The indirect effect of import competition on corporate tax avoidance

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Abstract: The role played by competition in corporate tax avoidance is theoretically unclear in the existing literature. This paper empirically examines this, with a focus on import competition. I exploit financial statements to measure tax avoidance of US-listed firms and the conferral of the Permanent Normal Trade Relations status on China as a quasi-natural experiment to establish causality. The results, supported by a series of sensitivity tests, reveal a positive effect of import competition on corporate tax avoidance. Furthermore, they are entirely driven by multinational enterprises. In response to the China shock, these firms invested in intangible assets to escape competition but these intangibles also allowed them to shift more profits towards low-tax countries. 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 publicly listed firms and the recent 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

Income taxation distorts corporate decisions: to lighten this burden, firms adapt how they organize, operate, and invest (Devereux and Griffith, 1998; De Mooij and Ederveen, 2003; Buettner and Ruf, 2007; De Mooij and Nicodème, 2008; Kopczuk and Zwick, 2020). Some of them also avoid taxes, i.e., exploit technicalities of the law to reduce tax liability, and tax aggressiveness has now 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). It is acknowledged that MNEs dissociate their economic activities and profits. They artificially shift profits towards tax havens and other low-tax countries as to reduce their average 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. According to Clausing (2016), they might reach $100 billion annually for the US. [1] For these reasons, what influences profit shifting and more broadly corporate tax avoidance is of foremost interest for both researchers and policy makers.

To date, the effect of competition on corporate tax avoidance is still an unresolved question. Existing theories suggest that corporate tax avoidance could either increase or decrease as competition toughens (Marrelli and Martina, 1988; Goerke and Runkel, 2011). I attempt to give clarifications in this paper, and my methodology builds on two distinct lines of the literature. A strand of research in economics pioneered by Autor, Dorn, and Hanson (2013) explores the aftermath of the rapid surge of China's exports initiated in the 1990s, referred to as the China shock. Within 15 years, the average penetration ratio of US imports from China in manufacturing was multiplied by 6 and China jumped from the 8th position to become the largest supplier of manufactured products to the US. Apart from being a sizable competition shock, the other advantage of focusing on this particular episode lies in the possibility of using a quasi-natural experiment to identify the causal effect of Chinese import competition, namely the granting

1. See Crivelli, De Mooij, and Keen (2016), Cobham and Janskỳ (2018), Tørsløv, Wier, and Zucman (2018), and Laffitte, Parenti, Souillard, and Toubal (2020) for other quantification exercises.

of the Permanent Normal Trade Relations (PNTR) status by the US to China in 2000. In parallel, a stream of research in accounting works on the measurement of corporate tax avoidance.[2] As corporate tax avoidance cannot be perfectly gauged by nature – obviously, firms do not disclose the amount of taxes they avoid –, scholars try to infer and quantify it using balance sheets, income statements, and cash flows. On this basis, I construct four indicators of tax aggressiveness for publicly traded manufacturing firms headquartered in the US between 1990 and 2005: (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 this literature and lower values are associated with more tax avoidance. Moreover, altogether, they encompass many techniques of corporate tax avoidance as they account for conforming, non-conforming, permanent, and temporary strategies.

The paper begins with three facts. First, Chinese import competition and corporate tax avoidance exhibit a positive correlation. While the former continuously increased between 1990 and 2005, the aforementioned indicators of corporate tax avoidance fell throughout the period. Second, the China shock accentuated the slump in sales of domestic firms and slowed the increase in sales generated by MNEs. Third, sales, pre-tax income, and effective tax rates are positively correlated: the higher sales and pre-tax income, the higher effective tax rates. This link is worth noticing because it implies that a positive correlation between the change in Chinese import competition and the change in corporate tax avoidance variables could be purely mechanic. If the China shock negatively affected sales and pre-tax income growth and if we believe that corporate taxes are progressive, then a positive correlation between changes in import competition and tax avoidance variables might be spurious. It is essential to understand that these tax avoidance variables are imperfect in the sense that they reflect not only tax avoidance but more generally tax liability. Therefore, they can vary independently of tax avoidance strategies and it is crucial to control for typical determinants of tax liability (e.g.,

2. See, for instance, Frank, Lynch, and Rego (2009), Hanlon and Heitzman (2010), Henry and Sansing (2018), Badertscher, Katz, Rego, and Wilson (2019), and De Simone, Nickerson, Seidman, and Stomberg (2019).

tax loss carry forward).

These observations naturally raise the question: did Chinese import competition really drive corporate tax avoidance upward ? To respond to this question, I first regress each of the four tax avoidance variables on the penetration ratio of US imports from China in the output market, 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 0.20 percentage point decrease in the effective tax rate, a 0.18 percentage point decrease in the ratio of non-deferred income taxes to pre-tax income, a 0.18 percentage point decrease in the ratio of cash income taxes paid to pre-tax income, and a 0.26 percentage point decrease in the ratio of cash income taxes paid to operating cash flows. These results are statistically highly significant and corroborated by a battery of robustness checks. They are consistent when I remove potential outliers, adopt different econometric models, and perform falsification tests. 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 the import competition variable and repeating the analysis with Mexican import competition yield analogous findings. Perhaps more notably, I draw the same conclusions by integrating the US conferral of the PNTR status on China in October 2000 in a difference-in-differences (DiD) exercise. The motive for the latter approach is five-fold. (i) The granting was unanticipated. (ii) Handley and Limão (2017) estimate that this event alone is responsible for one third of the boom of China's exports to the US between 2000 and 2005. (iii) The shock differentially exposed sectors to Chinese import competition. (iv) This exposure mostly depended on non-normal-trade-relations tariff rates, set seventy years ealier in 1930, so the treatment is plausibly exogenous (Pierce and Schott, 2016). (v) There are no pre-existing trends: differences in effective tax rates prior to the conferral are unrelated to the treatment.

To gain insights into this, I proceed in two steps. As a first step, I allow for heterogeneous effects and distinguish between MNEs and domestic firms. The former have in theory more possibilities to dodge taxes because they can shift profits from their affiliates implanted in high-tax countries to those located in low-tax jurisdictions. As

expected, I note that the average effect is indeed totally driven by MNEs and thereby reminiscent of profit shifting. As a second step, I investigate how MNEs shifted more profits in reaction to the China shock. Heckemeyer and Overesch (2017) place intra-firm royalty payments as a prominent profit shifting technique and 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 from industry leaders. Drawing on these papers, I examine whether import competition fosters profit shifting indirectly through intangible assets and I provide strong evidence going in this direction. (i) The effect of Chinese import competition on tax avoidance becomes statistically insignificant when I control for intangible assets, suggesting that Chinese import competition has no direct impact on tax avoidance conditional on intangibles. (ii) Intangible assets reduce corporate income taxes of MNEs exclusively and not that of domestic firms – yet 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. (iv) Also, I find that MNEs operating in the most import-competitive sectors did not expand their network of subsidiaries in tax havens and that sales of firms that were intensive in intangibles suffered from the China shock to a lesser extent. All in all, these results mean that the China shock pushed MNEs to invest in intangible assets in order to escape competition in the first place, but these assets facilitated their income shifting activities too in the meantime. In a way, the rise in tax avoidance seems to be a side effect of import competition.

