER-CES Manufacturing Industry Database contains industry-level annual output, employment, payroll and other input costs, investment, capital stock, total factor productivity, and prices in the US from 1958 to 2011. The database compiled by Schott (2008) informs on annual US trade flows from 1972 to 2005. Combined, they allow for the calculation of the penetration ratio of US imports from China IMP, i.e., the ratio of US imports from China to US domestic demand, for each industry j and year t:

$$IMP_{jt} = \frac{Imports_{jt}^{\text{China,US}}}{Shipments_{jt}^{\text{US}} + Imports_{jt}^{\text{World,US}} - Exports_{jt}^{\text{US,World}}}$$

$Imports_{jt}^{\text{China,US}}$ symbolizes US imports from China in industry j and year t, $Imports_{jt}^{\text{World,US}}$ symbolizes total US imports in industry j and year t, $Exports_{jt}^{\text{US,World}}$ symbolizes total US exports in industry j and year t, and $Shipments_{jt}^{\text{US}}$ symbolizes US production in industry j and year t. The ratio varies over time (see next section) and across industries, even among similar products. In 2005, for instance, the penetration ratio of Chinese imports of hardwood veneer and plywood products (SIC 2435) was 12 percent, i.e., about twice the average, whereas the ratio for softwood veneer and plywood products (SIC 2436) was 40 times smaller. Owing to data limitations, multi-sector firms mainly operating in the same industry j are considered to be equally exposed to Chinese import competition, i.e.,

FIGURE 1 – Exports from China between 1970 and 2010



Notes: This figure plots the share of exports from China in worldwide exports between 1970 and 2010. The data originate from the World Bank.

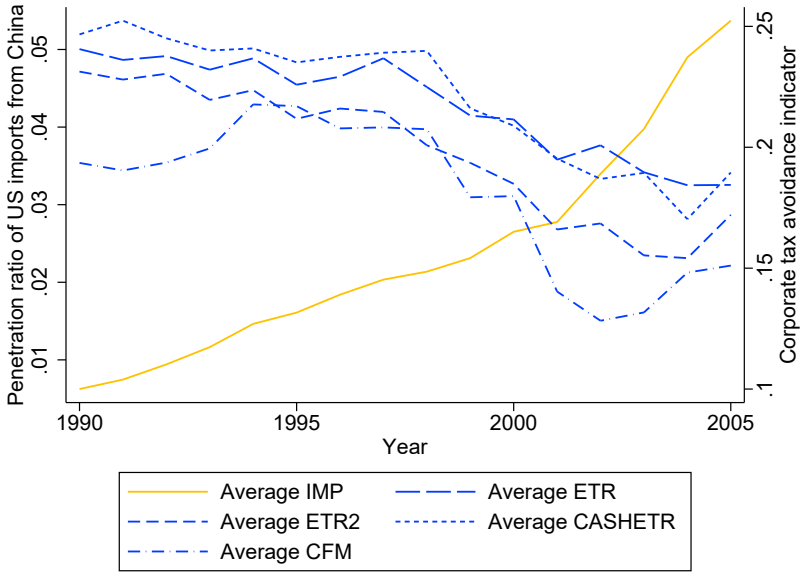
$IMP_{ijt} = IMP_{jt}$ for all i.

2.2 Sample

Only a subsample of the dataset described above is used for the study. For comparability, I remove companies whose headquarters are not located in the US. I also exclude observations before 1990. As illustrated in Figure 1, the 1990s mark the onset of the Chinese export boom. The share of Chinese exports in total world exports grew from 0.6 percent to 1.1 percent between 1970 and 1990 and then rose rapidly to 8 percent in 2010. In section 4, we will see that the period from 1990 to 2005 is a convenient time to exploit the US granting PNTR status to China in 2000 as a quasi-natural experiment. Finally, I include manufacturing firms exclusively since manufacturing products represented the major portion of Chinese exports during that period, and there is substantial variation in the import competition variable across manufacturing sectors.[6] In total, the subsample consists of an unbalanced panel of 51,791 firm-year observations, for a total of 5,739 firms operating in 218 industries between 1990 and 2005, 1,087 of which operated over

6. The second argument justifies the non-use of services as a comparison group in this paper.

FIGURE 2 – Import competition and corporate tax avoidance: macro-level evidence



Notes: This figure plots the average penetration ratio of US imports from China (left y-axis) and the mean value of each of the four corporate tax avoidance variables (right y-axis) between 1990 and 2005. For the latter, firm-year observations are set as missing when the tax avoidance variable lies outside the [0,1] interval. See section 3 for more details.

the entire time span. Summary statistics are provided in Appendix A Table AT2.

3 First evidence on import competition and corporate tax avoidance

The dataset uncovers three facts: (i) Chinese import competition and corporate tax avoidance variables are positively correlated, (ii) the China shock reinforced the decline in sales of domestic firms and tempered the increase in sales of MNEs, and (iii) effective tax rates and sales/pre-tax income move in the same direction.

Stylized fact 1: The rise in Chinese import competition is associated with an increase in corporate tax avoidance.

In Figure 2, I plot the average penetration ratio of US imports from China and the mean value of the four corporate tax avoidance variables for each year between 1990 and 2005.

TABLE 2 – Chinese import competition and firm sales

Dependent variable	$sales_{ijt}$
IMP_{jt}	-2,712.80
	(2,141.90)
Controls	Yes
Firm FEs	Yes
Year FEs	Yes
No. of obs.	33,297

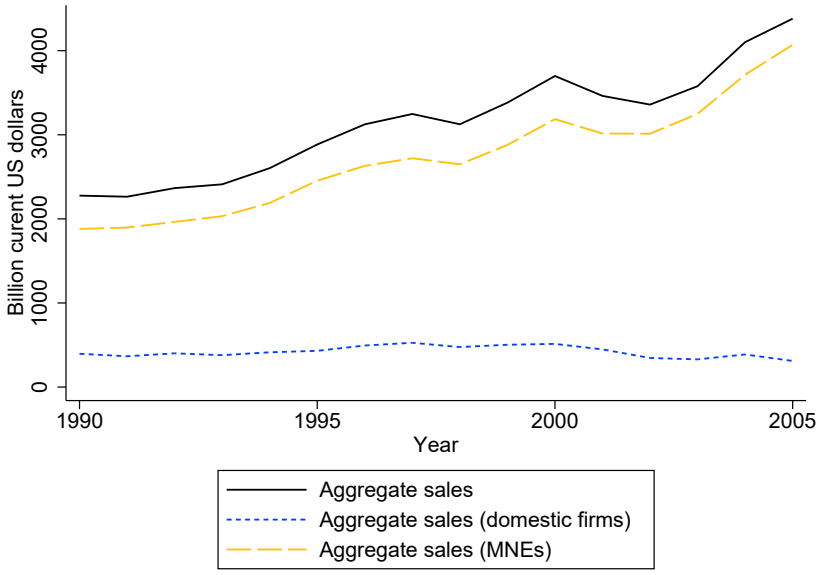
Notes: This table reports regression results obtained with ordinary least squares. The standard error, in parentheses, is clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

For interpretability and as is common practice in the literature, firm-year observations are set as missing when the tax aggressiveness variable lies outside the $[0, 1]$ interval. The competition variable continuously increased throughout the period.[7] On the contrary, indicators of corporate tax avoidance fell, in line with Dyreng et al. (2017). In the Online Appendix Table OAT1, the correlation is found to be statistically significant at the 1 percent level with just 16 data points. A 1 percentage point increase in the average import penetration ratio is associated with a 1.36 percentage point decrease in the average ETR, a 1.79 percentage point decrease in the average $ETR2$, a 1.47 percentage point decrease in the average $CASHETR$, and a 1.40 percentage point decrease in the average CFM. The correlation persists at the industry level, as outlined in the Online Appendix Table OAT2. It should be noted that the four metrics of tax avoidance appear relatively low (compared to US statutory tax rates) and somewhat volatile. This is because some firms have very low effective tax rates, making the distribution bimodal. I show this distribution in the Online Appendix Figure OAF2,[8] and I show in Table OAT3 that the negative correlation still holds when I calculate for each year and tax avoidance variable, a value that partially corrects this bias. I will revisit the volatility issue in the econometric analysis.

7. In the Online Appendix Figure OAF1, I reproduce Figure 2 using the penetration ratio of US imports from all foreign countries.

8. The left peak disappears when firm-year observations with a tax loss carry forward are dropped (see the Online Appendix Figure OAF3). Additionally, Figures OAF4 and OAF5 suggest that tax loss carry forwards of domestic firms partly explain the discrepancy between the ETR of domestic firms and the ETR of MNEs displayed in Dyreng et al. (2017), the former being surprisingly lower on average. Eliminating firms with tax loss carry forwards substantially reduces not only the gap between ETR and statutory tax rates but also the gap between domestic firms' and MNEs' ETR.

FIGURE 3 – Aggregate sales



Notes: This figure plots sales of companies included in the sample between 1990 and 2005. See section 3 for more details.

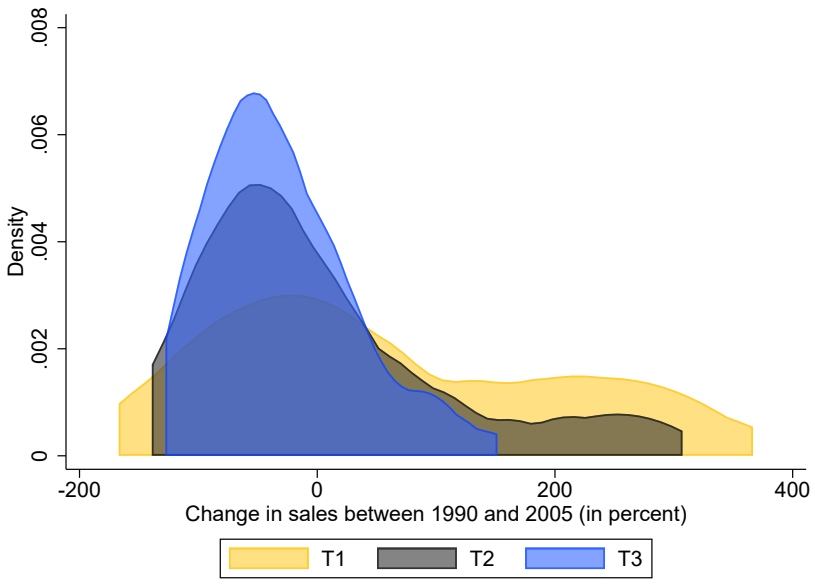
Stylized fact 2: Chinese import competition curtailed sales growth. In particular, it deepened the sales slump of domestic firms and dampened the sales increase of MNEs.