These findings are novel as they reveal a positive effect of import competition on corporate tax avoidance and profit shifting. They carry important policy implications as well. They help understand the decline in the average effective tax rate of US-listed firms (Dyreng, Hanlon, Maydew, and Thornock, 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 helps understand the recent backlash against large corporations and globalization (Helpman, 2017; Ravallion, 2018; Rodrik, 2018) and emphasizes that import competition and corporate taxes are closely connected. From this perspective,

the paper reaffirms the need to pursue trade and fiscal policies jointly and suggests that governments could devote more resources auditing MNEs in highly competitive sectors to curb profit shifting.

Related literature This paper lies at the intersection of two separate lines of research.

On the one hand, a stream of the literature studies corporate tax avoidance. 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), locating strategically 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). Beyond tax rates, corporate tax avoidance has been associated with a wide array of factors. 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 the literature by certifying that competition plays a role too and my counterfactual estimates imply that its role is significant. In addition, it unveils a channel whereby competition nurtures tax avoidance: through intangible assets. [3]

On the other hand, an area of research addresses the consequences of the boom of China's exports in the early 2000s. While the first wave of papers on this essentially concentrates on 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), more and more papers now focus on the impact of this competition shock

3. Four papers tackle the effect of competition on corporate tax evasion (Marrelli and Martina, 1988; Cai and Liu, 2009; Goerke and Runkel, 2011; Gokalp, Lee, and Peng, 2017), but tax avoidance differs from tax evasion insofar as the latter is certainly illegal. Thus, the strategies that are adopted and the companies that are involved are not the same in both cases. Small and medium-sized enterprises are more prone to evade taxes because they have limited knowledge of tax systems (Jones, Temouri, and Cobham, 2018), they have a lower probability to be 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). In the present paper, the accent is placed on tax avoidance, large corporations, and import competition.

on firm product scope and 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 Stumpner, 2019; Amiti, Dai, Feenstra, and Romalis, 2020). In this regard, my work shows that the China shock also exacerbated corporate tax avoidance and more specifically profit shifting of MNEs.

The article is organized as follows. Section 2 introduces the data. Then, section 3 lays out three stylized facts, mainly correlations, and section 4 establishes causality. Lastly, section 5 casts light on the mechanism and section 6 concludes.

2 Data

To conduct the analysis, I construct an unbalanced panel dataset of public manufacturing firms headquartered in the US and 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 borrowed from Compustat North America and the latter come from the NBER-CES Manufacturing Industry Database and Schott (2008).

Compustat North America gives rich information on balance sheets (assets, liabilities, and equity), income statements (revenues, costs, and expenses), and cash flows of companies publicly held in North America since 1950. Therefore, it includes the largest firms located in the US. Albeit being very 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), and only such companies are able to recruit the tax experts and consultants necessary to avoid taxes.

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 values of ETR, $ETR2$, $CASHETR$, and CFM are associated with more tax avoidance and 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 the International Financial Reporting Standards (IFRS)) generally differ from tax rules. This is why income 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 see whether the latter might be manipulated.

Taken together, these four proxies have three advantages. First of all, they have an intuitive interpretation. ETR being the simplest, it will be the preferred variable in the rest of the paper. Then, these indicators are the most frequent in the accounting literature. [4] Last but not least, they cover conforming, non-conforming, permanent, and temporary tax avoidance strategies. [5] Accordingly, they give an overall snapshot of corporate tax avoidance. Table 1 confirms this complementarity and shows that they absorb a mix of common and uncommon features of corporate tax avoidance at the

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 makes ETR, $ETR2$, $CASHETR$, and CFM even more relevant. Plus, although firms with negative profits are almost systematically removed in the accounting literature and this omission could bias the results (Henry and Sansing, 2018), these firms are not excluded in the rest of the 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 the one that is expected based on the book pre-tax income and the statutory tax rate. On the opposite, conforming tax avoidance impacts taxable and financial income. ETR, for example, cannot capture the tax benefits of interest deductibility – since it reduces taxable income and financial income – and more broadly conforming tax avoidance.

TABLE 1 – Correlation between tax avoidance variables (within firms)

	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). See section 2 for more details on the construction of these variables. 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.

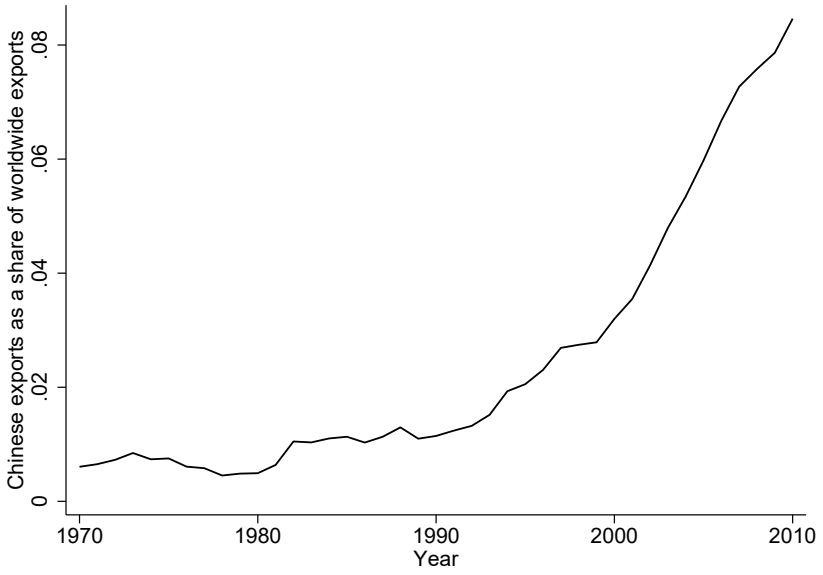
same time. Nevertheless, one caveat is that they can vary regardless of tax dodging strategies. To identify the effect of import competition on aggressive tax planning, I will control for factors determining tax liability in the econometric exercise.

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, investments, capital stocks, TFP, and price indexes 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 computing the penetration ratio of US imports from China IMP, i.e., the ratio of US imports from China to total US domestic demand, for each industry j and year t:

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

$Imports_{jt}^{\text{China,US}}$ is US imports from China in industry j and year t, $Imports_{jt}^{\text{World,US}}$ is total US imports in industry j and year t, $Exports_{jt}^{\text{US,World}}$ is total US exports in industry j and year t, and $Shipments_{jt}^{\text{US}}$ is US production in industry j and year t. The ratio varies over time (see next section) and across industries, even among very 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 that for softwood veneer and plywood products (SIC 2436)

FIGURE 1 – Exports from China between 1970 and 2010



Notes. This figure depicts the ratio of exports from China to worldwide exports between 1970 and 2010. The data used to construct it originate from the World Bank.

was forty times smaller. Owing to data limitations, I will consider that firms mainly operating in the same industry j are equally exposed to Chinese import competition, i.e., $IMP_{ijt} = IMP_{jt}$ for all i. In this regard, firms' main industry does not change over time in Compustat.

2.2 Sample

Only a subsample of the dataset described above is used for the study. I remove companies whose headquarters are not located in the US for comparability. Also, I drop observations before 1990 as the 1990s mark the onset of the boom of Chinese exports. As illustrated in figure 1, the share of Chinese exports in total world exports grew from 0.6 percent to 1.1 percent between 1970 and 1990 and then rapidly rose to reach 8 percent in 2010. Besides, we will see in section 4 that this 1990-2005 period is convenient to exploit the granting of the Permanent Normal Trade Relations status by the US to China in 2000 as a quasi-natural experiment. Finally, I retain manufacturing firms exclusively since manufacturing products represented a major part of Chinese exports

in that period and there is 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 4-digit 1987 SIC industries between 1990 and 2005, 1,087 of which operated over the entire time span. Summary statistics are provided in appendix A table AT2.

3 First evidence on import competition and corporate tax avoidance

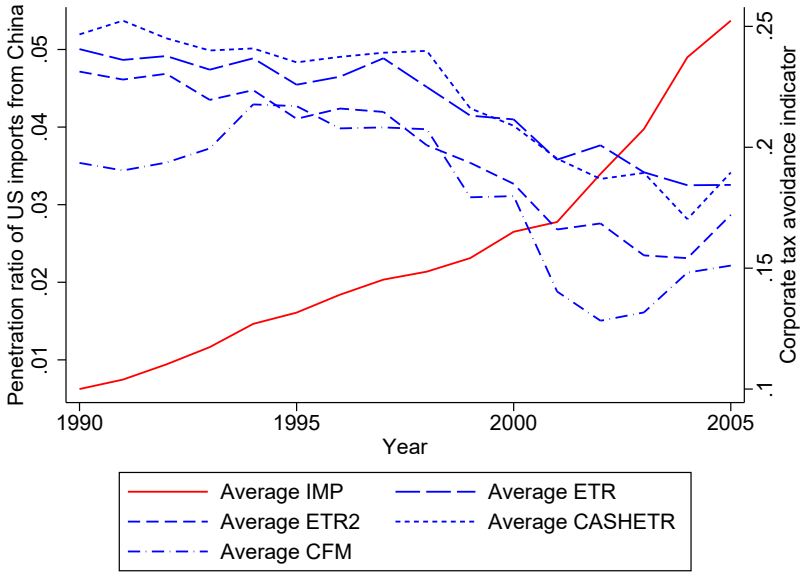
The dataset enables to uncover three facts: (i) Chinese import competition and corporate tax avoidance variables are positively correlated, (ii) Chinese import competition reinforced the decline in sales among domestic firms and tempered the increase in sales among MNEs, and (iii) effective tax rates 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. 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 observations. A 1 percentage point increase in the average import penetration ratio is associated with a 1.36 percentage points decrease in the average ETR, a 1.79 percentage points decrease in the average $ETR2$, a 1.47

6. The second argument justifies the non-use of services as a comparison group in this paper.
7. In the online appendix table OAF1, I reproduce figure 2 using the penetration ratio of US imports from all foreign countries.

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



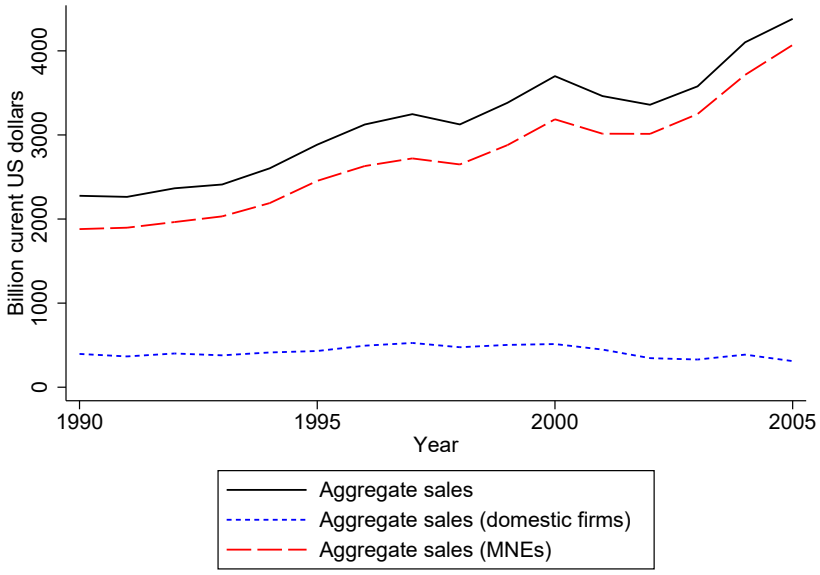
Notes. This figure depicts the average penetration ratio of US imports from China (left y-axis) and the mean value of each of the four corporate tax avoidance variables (right y-axis) between 1990 and 2005. For the latter, firm-year observations are set to missing when the tax avoidance variable lies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

percentage points decrease in the average $CASHETR$, and a 1.40 percentage points decrease in the average CFM. The correlation even 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. In the online appendix, I show this distribution in figure OAF2 [8] and I show in table OAT3 that the negative correlation remains when I calculate for each year and tax avoidance variable a value that partially corrects this bias. I will come back on the volatility issue in the econometric analysis.