Figure 3 brings sales into the picture and reveals that, remarkably, they doubled during this time, despite growing Chinese import competition. Nonetheless, the increase in total sales was fueled primarily by the increase in MNEs' sales. Domestic firms' sales, in contrast, dwindled by 22 percent. In Table 2 and Figure 4, I prove that the China shock aggravated the contraction of domestic firms' sales and slowed the rise of MNEs' sales. Sales are regressed on IMP, an MNE dummy, and a set of firm and year fixed effects. The coefficient associated with IMP is negative, reflecting the China shock's negative impact on sales. [9] The same applies to pre-tax income (see Online Appendix Table OAT4) or if I convert current US dollars into 1987 US dollars with industry-level price indexes of shipments from the NBER-CES Manufacturing Industry Database. [10] The negative correlation is clear in Figure 4. The graph exhibits the distribution of the growth rate of domestic

9. Note that the negative impact holds for both domestic and multinational enterprises. When allowing for heterogeneous effects, IMP becomes significant at the 10 percent level, and the interaction term $IMP \times MNE$ actually appears negative (although insignificant).

10. Figures 3 and 4 with pre-tax income and/or constant US dollars are available upon request.

FIGURE 4 – Chinese import competition and sales of domestic enterprises



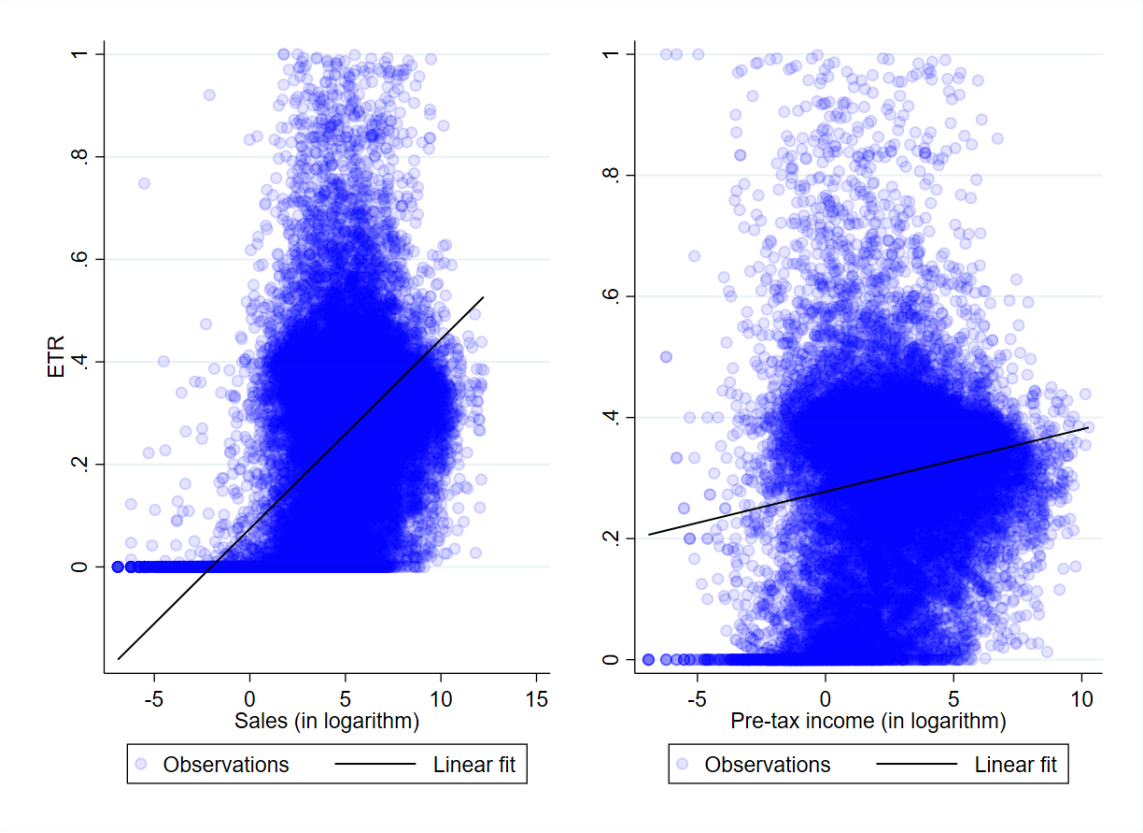
Notes: This figure plots sales growth distribution between 1990 and 2005 at the industry level, by tercile. Only domestic firms operating throughout the period are taken into account to calculate industry sales. Terciles are constructed based on the change in the penetration ratio of US imports from China between 1990 and 2005. T3 contains the sectors that are most affected by rising Chinese import competition. See section 3 for more details.

firms' sales at the sector level. Sectors are divided into three groups of equivalent size based on exposure to the rising Chinese import competition. Growth rates are concentrated around -50 percent for the third tercile, composed of the sectors most exposed to rising Chinese import competition (transportation equipment, industrial machinery and equipment, electronic and other electric equipment). The distribution is flatter and shifts to the right for the second tercile and shifts even further for the first tercile.

Stylized fact 3: Effective tax rates and sales/pre-tax income are positively correlated.

I examine the relationship between effective tax rates and sales/pre-tax income in Figure 5. The y-axis represents the effective tax rate, and the x-axis represents either sales (left, in logarithm) or pre-tax income (right, in logarithm). The figure depicts a positive correlation in both cases and stays comparable if I take sales and pre-tax income in levels. The slope of the linear fit curve in the first graph indicates that a 10 percentage point increase in sales translates into a 0.37 percentage point increase in the effective tax rate,

FIGURE 5 – Sales, pre-tax income, and effective tax rates



Notes: The subfigure on the left plots firm sales (in logarithm) on the x-axis and ETR on the y-axis, while the subfigure on the right plots firm pre-tax income (in logarithm) on the x-axis and ETR on the y-axis. Firm-year observations are set as missing when the effective tax rate lies outside the [0,1] interval. The slope of the linear fit in the first graph is equal to 3.7e-2, with a standard error equal to 3.1e-4. The slope of the linear fit in the second graph is equal to 1.0e-2, with a standard error equal to 4.0e-4. See section 3 for more details.

and the slope in the second graph indicates that a 10 percentage point increase in pre-tax income translates into a 0.10 percentage point increase in the effective tax rate. This pattern means that the negative correlation between effective tax rates and Chinese import competition is potentially attributable to losses in sales induced by the China shock. In the ensuing sections, I will rule out the mechanical effect of import competition on tax avoidance variables passing through sales and pre-tax income by integrating these two variables into the vector of covariates. Furthermore, we will see that Chinese import competition only decreased the effective tax rate of MNEs, for which sales doubled.

4 Causal effect of import competition on corporate tax avoidance

In this section, I go beyond correlations and provide robust evidence of a positive and causal effect of import competition on corporate tax avoidance. I start with the baseline estimates and a simple counterfactual analysis. Next, I address endogeneity concerns.

4.1 Baseline estimates and counterfactual analysis

I assess the effect of import competition on corporate tax avoidance with the following model:

$$CTA_{ijt} = \beta_0 + \beta_1 IMP_{jt} + \beta_2 X_{ijt} + u_i + \nu_t + e_{ijt} \tag{1}$$

CTA_{ijt} is the corporate tax avoidance variable for firm i mainly operating in industry j in year t. Recall from section 2 that IMP_{jt} represents the exposure to Chinese import competition. X_{ijt} is a vector of confounding factors. It includes firms' characteristics varying over time that determine tax liability and that are related to tax avoidance in the literature: sales, pre-tax income, tax loss carry forward, size, profitability, leverage, market power, inventories, market-to-book ratio, and multinational operations. More details on these variables can be found in Appendix A. I complement them with firm fixed effects u_i to account for industry-specific strategies as well as persistent differences across firms, such as tax rulings. [11] Finally, I add year dummies ν_t in order to absorb time trends – without imposing any structure – and year-specific unobservables like macroeconomic shocks. For the sake of clarity, I will focus on the coefficient of interest β_1 and will solely report $\hat{\beta}_1$ in the regression tables below.

Table 3 displays the estimation results of equation (1) for the four tax aggressiveness variables, with and without covariates. In line with the primary evidence presented in section 3, $\hat{\beta}_1$ is negative and statistically significant. The correlation remains economically

11. Egger, Strecker, and Zoller-Rydzek (2020) argue that MNEs, larger and more profitable, can threaten tax authorities to transfer their activities to other jurisdictions. Thus, MNEs have greater bargaining power and can obtain more tax deductions. The firm-level fixed effects and the multinational operation, sales, pre-tax income, and assets variables should capture this. They should also capture most of the changes in the tax avoidance variables ascribable to variations in the distribution of worldwide activity across countries.

and statistically significant when controls are introduced, so it is not spurious. In addition, the coefficients have the same order of magnitude in all columns. With controls, they range from -0.18 to -0.26, implying that all types of strategies have expanded uniformly in response to the China shock.[12] All other things being equal, a 1 percentage point hike in the penetration ratio of US imports from China is associated with a 0.20 percentage point reduction in ETR, a 0.18 percentage point reduction in $ETR2$, a 0.18 percentage point reduction in $CASHETR$, and a 0.26 percentage point reduction in CFM.

To better understand the amplitude of the effect, we can ask the following question: What would the average effective tax rate be in the absence of rising Chinese import competition? To respond to this question, I compute back-of-the-envelope counterfactual estimates. Armed with the estimation results of the preferred specification (Table 3 column (2)), I calculate a counterfactual average effective tax rate $\overline{ETR}_t^{counterfactual}$ for each year t:

$$\overline{ETR}_t^{counterfactual} = \overline{ETR}_t + 0.20 \times (\overline{IMP}_t - \overline{IMP}_{1990})$$

The evolution of $\overline{ETR}_t^{counterfactual}$ and $\overline{ETR}_t$ can be visualized in Figure 6. The figure suggests that the average effective tax rate would have been 0.93 percentage points higher in 2005 had the penetration ratio of US imports from China stayed constant over the period. In other words, through tax avoidance, the China shock contributed 17 percent to the decline in the average effective tax rate observed between 1990 and 2005 through tax avoidance. Thus, the effect is far from negligible.

4.2 Robustness

I evaluate the robustness of these benchmark results in Table 4. I demonstrate that they hold when I remove outliers, incorporate more control variables, change the specification of the econometric model, and perform falsification tests.