Stylized fact 2: Chinese import competition curtailed sales growth. In particular, it

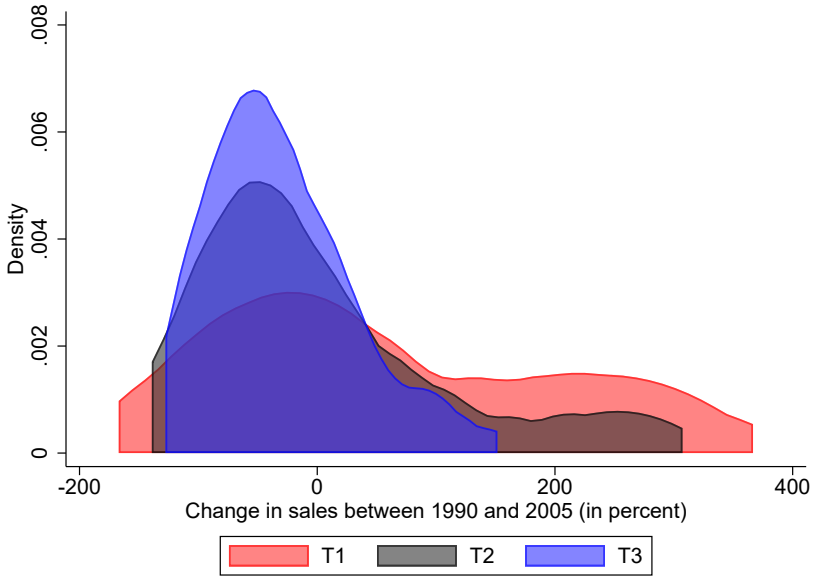
8. The left peak disappears when firm-year observations with a tax loss carry forward are dropped (see the online appendix figure OAF3). Apropos of that, figures OAF4 and OAF5 suggest that tax loss carry forwards of domestic firms partly explain the discrepancy between the ETR of domestic firms and that 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 and MNEs' ETR.

FIGURE 3 – Aggregate sales



Notes. This figure depicts aggregate sales of companies included in the sample between 1990 and 2005.

FIGURE 4 – Chinese import competition and sales of domestic enterprises



Notes. This figure depicts the distribution of sales growth 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 the most affected by rising Chinese import competition.

TABLE 2 – Chinese import competition and firm sales

	$sales_{ijt}$
IMP_{jt}	-2,712.80
	(2,141.90)
Controls	Yes
Firm FEs	Yes
Year FEs	Yes
Nb. of obs.	33,297

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

deepened the slump in sales of domestic firms and dampened the increase in sales of MNEs.

Figure 3 brings sales into the picture and reveals that they remarkably doubled in the meantime, despite growing Chinese import competition. Nonetheless, the increase in total sales is primarily fuelled by the increase in MNEs' sales. Sales of domestics firms, 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 in 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 a negative impact of the China shock on sales. [9] The same applies to pre-tax income (see 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 firms' sales at the sector level. Sectors are divided into three groups of equivalent size based on the exposure to the rising Chinese import competition. Growth rates are concentrated around -50 percent for the third tercile, composed of the most exposed sectors to rising Chinese import competition (transportation equipment, industrial

9. Note that the negative impact holds for both domestic and multinational enterprises. When added, 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.

machinery and equipment, electronic and other electric equipment). The distribution is flatter and shifts to the right for the second tercile, and even more for the first tercile.

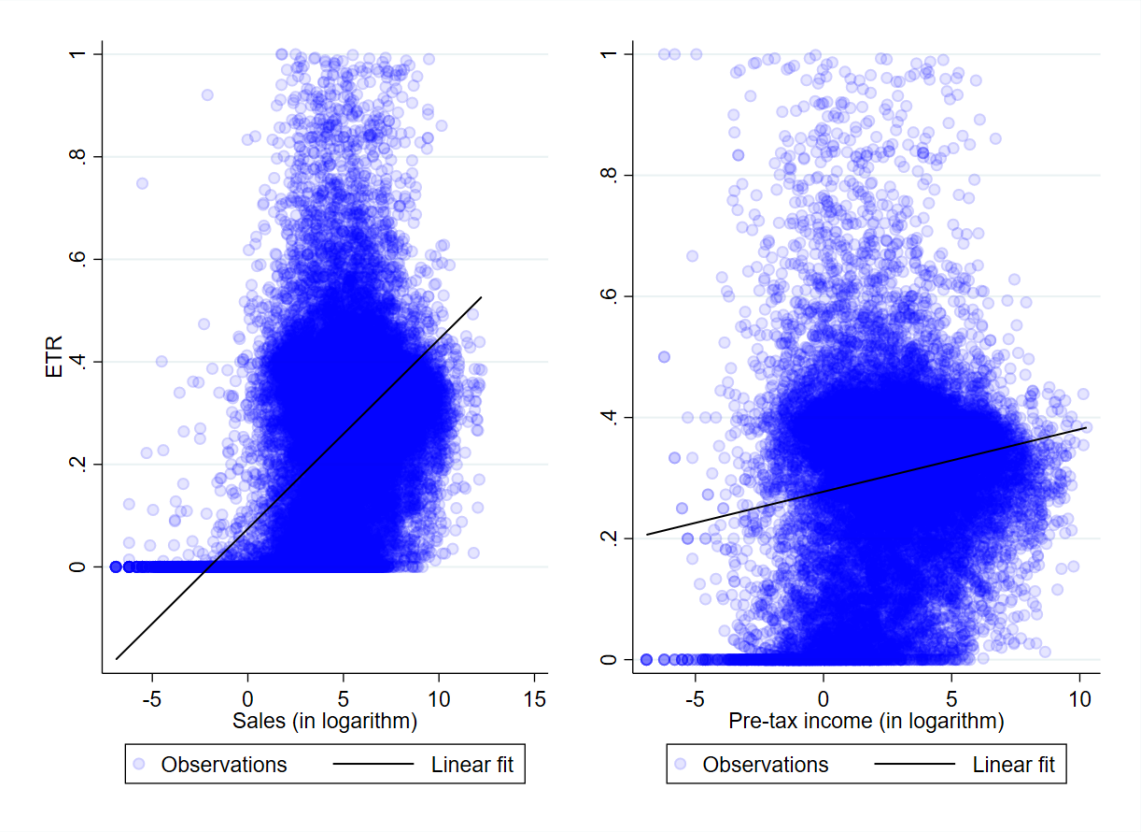
Stylized fact 3: Effective tax rates and sales/pre-tax income are positively correlated.

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 ten percentage points increase in sales translates into a 0.37 percentage point increase in the effective tax rate, and the one in the second graph indicates that a ten percentage points increase in pre-tax income translates into a 0.10 percentage point increase in the effective tax rate. This pattern is worth noting because it 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 next 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 confounding variables. Besides, we will see that Chinese import competition actually decreased the effective tax rate of MNEs only, 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.