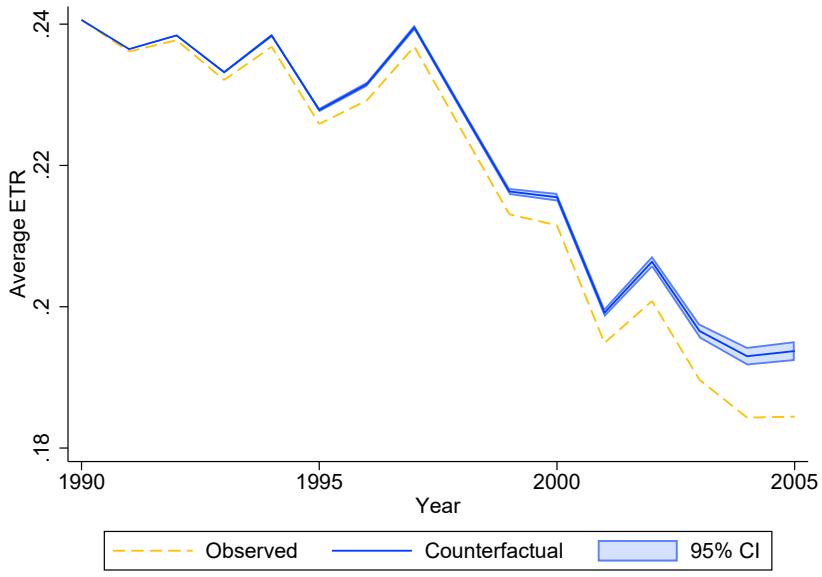
12. In untabulated results, a composite index PCA_{ijt} is constructed by means of a principal component analysis. Three principal components are used and explain 85 percent of the point cloud inertia. Denote λ_l the eigenvalue associated to the l^{th} principal component and x_{ml} the coordinate of the variable m on the l^{th} principal component. Let A, B, C, and D be ETR, $ETR2$, $CASHETR$, and CFM after standardization. The composite indicator is defined as: $PCA_{ijt} = \sum_{l=1}^{3} \frac{\lambda_l}{\sum_{k=1}^{3} \lambda_k} (x_{Al} \times A + x_{Bl} \times B + x_{Cl} \times C + x_{Dl} \times D)$. The synthetic variable is then transformed as to lie between 0 and 1 by taking $PCA_{ijt} = \frac{PCA_{ijt} - min(PCA_{ijt})}{max(PCA_{ijt}) - min(PCA_{ijt})}$. Replacing CTA_{ijt} by PCA_{ijt} in equation (1) delivers $\hat{\beta}_1 = -0.25$, with a standard error equal to 0.04.

TABLE 3 – Effect of import competition on corporate tax avoidance: baseline equation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	ETR_{ijt}		$ETR2_{ijt}$		$CASHETR_{ijt}$		CFM_{ijt}	
IMP_{jt}	-0.21[a]	-0.20[a]	-0.29[a]	-0.18[b]	-0.36[a]	-0.18[a]	-0.54[a]	-0.26[a]
	(0.03)	(0.03)	(0.08)	(0.07)	(0.07)	(0.04)	(0.09)	(0.06)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Firm FEs	No	Yes	No	Yes	No	Yes	No	Yes
Year FEs	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.00	0.20	0.00	0.21	0.00	0.13	0.00	0.12
No. of obs.	27,607	23,097	26,477	22,286	18,995	16,688	19,581	16,584

Notes: This table reports regression results of equation (1) obtained with ordinary least squares. In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. [d] $p < 0.15$, [c] $p < 0.10$, [b] $p < 0.05$, [a] $p < 0.01$. See section 4 for more details.

FIGURE 6 – Observed and counterfactual average effective tax rates



Notes: This figure plots the observed and counterfactual average effective tax rates for each year between 1990 and 2005. See section 4 for more details.

TABLE 4 – Effect of import competition on corporate tax avoidance: robustness checks

Dependent variable	(1) ETR	(2) $ETR2$	(3) $CASHETR$	(4) CFM
Baseline estimates	-0.20^{a}	-0.18^{b}	-0.18^{a}	-0.26^{a}
Panel A: exclusion of outliers				
A1. Extreme values	-0.36^{a}	-0.30^{a}	-0.33^{a}	-0.43^{a}
A2. Negative profits	-0.15^{a}	-0.11^{c}	-0.17^{a}	-0.22^{a}
A3. Entries and exits	-0.22^{a}	-0.23^{a}	-0.17^{a}	-0.22^{a}
A4. Involved in M&A	-0.23^{a}	-0.19^{a}	-0.18^{a}	-0.27^{a}
Panel B: more controls				
B1. Trends in globalization	-0.17^{a}	-0.15^{b}	-0.19^{a}	-0.21^{a}
B2. Trends in globalization (USDIA included)	-0.20^{a}	-0.15^{c}	-0.18^{b}	-0.14^{b}
B3. State-year FEs	-0.20^{a}	-0.19^{a}	-0.16^{a}	-0.26^{a}
B4. State-year-MNE status FEs	-0.21^{a}	-0.18^{a}	-0.15^{a}	-0.27^{a}
Panel C: alternative specifications				
C1. SIC 3-digit industry	-0.15^{a}	-0.16^{a}	-0.10^{b}	-0.18^{a}
C2. 4-year periods	-0.30^{a}	-0.11	-0.17^{c}	-0.23^{a}
C3. 16-year differences	-0.18^{c}	-0.36^{a}	-0.16^{c}	-0.32^{b}
Panel D: falsification tests				
D1. Random industry	0.01	-0.02	-0.01	0.05
D2. Pre-period data	-0.11	-0.06	0.35	0.36

Notes: This table assesses the robustness of the regression results outlined in Table 3. In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors are clustered at the 4-digit 1987 SIC industry and are not reported for space. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

In panel A, I show that deleting outliers does not affect the findings. I start by winsorizing the right-hand-side variables at the 2.5 and 97.5 percentiles to ensure that the estimates are not driven by extreme values of the independent variables (panel A1), and I eliminate firm-year data points with negative profits as is occasionally done in the accounting literature (panel A2). Next, I exclude firms not operating over the entire time span (panel A3) and firms involved in a merger and acquisition operation (panel A4) to rule out any compositional effect. [13] In all four cases, the results are similar to those in Table 3, in terms of both magnitude and significance. The coefficients double in panel A1, meaning

13. Firms first appear in Compustat two or three years before the initial public offering. Exits are of different types: merger and acquisition (M&A), bankruptcy, liquidation, reverse acquisition, leveraged buyout, etc. M&A transactions are the major cause of exits, and how Compustat treats the survivor depends on the method of acquisition.

that the estimates in Table 3 could eventually downplay the role of import competition and be seen as lower-bound estimates.

Panel B verifies that the effect holds when adding more covariates. One caveat is that IMP, as any other trade-induced variable, could pick up not only Chinese import competition but more broadly ongoing industry trends in globalization. To disentangle their respective impact, I augment equation (1) with five industry-year specific variables in panel B1: US exports to China, US total exports (from Schott, 2008), Chinese import tariffs (from Pierce and Schott, 2016), the penetration ratio of US imports from other foreign countries (from Schott, 2008), and the intensity of Chinese import competition in the input market. I proxy the intensity of Chinese import competition in the input market for (2-digit SIC) sector j and year t by $\sum_k \frac{\lambda_{kj}}{\sum_k \lambda_{kj}} IMP_{kt}^{2-digit}$, where $\frac{\lambda_{kj}}{\sum_k \lambda_{kj}}$ is the share of inputs originated from sector k used in the production of goods in sector j. These shares are calculated using input-output tables at the 1987 SIC 2-digit level for 1992 from the Bureau of Economic Analysis (BEA). In panel B2, I rerun this regression with one more independent variable measuring sales of US MNEs in China. This variable comes from the BEA's US Direct Investment Abroad (USDIA) database and deals with the widening of opportunities for American firms. The equation is estimated separately from panel B1 because these data are only available from 1999 onward. Similarly, I extend the set of dummies in panels B3 and B4. I replace year dummies with state-year and state-year-MNE status dummies. These regressions better take into account corporate income tax reforms implemented in the US state of incorporation over the study period. They should neutralize the effect of the check-the-box regulations enacted in 1997, accused by specialists of having facilitated MNEs' tax avoidance by giving them the opportunity to circumvent the subpart F income regulations. Overall, the coefficients in panel B match those obtained in Table 3.

In panel C, I show that adopting alternative specifications yields the same results. The exercise performed in panel C1 consists of replicating equation (1) at the SIC 3-digit level. As one may have noticed, the number of observations in Table 3 is small compared to the total number of firm-year observations in the dataset (51,791). This loss stems from two sources. It is impossible to construct ETR and $ETR2$ for 10 percent of firm-year observations and $CASHETR$ and CFM for 20 percent of firm-year observations, and I remove firm-year observations with a dependent variable lying outside the [0,1] interval for the sake of interpretability (around 15 percent of the restricted sample). Moreover,

some firms report a SIC 3-digit code instead of a 4-digit code. These firms do not appear in Table 3 by construction. In panel C1, I impute these missing values with the penetration ratio of US imports from China at the 3-digit level. The coefficients tend toward zero because the competition variable is less precise, but they remain statistically significant. In panel C2, I split the 1990-2005 period into four subperiods and estimate equation (1) with long-run tax avoidance variables (sum of the numerator across years divided by the sum of the denominator across the same years) and four-year averages of the independent variables. The reason for this, as mentioned in section 3, is that tax avoidance variables can be volatile. To date, there is no consensus in the literature on the use of annual or multi-year tax avoidance variables. On the one hand, Dyreng et al. (2008) recommend computing long-run values to smooth transient shocks. On the other hand, these long-run values abstract from temporary strategies, and around 70 percent of managers surveyed by Hoopes, Mescall, and Pittman (2012) report being able to change tax positions within one year (see also De Simone et al., 2019). Nevertheless, I find evidence of a positive effect of import competition on corporate tax avoidance with either approach. In panel C3, I show that the baseline results are also robust to the estimation of equation (1) with sixteen-year differences rather than levels.

Lastly, I carry out two falsification tests in panel D. In panel D1, I assign each firm to a random industry j' and substitute IMP_{ijt} with $IMP_{ij't}$ to give confidence that I truly estimate the effect of import competition in the industry in which the firm is mostly active. In panel D2, I re-estimate equation (1) using pre-sample data (1974-1989) for all variables except the penetration ratio to check that $\hat{\beta}_1$ is not capturing long-run trends in tax avoidance correlated with Chinese import competition.[14] The point estimates – statistically not different from zero, as expected – reinforce the results in Table 3.

4.3 Endogeneity

Thus far, the right-hand-side variables have been treated as exogenous in equation (1). Yet, they may be endogenous.

Two concerns pertain to reverse causality and the "bad controls" problem discussed in

14. Another way to control for trends in tax dodging is to introduce a set of 2-digit SIC industry-year dummies. It is feasible because, as explained in section 2, there is variation in Chinese import competition within 2-digit sectors. Doing so leads to coherent results (see the Online Appendix Table OAT5).