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



Notes. The subfigure on the left depicts firm sales (in logarithm) on the x-axis and ETR on the y-axis, while the subfigure on the right depicts firm pre-tax income (in logarithm) on the x-axis and ETR on the y-axis. Firm-year observations are set to missing when the effective tax rate lies outside the [0,1] interval. See section 3 for more details. 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.

4.1 Baseline estimates and counterfactual analysis

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

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

CTA_{ijt} is the corporate tax avoidance variable for firm i mainly operating in industry j in year t, and recall from section 2 that IMP_{jt} represents the exposure to Chinese

import competition. X_{ijt} is a vector of covariates. It includes firms' characteristics varying over time that could determine tax liability and 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 v_t in order to absorb time-trends – without imposing any structure – and year-specific unobservables like macroeconomic shocks. Below, I will focus on the coefficient of interest β_1 and solely report $\hat{\beta}_1$ in the regression tables for the sake of clarity.

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 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 quite 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.

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. They thus have a higher bargaining power and can extract more tax deductions. The multinational operation, sales, pre-tax income, and assets variables and the firm-level fixed effects should capture this. They should also capture most of changes in the tax avoidance variables ascribable to changes in the distribution of worldwide activity across countries.

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)
	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
Nb. of obs.	27,607	23,097	26,477	22,286	18,995	16,688	19,581	16,584

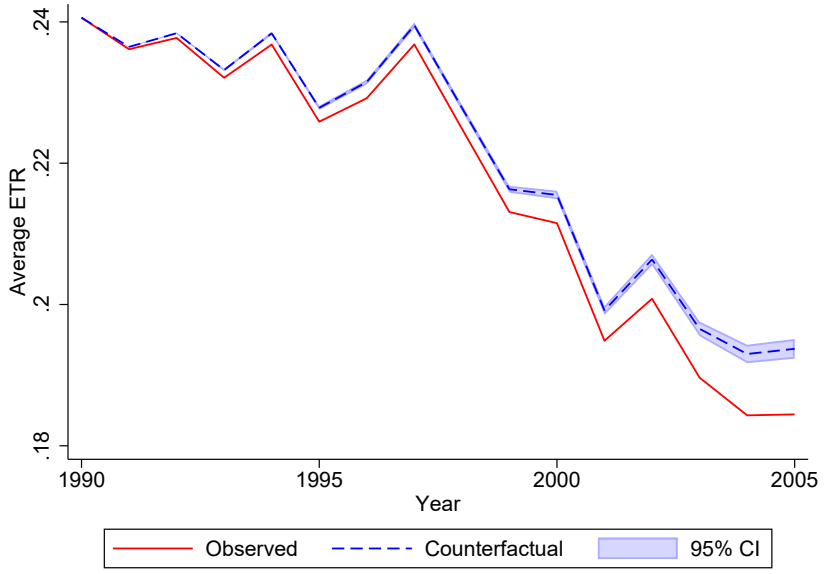
Notes. This table reports regression results of equation (1) obtained with ordinary least squares. The dependent variable is ETR in columns (1) and (2), $ETR2$ in columns (3) and (4), $CASHETR$ in columns (5) and (6), and CFM in columns (7) and (8). In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. See section 4 for more details. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^d p < 0.15$, $^c p < 0.10$, $^b p < 0.05$, $^a p < 0.01$.

To have a better grasp of the amplitude of the effect, we can ask the following question: what would be the average effective tax rate in the absence of rising Chinese import competition ? To answer it, 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, as defined below:

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

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 point higher in 2005 if the penetration ratio of US imports from China had been constant over the period. Put otherwise, 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.

FIGURE 6 – Observed and counterfactual average effective tax rates



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

4.2 Robustness

I gauge 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.

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 by dropping firm-year observations 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

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 buy-out, etc. M&A transactions are the major cause of exits and how Compustat treats the survivor depends on the method of acquisition.

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

	(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. The dependent variable is ETR in column (1), $ETR2$ in column (2), $CASHETR$ in column (3), and CFM in column (4). In each regression, firm-year observations with a dependent variable outside the [0,1] interval are omitted. See section 4 for more details. Standard errors are clustered at the 4-digit 1987 SIC industry and not reported for space. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

those in table 3, both in terms of magnitude and significance. The coefficients double in panel A1, meaning that the estimates in table 3 could eventually downplay the role of import competition.

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 and 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 compe-

tition 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 re-run this regression with one more independent variable measuring sales of US MNEs in China from the US Direct Investment Abroad (USDIA) database of the BEA to further deal with the widening of opportunities for American firms. This equation is estimated separately from panel B1 because these data are available only from 1999 onward. By the same token, 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 period. They neutralize the effect of the check-the-box regulations enacted in 1997, accused by specialists to have facilitated tax avoidance of MNEs 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 in 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 things. 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 towards zero because the competition variable is less precise but they remain statistically significant however. 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 is that, as mentioned in section 3, 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 to compute 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). That being said, 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 but 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 given in table 3.

4.3 Endogeneity

So far, the right-hand side variables have been treated as exogenous in equation (1). Yet, there are at least three arguments why they may be endogenous.

Two concerns pertain to reverse causality and the "bad controls" problem discussed in Angrist and Pischke (2009). Firm-specific control variables X_{ijt} could be affected by tax aggressiveness and/or could be the outcomes of Chinese import competition. In these two situations, the coefficient of interest would be biased. To mitigate this, I reproduce

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).

in table 5 panel A the results of table 3 when all variables in X have pre-determined 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 could be biased in table 3 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 critical values of Stock and Yogo (2005). Panel B2 presents 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 high-income countries as an instrument. Mexico is another good candidate insofar as the average penetration ratio of US imports from Mexico in manufacturing increased three-fold between 1990 and 2005. The results are attached in the online appendix table OAT6 and qualitatively unchanged. Coming back 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 in that period comes from the supply-side – thanks to the progressive dismantling of state-owned companies, the gradual removal of barriers to foreign investments and later on the 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

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

	(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. The dependent variable is ETR in column (1), $ETR2$ in column (2), $CASHETR$ in column (3), and CFM in column (4). 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. See section 4 for more details. Standard errors are clustered at the 4-digit 1987 SIC industry and not reported for space. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

for MNEs, for which the median ratio of foreign profits to worldwide profits is 17 percent.

To overcome these limitations, an alternative strategy consists in exploiting a quasi-natural experiment: the US conferral of the Permanent Normal Trade Relations 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. Nonetheless, 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 being a non-market economy. All the same, 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 of the House of Representatives were against the renewal. Public opinion seemed against as well. Gallup polls found 13 percent of Americans expressing a very or mostly unfavorable view of China months before the Tiananmen incidents, and this share then suddenly increased and stayed above 50 percent througout the 1990s. [15] Other surveys told that public opinion wanted the US to put pressure on China and disapproved 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 the PNTR status after an unanticipated and five-month process played a key role in the boom of 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 in Chinese goods in 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 just before the reform in 1999, retrieved from Pierce and Schott (2016). Then, 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, 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 that in 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 stay globally negative and statistically significant. [17] They are significant at lower levels though, and

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

16. Greenland, Ion, Lopresti, and Schott (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.

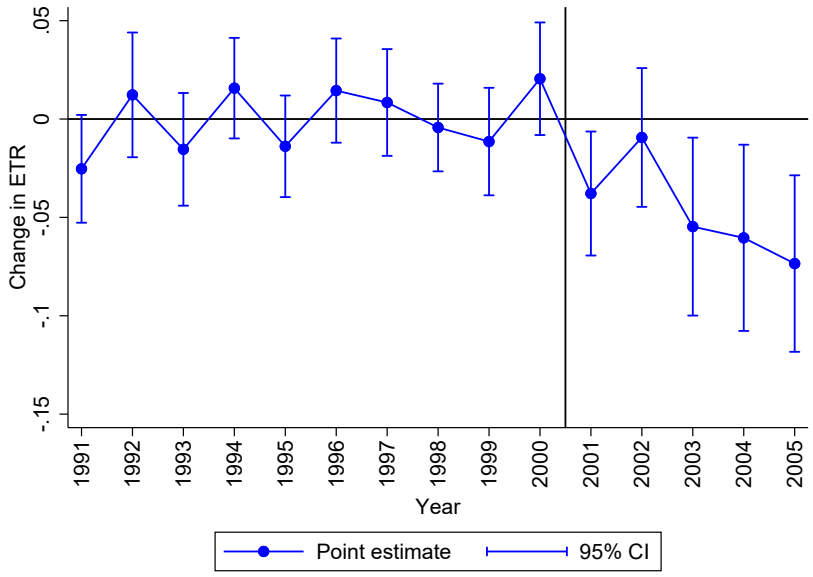
17. In the same spirit of table 5 panel B, using $PNTR$ as an instrument in 2SLS regressions delivers the same conclusions qualitatively speaking (see the online apprendix table OAT7).

three reasons can be put forward: (i) the DiD approach automatically and drastically reduces variation in the treatment, (ii) the shock explains only a part of the boom of China's exports, and (iii) as we will see in the next section, the effect is driven by a group of firms. In figure 7, I prove that the evolution of the effective tax rate prior to 2001 is unrelated to the tariff gap. It 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 exact same year of the treatment, i.e., 2001. Besides, an 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). The fact that some of these weights can be negative and that the ATEs could be heterogeneous across firms or periods is thus a source of concern: the coefficient of interest could be negative even though all ATEs are in fact 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. All in all, 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 actually specific to MNEs. 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 finally demonstrate that MNEs did not enlarge their network of subsidiaries in tax havens and that intangibles tempered the negative impact of the shock on sales. These observations suggest that investments in intangibles of MNEs aimed at escaping competition rather than saving taxes in the first place. In a way, the effect of import competition on profit shifting is thus indirect.

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



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

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 and MNEs. The latter have potentially more possibilities to avoid taxes because they can artificially shift profits towards low-tax jurisdictions, unlike pure domestic firms. Plus, an interesting 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

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

(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 one 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 driven by MNEs and reminiscent of profit shifting. [19]

5.2 The role of intangible assets

The following question emerges: how did MNEs accentuate their shifting activities ? The literature emphasizes three major profit shifting methods. First, they 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, multinational enterprises might want to locate intellectual property rights in tax-friendly jurisdictions and make affiliates located 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.

A possibility 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 on the effective tax rate conditional on the stock of intangible assets, or at least a smaller effect. I test this hypothesis by adding intangible assets into

19. In untabulated results, I find that the average effect is driven by MNEs from all states, not only by (multinational) firms incorporated in Delaware. Even though 60 percent of firms in the sample are incorporated in Delaware, the proportion of MNEs in this state is similar to the one observed in the other states. This guarantees a proper estimation of Delaware- and Delaware-MNEs-specific effects. More details are available upon request.

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

	(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
Nb. 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 but column (5), firm-year observations with a dependent variable outside the [0,1] interval are omitted. See section 5 for more details. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

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 can be seen 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.[20] 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 this, I study the impact of Chinese import competition on intangible

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

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 hit domestic and MNEs differently. The point estimates reveal that the competition shock had little incidence on domestic firms' intangible assets. On the opposite, the China shock had a positive and significant impact on intangible assets of MNEs.

These observations concur with preceding contributions. 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 interesting question is whether intangibles reduce income taxes paid by MNEs thanks to credits and deductions offered by governments or by facilitating profit shifting. In this regard, the estimation results of equation (5) speak in favor of the second proposition. The fact that intangible assets lower the effective tax rate of MNEs alone and not the one of domestic enterprises, yet eligible for to these tax breaks, directly echoes the profit shifting literature.

5.3 Robustness

In table OAT8, 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 identify precisely (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. [21] Hence, I replicate the results obtained in table 6 with a more comprehensive proxy of intangible assets denoted $intangibles2_{ijt}$ and 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 are presented in table OAT8 and align with the previous ones in all respects.

Symmetrically, instead of expanding the definition of intangibles, I narrow the definition of intangibles and focus on patents in table OAT9. For this purpose, 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, assignee location, patent type, patent number, granting and application dates, etc. It covers the period 1976-2006 and can be matched to Compustat North America data. Accordingly, I use this information to replace the variable $intangibles_{ijt}$ by another one, $patents_{ijt}$, indicating for each year the number of patents each firm has been granted. The results, to be found in the online appendix table OAT9, go in the same direction and thus further strengthen the findings in section 5.2.

Lastly, in the online appendix table OAT10, 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 OAT11, I show that the findings are equivalent when the multinational activity variable is constructed using the Exhibit 21 reports of Form 10-K that US-listed firms are required to fill every year by the Securities and Exchange Commission (SEC, see below).