Angrist and Pischke (2009). Firm-specific control variables X_{ijt} could be affected by tax aggressiveness, Chinese import competition, or both. In these two situations, the coefficient of interest would be biased. To mitigate this, I reproduce in Table 5 panel A the results of Table 3 when all variables in X have predetermined values. I employ one-year lags in panel A1 and two-year lags in panel A2, and the results are still consistent.

Another reason why the results in Table 3 could be biased is that changes in Chinese import competition, as measured by the penetration ratio of US imports from China, are ascribable to both supply- and demand-side shocks. To extract the supply-driven changes in Chinese import competition, I proceed with a two-stage least squares (2SLS) estimation. Building on Autor et al. (2013) and similarly to Iacovone et al. (2013) and Chakraborty and Henry (2019), I instrument the penetration ratio of US imports from China by the average share of Chinese imports in total imports among eight other high-income countries (Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland). In panel B1, I show that the instrument has power. The F-statistic in the first stage of the instrumental variables is always greater than 29, well above the range of Stock and Yogo (2005)'s critical values. Panel B2 transcribes the results obtained in the second stage and shows that, if anything, the baseline coefficients outlined in Table 3 undershoot the effect of import competition on corporate tax avoidance. Following the same line of reasoning, I look at the effect of Mexican import competition and utilize the average share of imports from Mexico of the same set of high-income countries as an instrument. Mexico is another suitable candidate insofar as the average penetration ratio of US imports from Mexico in manufacturing increased threefold between 1990 and 2005. The results are attached in the Online Appendix Table OAT6 and are qualitatively unchanged. Returning to Table 5 panel B, the identification relies on three assumptions: (i) High-income countries are exposed to the supply-driven growth of exports from China in a comparable way, (ii) increasing returns to scale in Chinese manufacturing are moderate, and (iii) demand shocks are uncorrelated across these economies. Even though the literature suggests that a significant part of the rise of China's total exports during that period comes from the supply-side – due to the progressive dismantling of state-owned companies, the gradual removal of barriers to foreign investments, and, later, entry into the World Trade Organization (WTO) in 2001 (Brandt, Ma, and Rawski, 2014) –, we cannot categorically reject that demand shocks are correlated across high-income countries. In the same vein, the exclusion restriction can be debated for MNEs, for which the median ratio of foreign pro-

TABLE 5 – Effect of import competition on corporate tax avoidance: endogeneity

Dependent variable	(1) ETR	(2) $ETR2$	(3) $CASHETR$	(4) CFM
Panel A: lagged controls				
A1. One-year lags	-0.21^{a}	-0.16^{b}	-0.19^{a}	-0.30^{a}
A2. Two-year lags	-0.21^{a}	-0.14^{d}	-0.19^{a}	-0.27^{a}
Panel B: 2SLS à la Autor et al. (2013)				
B1. First stage results: IMP_{jt} on instrument				
Point estimate	0.63^{a}	0.63^{a}	0.62^{a}	0.63^{a}
F-statistic	32.65	33.16	29.12	30.23
B2. Second stage results: CTA_{ijt} on $\widehat{IMP}_{jt}$				
Point estimate	-0.31^{a}	-0.28^{b}	-0.28^{a}	-0.37^{a}
Panel C: PNTR as a quasi-natural experiment	-0.06^{b}	-0.08^{c}	-0.01	-0.07^{d}
Controls	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes

Notes: This table tackles endogeneity concerns in equation (1) and Table 3. In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. $\widehat{IMP}_{jt}$ is the prediction of IMP_{jt} after the first stage of the 2SLS procedure. Standard errors are clustered at the 4-digit 1987 SIC industry and are not reported for space. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

fits to worldwide profits is 17 percent.

To overcome these limitations, an alternative strategy consists of exploiting a quasi-natural experiment: the US conferral of PNTR status on China in late 2000. US imports from non-market economies are normally subject to higher tariff rates, called non-normal trade relations (NNTR) tariff rates. However, the US Trade Act of 1974 allows US presidents to grant most favored nation (MFN) tariff rates to non-market economies on an annual basis, upon approval by the US Congress. This explains why China's exports to the US were subject to normal trade relations (NTR) tariffs (equivalently, MFN tariffs) between 1980 and 2000 despite China being a non-market economy. The annual renewal generated substantial uncertainty, especially after the Tiananmen Square protests in 1989. While the renewal was nearly automatic in the 1980s, the House of Representatives tried to revoke this temporary status multiple times in the 1990s, and these threats were taken seriously (Pierce and Schott, 2016). In 1990, 1991, and 1992, for instance, more than 50 percent of votes in the House of Representatives were against the renewal. Public opinion

seemed against it as well. Gallup polls found that 13 percent of Americans expressed a very or mostly unfavorable view of China months before the Tiananmen incidents, and this share suddenly increased and remained above 50 percent throughout the 1990s. [15] Other surveys showed that public opinion favored the US putting pressure on China and disapproved of Bush's handling of Sino-American relations (Skidmore and Gates, 1997). As a consequence, trade between the US and China was largely hampered, and the granting of PNTR status after an unanticipated and five-month process played a key role in the boom in China's exports to the US between 2000 and 2005. [16] According to Handley and Limão (2017), the induced reduction in trade policy uncertainty and expected import tariffs is responsible for a third of the growth of US expenditures on Chinese goods during that period. In the present paper, I adopt a DiD approach along the lines of Pierce and Schott (2016). I create a variable $PNTR_{jt}$ equal to 0 before 2001 for all industries j and equal from 2001 onward to the difference between the NNTR tariff rate and the NTR tariff rate in industry j in 1999, retrieved from Pierce and Schott (2016). Next, I estimate:

$$\begin{aligned} CTA_{ijt} &= \gamma_0 + \gamma_1 PNTR_{jt} + \gamma_2 X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \\ \text{with } PNTR_{jt} &= \mathbb{1}_{t \geq 2001} \left(NNTR_{j1999} - NTR_{j1999} \right) \end{aligned} \tag{2}$$

The identifying assumption is that all other things being equal and absent the granting of PNTR status, tax avoidance practices would have evolved similarly in all sectors, irrespective of their exposure to the shock ($PNTR$). The particularity of $PNTR$ resides in its exogeneity: Almost 90 percent of the variation in $PNTR$ comes from NNTR tariff rates, established under the Smoot-Hawley Tariff Act in 1930 (Pierce and Schott, 2016). The point estimates in Table 5 panel C coincide with the previous results. They remain globally negative and statistically significant. [17] They are significant at lower levels, however, and three reasons can be proposed: (i) The DiD approach automatically and drastically reduces variation in the treatment, (ii) the shock explains only a part of the boom in China's exports, and (iii) as we will see in the ensuing section, the effect is driven by a group of firms: MNEs.

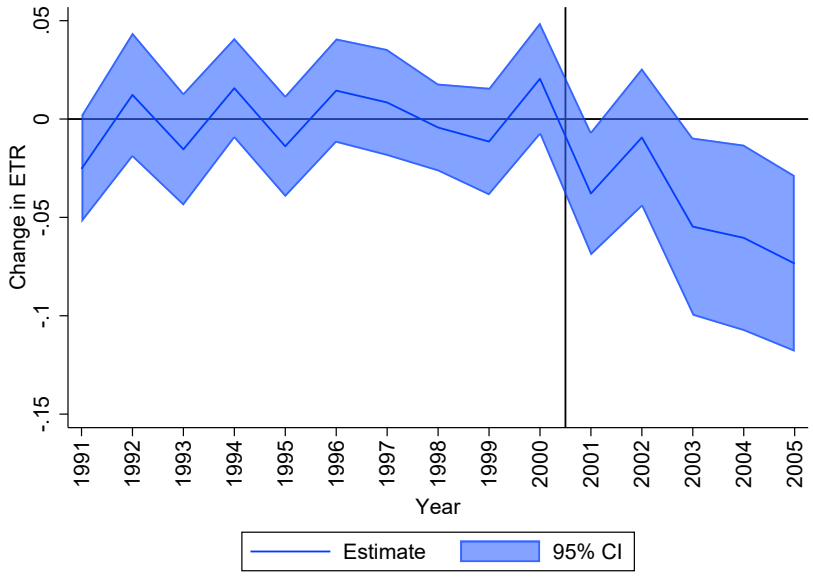
In Figure 7, I prove that the evolution of the effective tax rate prior to 2001 is unrelated to

15. See `https://news.gallup.com/poll/1627/china.aspx`.

16. Greenland et al. (2020) show that very few newspaper articles mentioned this permanent status before the introduction of the bill in the House of Representatives in May 2000.

17. In the same spirit of Table 5 panel B, using $PNTR$ as an instrument in 2SLS regressions delivers the same conclusions, qualitatively speaking (see the Online Appendix Table OAT7).

FIGURE 7 – Pre-trends in ETR and dynamics of the effect



Notes: This figure plots the coefficients obtained when replacing in equation (2) $PNTR_{jt}$ with the following set of 15 variables: $\mathbb{1}_{t \geq x} \times \left(NNTR_{j1999} - NTR_{j1999}\right)$, $x \in \{1991, ..., 2005\}$. Standard errors are clustered at the 4-digit 1987 SIC industry. See section 4 for more details.

the tariff gap. This supports the common trend assumption and can be seen as a placebo test for panel C column (1). It also implies that the treatment is unlikely to be a proxy for unobserved industry-year shocks. For these shocks to be problematic, they would have to occur in the same year of the treatment, i.e., 2001. Another important point recently raised in the econometrics literature is that linear regressions with high-dimensional fixed effects estimate weighted sums of the average treatment effects (ATEs). Hence, the fact that some of these weights can be negative and that the ATEs could be heterogeneous across firms or periods is a source of concern: The coefficient of interest could be negative even though all ATEs are positive. I follow the guidelines of de Chaisemartin and D'Haultfœuille (2020), who discuss this for models with two-way fixed effects akin to mine. I find a low share of negative weights in each regression, meaning that treatment effect heterogeneity should not constitute a major threat to the validity of the findings. On the whole, the sensitivity tests in Tables 4 and 5 lend credence to a positive and causal effect of import competition on corporate tax avoidance.

5 Multinational firms and intangible assets

This section delves into the channels through which import competition fosters corporate tax avoidance. I show that the positive effect highlighted in the previous section is specific to MNEs and most striking for those familiar with tax havens. Further, I provide systematic evidence that the China shock prompted MNEs to invest in intangible assets and that these assets intensified their profit shifting activities. Before concluding, I demonstrate that intangibles tempered the negative impact of the shock on sales and that MNEs in import-competitive industries did not enlarge their network of subsidiaries in tax havens. These observations suggest that MNEs' investments in intangibles were aimed at escaping competition rather than avoiding taxes in the first place. In a way, the effect of import competition on profit shifting is thus indirect.