21. Note that in the Compustat data, 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 one?

	(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
Nb. 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. See section 5 for more details. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

5.4 A side effect

Expenditures in intangibles of MNEs increased after the China shock, which resulted in more profit shifting. One question remains: were these intangibles used for tax purposes in the first place? Table 7 provides some hints about this. In columns (1) and (2), I explore whether firms expanded in tax havens. US-listed firms disclose each year a list of their "significant" subsidiaries in Exhibit 21 of Form 10-K, in accordance with the rules of the SEC. A subsidiary is "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 affiliate, the latter represents least 10 percent of assets (or revenues). Put otherwise, 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. The database of Dyreng and Lindsey (2009) summarizes this information starting from 1993. On this basis, I track for each firm foreign direct investments in tax havens and regress the equations:

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

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

$TAXHAVEN_{ijt}^{ext}$ is a binary variable equal to one if firm i mainly 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. 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 table OAT12 in the online appendix). The results indicate that rising Chinese import competition did not intensify firms' presence in tax havens, neither at the extensive margin (column (1)) nor at the intensive margin (column (2)). One could have expected the reverse if intangibles were mainly used for tax reasons. Moreover, column (3) extends table 2 and shows that the negative impact of the China shock on firms' sales is mitigated by intangible assets. These findings suggest that the positive effect of import competition on profit shifting is truly indirect, in the sense that the primary objective of 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. In this paper, I empirically examine this with a focus on import competition. Utilizing a rich set of firm- and sector-level data, I study the boom of China's exports in the 1990s-2000s on tax aggressiveness of the largest US firms. The results point to a positive and significant effect of import competition on corporate tax avoidance. Other things held constant, the baseline results 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. They are robust across specifications and validated by falsification tests, an instrumental variable approach, and an event study. Moreover, they are specific to MNEs. I provide evidence that these corporations invested in intangible assets in response to the China shock, principally to alleviate losses in sales, and that these assets facilitated 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. They carry important implications too. For example, because they reveal a close relationship between competition, trade,

and corporate income taxes, they 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 (see for instance 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).

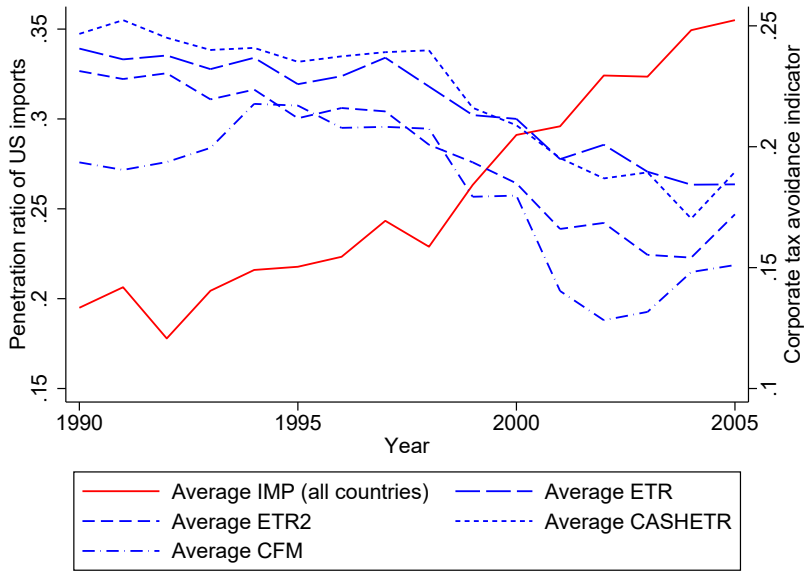
TABLE AT2 – Summary statistics

	P25	P50	Mean	P75	Std deviation	Nb. 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
$pre\text{-}tax\ income_t$	-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 on the Compustat firm-specific variables used in this paper. P25 refers to the first quartile, P50 to the median, and P75 to the third quartile. Monetary values are in current million US dollars. *Firm-year observations are set to 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 depicts 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 to missing when the tax avoidance variable lies outside the [0,1] interval.

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

	(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
Nb. of obs.	16	16	16	16

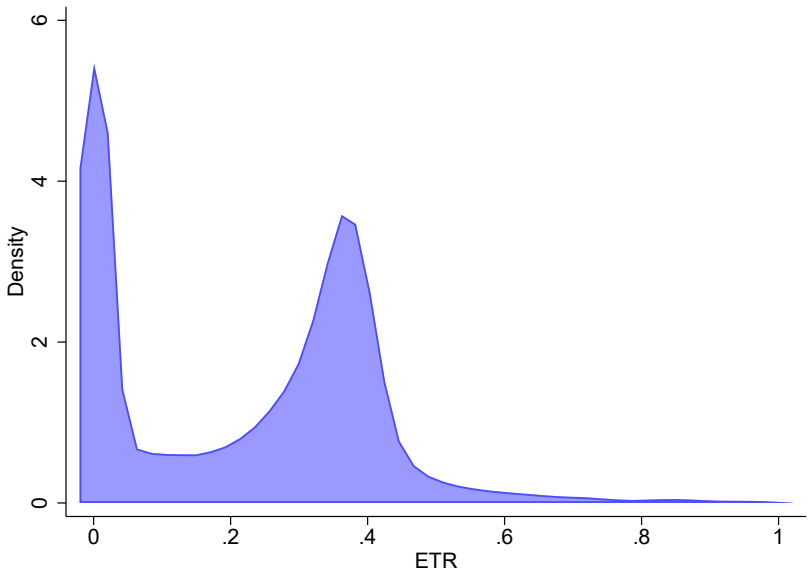
Notes. This table reports regression results obtained with ordinary least squares. The dependent variable is the year average of ETR in column (1), that of $ETR2$ in column (2), that of $CASHETR$ in column (3), and that of CFM in column (4). The independent variable $\overline{IMP}_t$ is the year average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

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

	(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
Nb. of obs.	1,785	1,771	1,783	1,783

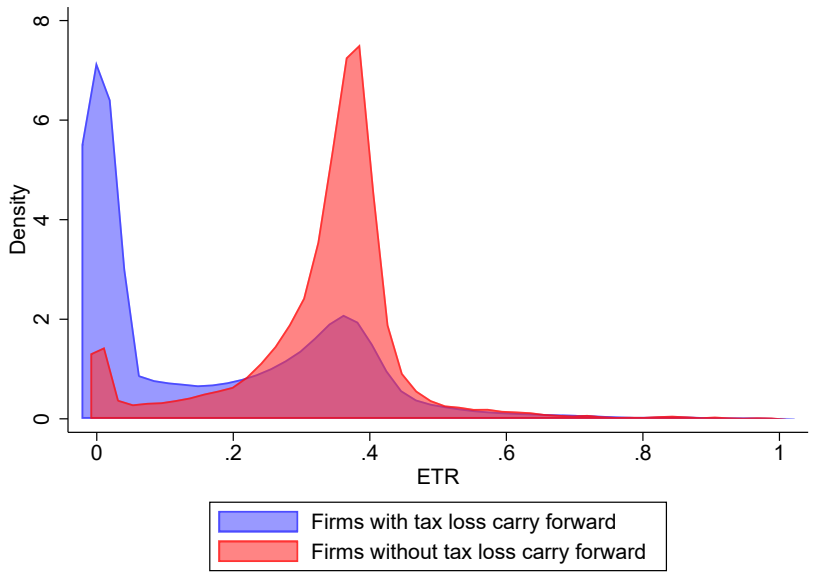
Notes. This table reports regression results obtained with ordinary least squares. The dependent variable is the industry-year average of ETR in column (1), that of $ETR2$ in column (2), that of $CASHETR$ in column (3), and that of CFM in column (4). The independent variable IMP_{jt} is the industry-year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