5.1 Domestic versus multinational firms

To better understand what lies behind the average effect estimated in the previous section, I now investigate the existence of heterogeneous effects. More precisely, I differentiate between domestic firms and MNEs. The latter have more possibilities for avoiding taxes because they can shift profits toward the subsidiaries located in relatively low-tax jurisdictions. In addition, a helpful feature of the dataset is that financial statements are consolidated at the firm level, enabling profit shifting activities to be reflected in the effective tax rates. [18]

$$ETR_{ijt} = \beta_0 + \beta_{1,1} PNTR_{jt} + \beta_{1,2} PNTR_{jt} \times MNE_{ijt} + \beta_2 X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (3)$$

I use a triple difference estimator in equation (3). I construct a new variable denoted $PNTR \times MNE$ and plug it into the regressors of the preferred specification, equation (2). This variable is the product of the treatment variable $PNTR$ and the multinational activity dichotomous variable MNE. The regression results are displayed in Table 6 column (2). The coefficient associated with $PNTR$ becomes insignificantly different from zero while the coefficient associated with the interaction term $PNTR \times MNE$ appears negative and statistically significant at the 1 percent level. The effect estimated in section 4 is therefore

18. MNEs are not obliged to disclose in their financial statements the deferred US income tax expense related to their foreign earnings if they declare it as "permanently reinvested."

driven by MNEs. Online Appendix Figure OAF6 graphically reports the results for all four metrics of tax avoidance.

Online Appendix Figure OAF7 digs deeper into this asymmetry and separates MNEs present in tax havens from the rest of MNEs. Each year, US-listed firms disclose a list of their "significant" subsidiaries in Exhibit 21 of Form 10-K in accordance with the rules of the Securities and Exchange Commission (SEC). A subsidiary is deemed "significant" if its assets (or income) represent at least 10 percent of consolidated assets (or income), or if by combining all undisclosed subsidiaries into one fictive subsidiary, the fictive subsidiary represents at least 10 percent of assets (or income). In other words, Exhibit 21 filings uncover subsidiaries where at least 90 percent of firms' consolidated assets and revenues are recorded and thus give a precise overview of the worldwide network of US-listed firms' subsidiaries. Dyreng and Lindsey (2009)'s database summarizes this information starting from 1993. On this basis, I explore whether the most tax-aggressive MNEs, implanted in tax havens, are those for which the tax avoidance variables decreased the most. A country is classified as a tax haven if it appears on the lists elaborated by Hines and Rice (1994) and Dyreng and Lindsey (2009) (see the list in the Online Appendix Table OAT8). The results in Online Appendix Figure OAF7 corroborate this conjecture. Together, Table 6 column (2), Online Appendix Figure OAF6, and Online Appendix Figure OAF7 are fully reminiscent of profit shifting activities.

5.2 The role of intangible assets

The following question emerges: How did MNEs accentuate their profit shifting activities after the China shock? The literature emphasizes three major profit shifting methods. First, MNEs can manipulate transfer prices, i.e., distort the price of the transactions made between their affiliates. Second, they can take advantage of the tax deductibility of interest payments and adjust the capital structure of their affiliates by using intra-firm loans. Third, multinationals can locate intellectual property rights in tax-friendly jurisdictions and make affiliates in high-tax countries pay royalties for the use of intangible assets. Given that Compustat reports financial statements for each corporation on a consolidated basis, I can identify neither transfer prices nor intra-firm loans. I hereby focus on intangibles and intra-firm royalty payments, a well-known channel found by Heckemeyer and Overesch (2017) to be one of the most employed profit shifting techniques.

TABLE 6 – Effect of import competition on corporate tax avoidance: mechanism

Dependent variable	(1) ETR_{ijt}	(2) ETR_{ijt}	(3) ETR_{ijt}	(4) ETR_{ijt}	(5) $intangibles_{ijt}$
$PNTR_{jt}$	-0.06^{b}	-0.02	-0.03	-0.03	103.45
	(0.03)	(0.03)	(0.03)	.(0.03)	(270.53)
$PNTR_{jt} \times MNE_{ijt}$		-0.06^{a}			480.99^{b}
		(0.02)			(201.39)
$intangibles_{ijt}$			-2.54e-6^{c}	1.87e-5^{a}	
			(1.46e-6)	(6.79e-6)	
$intangibles_{ijt} \times MNE_{ijt}$				-2.14e-5^{a}	
				(6.91e-6)	
Controls	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
No. of obs.	24,162	24,162	20,758	20,758	24,481

Notes: This table reports regression results of equation (2) in column (1), equation (3) in column (2), equation (4) in column (3), equation (5) in column (4), and equation (6) in column (5). $intangibles$ is in current million dollars. In all columns except column (5), firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

A possible answer is that Chinese import competition impacted tax avoidance through an increase in intangible assets. Should this be the case, we would expect the China shock to have no significant effect, or at least a smaller effect, on the effective tax rate conditional on the stock of intangible assets. I test this hypothesis by adding intangible assets into the right-hand-side variables and running the regressions:

$$ETR_{ijt} = \beta_0 + \beta_1 PNTR_{jt} + \beta_2 intangibles_{ijt} + \beta_3 X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (4)$$

$$ETR_{ijt} = \beta_0 + \beta_1 PNTR_{jt} + \beta_{2,1} intangibles_{ijt} + \beta_{2,2} intangibles_{ijt} \times MNE_{ijt} + \beta_3 X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (5)$$

As shown in Table 6 columns (3) and (4), intangible assets diminish the effective tax rate of MNEs, supporting the view that these firms strategically locate their intangibles to avoid taxes. [19] Importantly, the effect of the China shock dissipates. The coefficient is divided by two and becomes not statistically different from zero at standard levels. It suggests that import competition may indeed affect tax avoidance indirectly via intangibles. To verify

19. The p-value of the test whose null hypothesis is $\beta_{2,1} + \beta_{2,2} = 0$ is 0.07.

this, I study the impact of Chinese import competition on intangible assets and estimate the following equation in Table 6 column (5):

$$\begin{aligned} intangibles_{ijt} &= \gamma_0 + \gamma_{1,1} PNTR_{jt} + \gamma_{1,2} PNTR_{jt} \times MNE_{ijt} \\ &\quad + \gamma_2 X_{ijt} + u_i + v_t + e_{ijt} \end{aligned} \tag{6}$$

In other words, I regress firms' intangibles on $PNTR$, accounting for the same confounding variables as in equation (2). In addition, and in light of what has been shown in the previous subsection, I also allow for the possibility that rising import competition hits domestic firms and MNEs differently. The point estimates reveal that the competition shock had little incidence on domestic firms' intangible assets. In contrast, the China shock had a positive and significant impact on intangible assets of MNEs, and more notably on MNEs having ties with tax havens (see Online Appendix Table OAT9).

These observations concur with preceding contributions. Existing studies point out that the China shock led to more innovation and technical change (Bloom et al., 2016), investments in intangibles from industry leaders (Gutiérrez and Philippon, 2017), and product differentiation (Hombert and Matray, 2018). Perhaps a more challenging question is whether intangibles reduce income taxes paid by MNEs due to credits and deductions offered by governments or by facilitating profit shifting. In this regard, the estimation results speak in favor of the second proposition. MNEs located in tax havens are the ones recording the largest variations in tax avoidance and intangibles at the same time. Moreover, the fact that intangible assets lower the effective tax rate of MNEs, and not that of domestic enterprises who are eligible for these tax breaks, directly echoes the profit shifting literature.

5.3 Robustness

In the Online Appendix Table OAT10, I review an important threat to the validity of the results: the definition of intangible assets. There are two types of intangible assets: those acquired externally and those developed internally. US accounting rules are such that the former appear in balance sheets as part of the "intangible assets" category. This category is composed of goodwill, i.e., assets that are non-physical and difficult to precisely identify (e.g., human capital, brand, reputation, and identity), and other intangible assets,

i.e., assets that are non-physical but identifiable (e.g., copyright, patents, and software). However, intangibles created within companies are generally not capitalized on balance sheets. Rather, they are mostly recorded as R&D expenditures or Selling, General, and Administrative (SGA) expenditures.[20] Hence, I replicate the results obtained in Table 6 with a more comprehensive proxy of intangible assets, denoted $intangibles2_{ijt}$, including both externally acquired and internally generated intangible assets. As in Eisfeldt and Papanikolaou (2014) and Peters and Taylor (2017), the stock of internally created intangibles is approximated by a fraction (30 percent) of all past and current R&D and SGA expenses. The results presented in Table OAT10 align with previous results in all respects.

Symmetrically, instead of expanding the definition of intangibles, I narrow it and focus on patents in the Online Appendix Table OAT11. To this end, I exploit the database of the NBER Patent Data Project. This database reports numerous details on patents registered at the US Patent and Trademark Office: assignee number, patent number, granting and application dates, etc. It covers the period from 1976 to 2006 and can be matched to Compustat North America. I use this information to replace the variable $intangibles_{ijt}$ with another, $patents_{ijt}$, indicating the number of patents each firm was granted each year. The results go in the same direction and thus further strengthen the findings in section 5.2.

Lastly, I show that the results presented in this section are consistent when $intangibles$ is expressed as a share of total assets or in logarithm in the Online Appendix Table OAT12. In the Online Appendix Table OAT13, I show that the findings are equivalent when the multinational activity variable is constructed using exclusively the Exhibit 21 reports of Form 10-K.

5.4 A side effect

MNEs' intangibles expenditures increased after the China shock, which resulted in more profit shifting. One question remains: Were these intangibles used purely for tax purposes? Table 7 provides some clues. In columns (1) and (2), I explore whether firms in

20. Note that in Compustat, R&D and SGA expenditures are combined and reported in a variable deceptively labeled "Selling, General, and Administrative Expense."

TABLE 7 – Effect of import competition on corporate tax avoidance: A side effect ?

Dependent variable	(1) $TAXHAVEN_{ijt}^{ext}$	(2) $TAXHAVEN_{ijt}^{int}$	(3) $sales_{ijt}$
$PNTR_{jt}$	0.04	3.15	-2,740.44^{b}
	(0.07)	(4.50)	(1,226.00)
$PNTR_{jt} \times intangibles_{ijt}$			1.44^{b}
			(0.70)
Controls	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes
No. of obs.	28,443	4,651	30,141

Notes: This table reports regression results of equation (7) in column (1) and equation (8) in column (2). Equation (8) is regressed conditional on $TAXHAVEN_{ijt}^{int} > 0$. The regression results in column (3) mirror those presented in Table 2. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

the most-exposed sectors expanded into tax havens. I regress:

$$TAXHAVEN_{ijt}^{ext} = \beta_0 + \beta_1 PNTR_{jt} + \beta_2 X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (7)$$

$$TAXHAVEN_{ijt}^{int} = \beta_0 + \beta_1 PNTR_{jt} + \beta_2 X_{ijt} + \mu_i + \nu_t + \epsilon_{ijt} \quad (8)$$

$TAXHAVEN_{ijt}^{ext}$ is a binary variable equal to 1 if firm i operating in sector j has at least one subsidiary located in a tax haven in year t. $TAXHAVEN_{ijt}^{int}$ counts the number of subsidiaries incorporated in tax havens. If MNEs invested in intangible assets mainly for tax purposes, we would expect MNEs to broaden their activities in tax havens after the China shock. Surprisingly, Chinese import competition did not amplify the considerable development of US-listed firms' foreign direct investments in tax havens over the period, neither at the extensive margin (column [1]) nor at intensive margin (column [2]). Moreover, column (3) refines Table 2 and shows that the negative impact of the China shock on sales is mitigated by intangible assets. These findings are suggestive evidence that the positive effect of import competition on profit shifting is truly unintended, in the sense that the primary objective of the investments in intangibles was not to save taxes but to escape import competition.

6 Conclusion

The role played by competition in corporate tax avoidance is theoretically ambiguous in the literature. I empirically examine this role in this paper, with a focus on the China shock and US-listed firms. The analysis can be divided into two steps. In the first step, I estimate an average effect. The baseline results point to a positive and significant effect of import competition on corporate tax avoidance and are validated by a range of robustness tests. All other things held constant, they indicate that a 1 percentage point increase in the penetration ratio of US imports from China translates into a 0.20 percentage point decrease in the effective tax rate. In the second step, I study the underlying mechanism. I show that the effect of competition on tax avoidance is not homogeneous across firms. The effect does not hold for domestic firms and is particularly large for MNEs implanted in tax havens. Moreover, the rise in tax avoidance passes through intangible assets and can be seen as an unintended consequence of import competition. In response to the China shock, MNEs invested in intangible assets principally to alleviate revenue losses. However, these assets also allowed them to magnify their profit shifting activities. These findings shed light on the evolution of effective tax rates, help explain the backlash against MNEs and globalization in public opinion, and emphasize the need to connect international trade and tax policies at the international level.

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Appendix: Compustat variables

TABLE AT1 – Definition of the main variables

Variable	Definition
ETR_t	Income taxes over pre-tax income (excluding special items) $\frac{TXT_t}{PI_t - SPI_t}$
$ETR2_t$	Non-deferred income taxes over pre-tax income (excluding special items) $\frac{TXT_t - TXDI_t}{PI_t - SPI_t}$
$CASHETR_t$	Cash income taxes paid over pre-tax income (excluding special items) $\frac{TXPD_t}{PI_t - SPI_t}$
CFM_t	Cash income taxes paid over operating cash flows (excluding extraordinary items and discontinued operations) $\frac{TXPD_t}{OANCF_t + TXPD_t - XIDOC_t}$
$sales_t$	Sales $SALE_t$
$pre\text{-}tax\ income_t$	Pre-tax income less special items $PI_t - SPI_t$
$size_t$	Total assets AT_t
$profitability_t$	Pre-tax income less extraordinary items over total assets $\frac{PI_t - XI_t}{AT_t}$
$leverage_t$	Long-term debt over assets $\frac{DLTT_t}{AT_t}$
mtb_t	Market value of equity divided by book value of equity $\frac{CSHO_t \times PRCCF_t}{CEQ_t}$
$market\ power_t$	Sales over the cost of goods sold $\frac{SALE_t}{COGS_t}$
$inventory_t$	Inventories over total assets $\frac{INVT_t}{AT_t}$
$tlcf_t$	Dummy equal to 1 if there is a tax loss carry forward $\mathbb{1}_{TLCF_t > 0}$
MNE_t	Dummy equal to 1 if the firm is incorporated in a foreign country $FIC_t \neq USA$ or the pre-tax foreign income is different from zero $PIFO_t \neq 0$ or foreign income taxes are different from zero $TXFO_t \neq 0$ or deferred foreign income taxes are different from zero $TXDFO_t \neq 0$
$intangibles_t$	Intangible assets $INTAN_t$
$intangibles2_t$	Intangible assets + 30 percent of past and current selling, general and administrative expenses $INTAN_t + 0.3 \times \sum_{k=1990}^{t} XSGA_k$

Notes: This table lists all the firm-specific variables from Compustat used in this paper. They are constructed in accordance with the accounting literature (e.g., Armstrong, Blouin, and Larcker, 2012; Hoi, Wu, and Zhang, 2013; McGuire, Wang, and Wilson, 2014; Higgins, Omer, and Phillips, 2015; Khan, Srinivasan, and Tan, 2016).

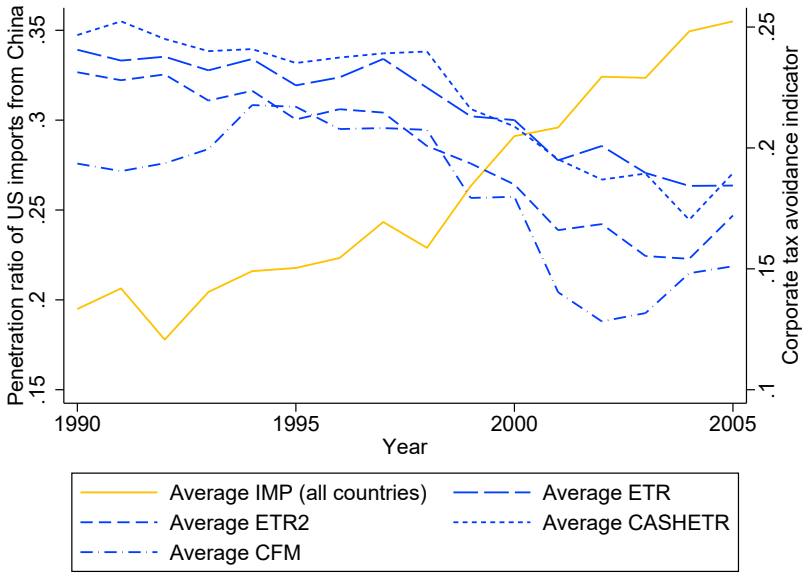
TABLE AT2 – Summary statistics

	P25	P50	Mean	P75	Std deviation	No. of obs.
ETR_t^*	0.00	0.26	0.22	0.37	0.19	40,101
$ETR2_t^*$	0.00	0.18	0.20	0.35	0.20	38,370
$CASHETR_t^*$	0.04	0.21	0.22	0.35	0.19	29,225
CFM_t^*	0.03	0.15	0.18	0.28	0.18	30,392
$sales_t$	10.23	67.55	1,037.09	374.48	6,245.36	48,467
pre-tax income$_t$	-2.61	1.209	79.74	19.60	576.18	47,214
$size_t$	14.01	65.35	1,107.81	343.12	8,435.78	48,596
$profitability_t$	-0.17	0.03	-0.72	0.10	25.67	48,349
$leverage_t$	0.00	0.09	0.31	0.27	7.93	48,341
mtb_t	0.99	1.92	3.14	3.62	169.82	42,060
market power$_t$	1.26	1.49	1.86	1.91	7.70	46,833
$inventory_t$	0.07	0.15	0.18	0.25	0.14	48,455
$tlcf_t$	0	1	0.71	1	0.45	51,791
MNE_t	0	0	0.37	1	0.48	51,791
$intangibles_t$	0	0.76	169.44	22.95	1,214.23	42,193
$intangibles2_t$	4.97	25.97	524.12	145.76	3,045.53	42,193

Notes: This table reports summary statistics for the Compustat firm-specific variables used in this paper. P25 refers to the first quartile, P50 refers to the median, and P75 refers to the third quartile. Monetary values are in current million US dollars. *Firm-year observations are set as missing when the tax avoidance variable lies outside the [0,1] interval.

Online Appendix: supplementary figures and tables

FIGURE OAF1 – Import competition and corporate tax avoidance: macro-level evidence (with all foreign countries)



Notes: This figure plots the average penetration ratio of US imports from all foreign countries (left y-axis) and the mean value of each of the four corporate tax avoidance variables (right y-axis) between 1990 and 2005. For the latter, firm-year observations are set as missing when the tax avoidance variable lies outside the [0,1] interval.

TABLE OAT1 – Import competition and corporate tax avoidance: macro-level regressions

Dependent variable	(1) $\overline{ETR}_t$	(2) $\overline{ETR2}_t$	(3) $\overline{CASHETR}_t$	(4) $\overline{CFM}_t$
$\overline{IMP}_t$	-1.36^a	-1.79^a	-1.47^a	-1.40^a
	(0.13)	(0.22)	(0.17)	(0.30)
Controls	No	No	No	No
No. of obs.	16	16	16	16

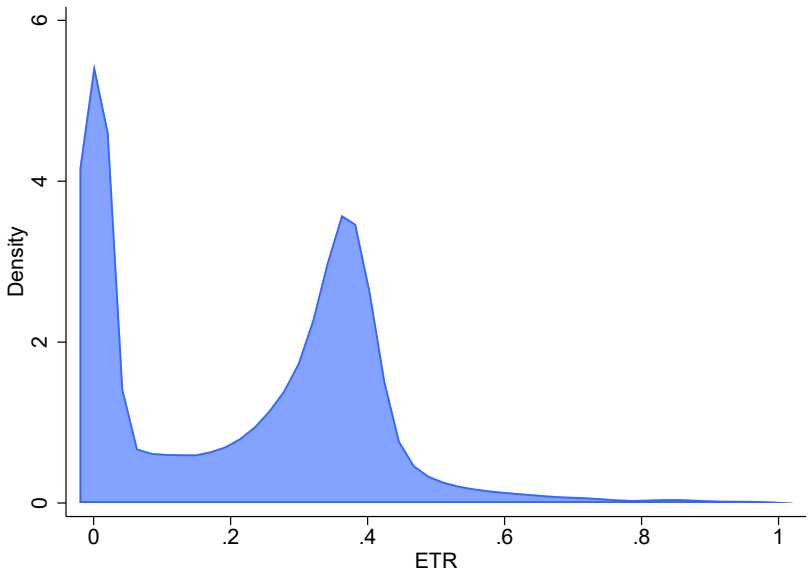
Notes: This table reports regression results obtained with ordinary least squares. The dependent variable is the year average of ETR in column (1), that of $ETR2$ in column (2), that of $CASHETR$ in column (3), and that of CFM in column (4). The independent variable $\overline{IMP}_t$ is the year average of the penetration ratio of US imports from China. Firm-year observations are set as missing when the tax avoidance variable lies outside the [0,1] interval. Standard errors are in parentheses. $^d p < 0.15$, $^c p < 0.10$, $^b p < 0.05$, $^a p < 0.01$. See section 3 for more details.