FIGURE OAF2 – Distribution of effective tax rates



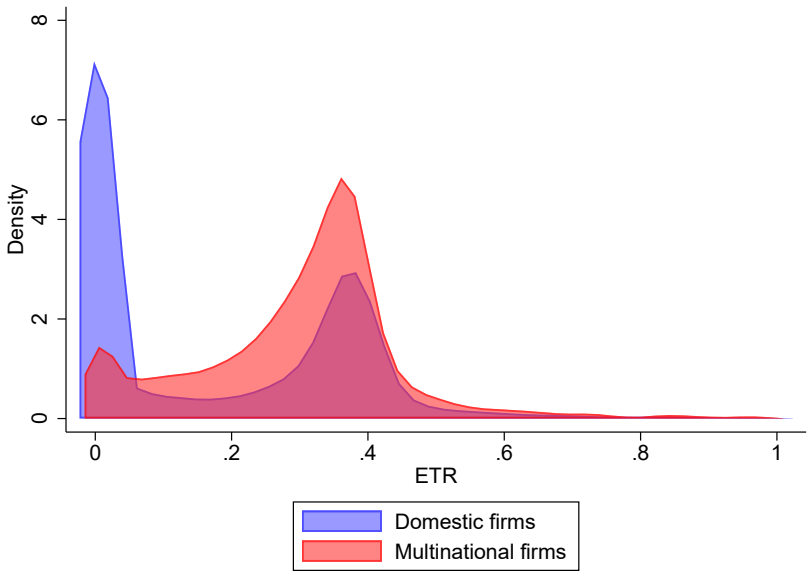
Notes. This graph depicts the distribution of effective tax rates. Firm-year observations with an effective tax rate outside the [0,1] interval are omitted.

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



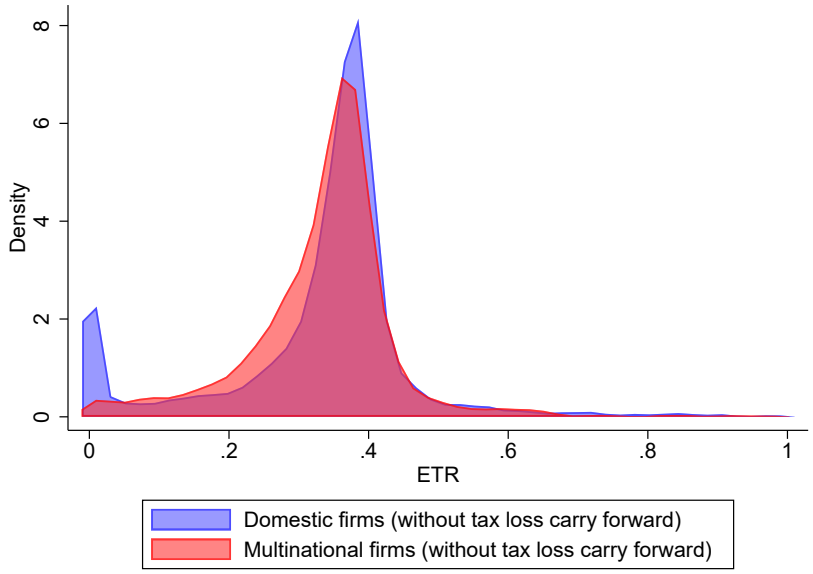
Notes. This graph depicts the distribution of effective tax rates. Firm-year observations with an effective tax rate outside the [0,1] interval are omitted.

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



Notes. This graph 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 depicts 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)

	(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
Nb. 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 other 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 to missing when the tax avoidance variable lies outside the [0,1] interval. See section 3 for more details. Standard errors are in parentheses. $^d p < 0.15$, $^c p < 0.10$, $^b p < 0.05$, $^a p < 0.01$.

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

	$pre\text{-}tax\ income_{ijt}$
IMP_{jt}	-341.52^{c}
	(174.67)
Controls	Yes
Firm FEs	Yes
Year FEs	Yes
Nb. of obs.	32,470

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

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

	(1) ETR	(2) $ETR2$	(3) $CASHETR$	(4) CFM
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
Nb. of obs.	23,097	22,286	16,688	16,584

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

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

	(1) ETR	(2) $ETR2$	(3) $CASHETR$	(4) CFM
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
Nb. 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. See section 4 for more details. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

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

	(1) ETR	(2) $ETR2$	(3) $CASHETR$	(4) CFM
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
Nb. 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. See section 4 for more details. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

TABLE OAT8 – Effect of import competition on corporate tax avoidance: mechanism (extended definition of intangibles)

	(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
Nb. 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). The dependent variable is ETR in columns (1), (2), (3), and (4), and $intangibles2$ in column (5). In all columns but column (5), firm-year observations with a dependent variable outside the [0,1] interval are omitted. See section 5 for more details. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

TABLE OAT9 – Effect of import competition on corporate tax avoidance: mechanism (patents)

	(1)	(2)	(3)	(4)	(5)
	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
Nb. 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. See section 5 for more details. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

TABLE OAT10 – Effect of import competition on corporate tax avoidance: mechanism (intangibles as a share of assets and in logarithm)

	(1)	(2)	(3)	(4)
	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
Nb. 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. See section 5 for more details. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

TABLE OAT11 – Effect of import competition on corporate tax avoidance: mechanism (MNE activity measured with Exhibit 21 files)

	(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
Nb. 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 filed by firms. See section 5 for more details and Dyreng and Lindsey (2009) and Dyreng, Hoopes, Langetieg, and Wilde (2020) for more details and discussions on Exhibit 21 reports. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

TABLE OAT12 – 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, Switzerland, Turks and Caicos Islands, Vanuatu

Notes. Combined, these two lists contain 52 tax havens. Due to data limitations however, Channel Islands and UK Caribbean Islands are omitted in the analysis.