TABLE OAT2 – Import competition and corporate tax avoidance: industry-level regressions

Dependent variable	(1) $\overline{ETR}_{jt}$	(2) $\overline{ETR2}_{jt}$	(3) $\overline{CASHETR}_{jt}$	(4) $\overline{CFM}_{jt}$
IMP_{jt}	-0.11^{d}	-0.11^{c}	-0.06	-0.12^{d}
	(0.07)	(0.06)	(0.06)	(0.08)
Industry FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
No. of obs.	1,785	1,771	1,783	1,783

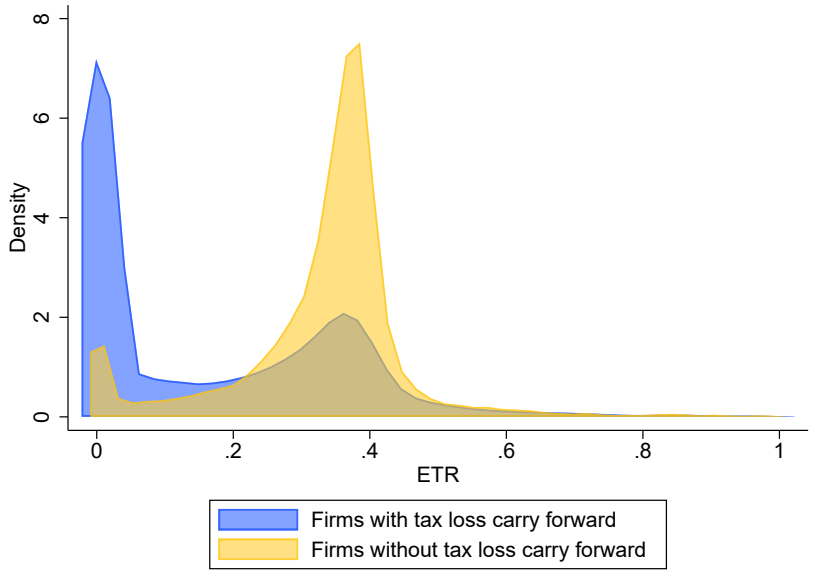
Notes: This table reports regression results obtained with ordinary least squares. The dependent variable is the industry-year average of ETR in column (1), that of $ETR2$ in column (2), that of $CASHETR$ in column (3), and that of CFM in column (4). The independent variable IMP_{jt} is the industry-year penetration ratio of US imports from China. Firm-year observations are set as missing when the tax avoidance variable lies outside the [0,1] interval. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

FIGURE OAF2 – Distribution of effective tax rates



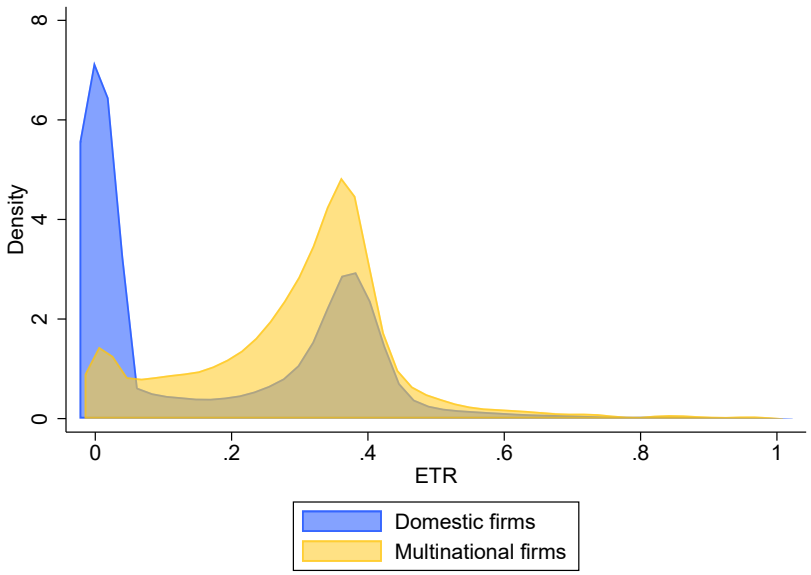
Notes: This graph plots the distribution of effective tax rates. Firm-year observations with an effective tax rate outside the [0,1] interval are omitted.

FIGURE OAF3 – Distribution of effective tax rates: firms with and without tax loss carry forward



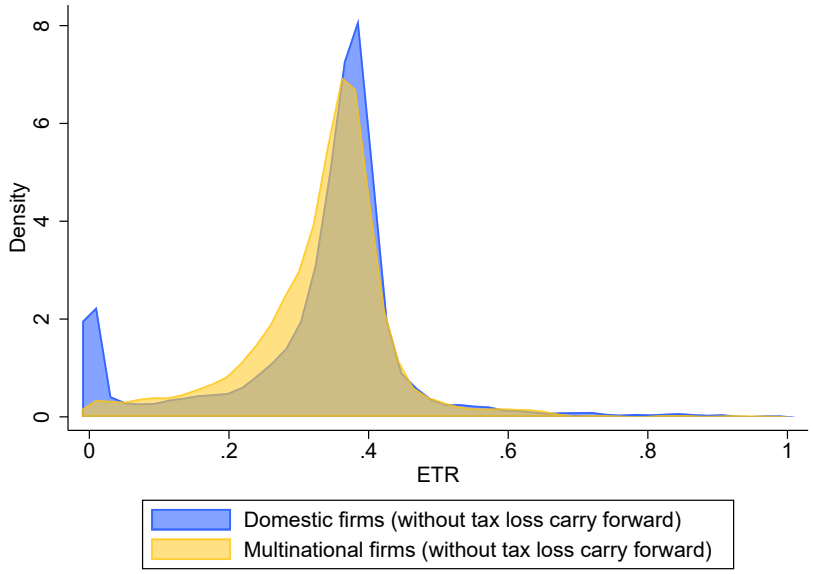
Notes: This graph plots the distribution of effective tax rates. Firm-year observations with an effective tax rate outside the [0,1] interval are omitted.

FIGURE OAF4 – Distribution of effective tax rates: domestic firms and MNEs



Notes: This plots depicts the distribution of effective tax rates. Firm-year observations with an effective tax rate outside the [0,1] interval are omitted.

FIGURE OAF5 – Distribution of effective tax rates: domestic firms and MNEs without tax loss carry forward



Notes: This graph plots the distribution of effective tax rates. Firm-year observations with an effective tax rate outside the [0,1] interval are omitted.

TABLE OAT3 – Import competition and corporate tax avoidance: macro-level regressions (bis)

Dependent variable	(1) $\widetilde{ETR}_t$	(2) $\widetilde{ETR2}_t$	(3) $\widetilde{CASHETR}_t$	(4) $\widetilde{CFM}_t$
$\overline{IMP}_t$	-1.13^b	-0.58	-0.72^d	0.88
	(0.41)	(0.48)	(0.43)	(0.62)
Controls	No	No	No	No
No. of obs.	16	16	16	16

Notes: This table reports regression results obtained with ordinary least squares. In column (1), the dependent variable $\widetilde{ETR}_t$ is obtained by regressing, for each year, the numerator (income taxes) on the denominator (pre-tax income) with ordinary least squares. This way, the dependent variable minimizes the sum of quadratic errors for each year and gets closer to the statutory tax rate. The dependent variables in columns (2), columns (3), and columns (4) are obtained analogously. In each of the 64 ($= 4 \times 16$) regressions run to compute the dependent variables, firm-year observations are set as missing when the tax avoidance variable lies outside the [0,1] interval. Standard errors are in parentheses. $^d p < 0.15$, $^c p < 0.10$, $^b p < 0.05$, $^a p < 0.01$. See section 3 for more details.

TABLE OAT4 – Chinese import competition and firm pre-tax income

Dependent variable	$pre\text{-}tax\ income_{ijt}$
IMP_{jt}	-341.52^{c}
	(174.67)
Controls	Yes
Firm FEs	Yes
Year FEs	Yes
No. of obs.	32,470

Notes: This table reports regression results obtained with ordinary least squares. The standard error, in parentheses, is clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 3 for more details.

TABLE OAT5 – Effect of import competition on corporate tax avoidance: inclusion of 2-digit SIC industry-year dummies

Dependent variable	(1) ETR_{ijt}	(2) $ETR2_{ijt}$	(3) $CASHETR_{ijt}$	(4) CFM_{ijt}
IMP_{jt}	-0.13^{a}	-0.05	-0.13^{a}	-0.19^{a}
	(0.04)	(0.06)	(0.05)	(0.06)
Controls	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
No. of obs.	23,097	22,286	16,688	16,584

Notes: This table complements Table 4 panel D since a set of 2-digit SIC industry-year dummies is now introduced. In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

TABLE OAT6 – Effect of import competition on corporate tax avoidance: the Mexican case

Dependent variable	(1) ETR_{ijt}	(2) $ETR2_{ijt}$	(3) $CASHETR_{ijt}$	(4) CFM_{ijt}
IMP_{jt}	-1.05^{c}	-0.55	-1.17^{d}	-1.50^{b}
	(0.58)	(0.52)	(0.72)	(0.75)
Controls	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
No. of obs.	20,728	20,728	15,329	15,187

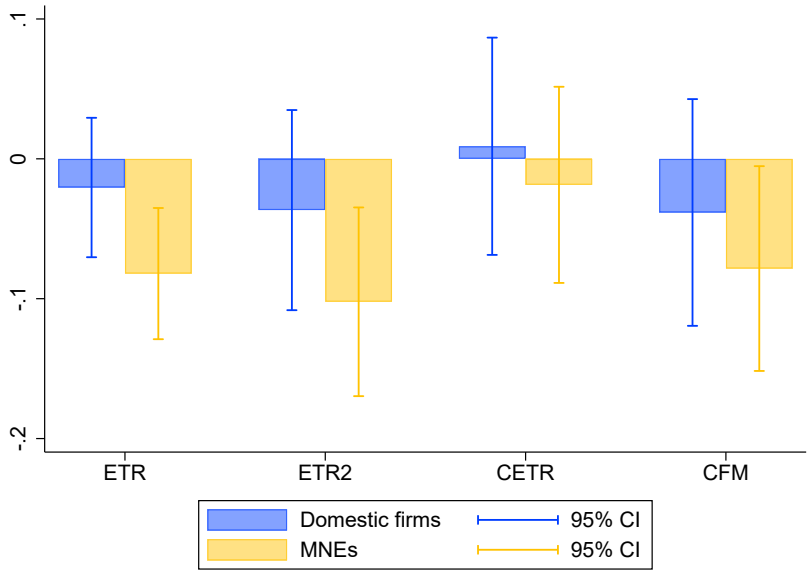
Notes: This table replicates Table 5 panel B using Mexican import competition instead of Chinese import competition. The results are obtained with 2SLS. The instrument is the average share of imports from Mexico in total imports among the same eight high-income countries. In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

TABLE OAT7 – Effect of import competition on corporate tax avoidance: $PNTR$ as an instrument

Dependent variable	(1) ETR_{ijt}	(2) $ETR2_{ijt}$	(3) $CASHETR_{ijt}$	(4) CFM_{ijt}
IMP_{jt}	-0.54^{a}	-0.79^{a}	-0.31	-0.74^{b}
	(0.21)	(0.29)	(0.29)	(0.37)
Controls	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
No. of obs.	22,715	22,286	16,286	16,157

Notes: This table supplements Table 5 panel C by using $PNTR$ as an instrument. The results are obtained with 2SLS. In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 4 for more details.

FIGURE OAF6 – Effect of import competition on corporate tax avoidance: domestic firms and MNEs



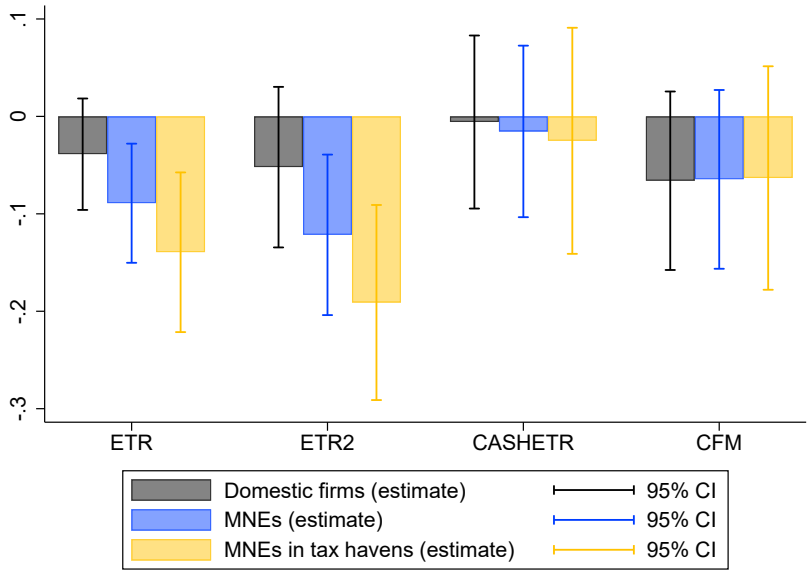
Notes: This graph plots the estimation results of equation (3) for the four tax avoidance variables. Standard errors are clustered at the 4-digit 1987 SIC industry. See section 5 for more details.

TABLE OAT8 – List of tax havens

Countries listed only in Hines and Rice (1994)	British Virgin Islands, Jordan, Maldives, Saint Martin, Channel Islands, UK Caribbean Islands
Countries listed only in Dyreng and Lindsey (2009)	Aruba, Costa Rica, Guernsey, Jersey, Malaysia, Mauritius, Nauru, Niue, Samoa, San Marino, Seychelles
Countries listed in both classifications	Andorra, Anguilla, Antigua, Bahamas, Bahrain, Barbados, Barbuda, Belize, Bermuda, Cayman Islands, Cook Islands, Cyprus, Dominica, Gibraltar, Grenada, Hong Kong, Ireland, Isle of Man, Lebanon, Liberia, Liechtenstein, Luxembourg, Macau, Malta, Marshall Islands, Monaco, Montserrat, Netherlands Antilles, Panama, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Singapore, Switzerland, Turks and Caicos Islands, Vanuatu

Notes: Combined, these two lists contain 52 tax havens. However, due to data limitations, Channel Islands and UK Caribbean Islands are omitted.

FIGURE OAF7 – Effect of import competition on corporate tax avoidance: domestic firms, MNEs, and tax havens



Notes: This graph plots the estimation results of an augmented version of equation (3) for the four tax avoidance variables. Standard errors are clustered at the 4-digit 1987 SIC industry. See section 5 for more details.

TABLE OAT9 – Effect of import competition on corporate tax avoidance: mechanism (distinction between MNEs with or without subsidiaries in tax havens)

Dependent variable	(1) ETR_{ijt}	(2) $intangibles_{ijt}$
$PNTR_{jt}$	-0.03	-131.14
	(0.03)	(280.63)
$PNTR_{jt} \times MNE_{ijt}$		228.10^{d}
		(138.39)
$PNTR_{jt} \times TAXHAVEN_{ijt}^{ext}$		534.21^{b}
		(264.30)
$intangibles_{ijt}$	2.21e-5^{a}	
	(7.49e-6)	
$intangibles_{ijt} \times MNE_{ijt}$	-2.52e-5^{a}	
	(7.98e-6)	
$intangibles_{ijt} \times TAXHAVEN_{ijt}^{ext}$	6.45e-07	
	(2.11e-06)	
Controls	Yes	Yes
Firm FEs	Yes	Yes
Year FEs	Yes	Yes
No. of obs.	20,758	24,481

Notes: This table reports regression results of an augmented version of equation (5) in column (1) and of an augmented version of equation (6) in column (2). In column (1), firm-year observations with a dependent variable outside the [0,1] interval are omitted. $TAXHAVEN_{ijt}^{ext}$ is a dummy equal to one if firm i discloses at least one subsidiary in a tax haven in year t. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

TABLE OAT10 – Effect of import competition on corporate tax avoidance: mechanism (extended definition of intangibles)

Dependent variable	(1) ETR_{ijt}	(2) ETR_{ijt}	(3) ETR_{ijt}	(4) ETR_{ijt}	(5) $intangibles2_{ijt}$
$PNTR_{jt}$	-0.06[b]	-0.02	-0.03	-0.03	1,279.28[c]
	(0.03)	(0.03)	(0.03)	.(0.03)	(748.32)
$PNTR_{jt} \times MNE_{ijt}$		-0.06[a]			2,352.42[a]
		(0.02)			(422.26)
$intangibles2_{ijt}$			-1.81e-6[b]	6.30e-6	
			(8.89e-7)	(4.76e-6)	
$intangibles2_{ijt} \times MNE_{ijt}$				-8.12e-6[c]	
				(4.65e-6)	
Controls	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
No. of obs.	24,162	24,162	20,758	20,758	24,481

Notes: This table reports regression results of equation (2) in column (1), equation (3) in column (2), equation (4) in column (3), equation (5) in column (4), and equation (6) in column (5). In all columns but column (5), firm-year observations with a dependent variable outside the [0,1] interval are omitted. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

TABLE OAT11 – Effect of import competition on corporate tax avoidance: mechanism (patents)

	(1)	(2)	(3)	(4)	(5)
Dependent variable	ETR_{ijt}	$patents_{ijt}$	$patents_{ijt}$	ETR_{ijt}	$log(1+patents_{ijt})$
$PNTR_{jt}$	-0.05^{c}	3.53	0.16	-0.05^{c}	-0.22
	(0.03)	(6.73)	(0.19)	(0.03)	(0.16)
$PNTR_{jt} \times MNE_{ijt}$		31.26^{c}	0.23^{c}		0.69^{a}
		(16.20)	(0.13)		(0.17)
$patents_{ijt}$	3.16e-4^{b}				
	(1.39e-4)				
$patents_{ijt} \times MNE_{ijt}$	-3.56e-4^{b}				
	(1.41e-4)				
$log(1+patents_{ijt})$				3.03e-3^{d}	
				(1.94e-3)	
$log(1+patents_{ijt}) \times MNE_{ijt}$				-5.40e-3^{b}	
				(2.40e-3)	
Controls	Yes	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
No. of obs.	24,162	28,443	18,917	24,162	28,443

Notes: This table replicates columns (4) and (5) in Table 6. In columns (1), (2), and (3), *patents* is in absolute value. The equations are estimated with OLS in columns (1) and (2) and a negative binomial regression in column (3). In columns (4) and (5), *patents* is augmented by one unit and in logarithm and the equations are estimated with OLS. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

TABLE OAT12 – Effect of import competition on corporate tax avoidance: mechanism (intangibles as a share of assets and in logarithm)

	(1)	(2)	(3)	(4)
Dependent variable	ETR_{ijt}	$intangibles_{ijt}$	ETR_{ijt}	$log(1+intangibles_{ijt})$
$PNTR_{jt}$	-0.03	0.02	-0.03	-1.02^{a}
	(0.03)	(0.03)	(0.03)	(0.33)
$PNTR_{jt} \times MNE_{ijt}$		0.04^{c}		1.92^{a}
		(0.02)		(0.32)
$intangibles_{ijt}$	0.04^{a}			
	(0.02)			
$intangibles_{ijt} \times MNE_{ijt}$	-0.06^{b}			
	(0.03)			
$log(1+intangibles_{ijt})$			0.01^{a}	
			(1.83e-3)	
$log(1+intangibles_{ijt}) \times MNE_{ijt}$			-0.01^{a}	
			(2.18e-3)	
Controls	Yes	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
No. of obs.	20,758	24,481	20,758	24,481

Notes: This table replicates columns (4) and (5) in Table 6. In columns (1) and (2), $intangibles$ is expressed as a share of total assets. In columns (3) and (4), $intangibles$ is in current million dollars and logarithm. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details.

TABLE OAT13 – Effect of import competition on corporate tax avoidance: mechanism (MNE activity measured with Exhibit 21 files)

Dependent variable	(1) ETR_{ijt}	(2) ETR_{ijt}	(3) $intangibles_{ijt}$
$PNTR_{jt}$	-0.04	-0.03	14.66
	(0.03)	(0.03)	(267.22)
$PNTR_{jt} \times MNE_{ijt}$	-0.05^{a}		412.28^{b}
	(0.02)		(200.47)
$intangibles_{ijt}$		-2.02e-6	
		(2.39e-6)	
$intangibles_{ijt} \times MNE_{ijt}$		-6.37e-7	
		(1.93e-6)	
Controls	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes
No. of obs.	24,162	20,758	24,481

Notes: This table replicates columns (2), (4), and (5) in Table 6. This time, the multinational activity dummy is defined using Exhibit 21 reports of Form 10-K. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$. See section 5 for more details and Dyreng and Lindsey (2009) and Dyreng, Hoopes, Langetieg, and Wilde (2020) for more details and discussions regarding Exhibit 21 files.