Import competition and corporate tax avoidance: Evidence from the China shock

Baptiste Souillard*[1,2]

[1]*ECARES, SBS-EM, Université libre de Bruxelles*
[2]*F.R.S.-FNRS Aspirant*

Abstract: This paper examines the effect of import competition on corporate tax avoidance. I exploit the rapid surge of China's exports as a competition shock and balance sheets and income statements to measure tax avoidance of US-headquartered publicly listed manufacturing firms. The baseline results reveal that a 1 percentage point increase in the penetration ratio of US imports from China entails, on average, a 0.20 percentage point decrease in the effective tax rate. They are supported by a series of sensitivity tests and robust to using the US conferral of the Permanent Normal Trade Relations status on China in late 2000 as a quasi-natural experiment. Furthermore, the results are entirely driven by multinational firms. In response to the China shock, these firms invested in intangible assets, and these intangibles 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 firms and globalization.

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

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

*First draft: June 2018. This version: August 2020. I would like to thank Micael Castanheira, Paola Conconi, Sébastien Laffitte, Julien Martin, Francesco Pappadà, Mathieu Parenti, Farid Toubal, and Gonzague Vannoorenberghe for their valuable comments and suggestions. I also would like to thank Lorenzo Trimarchi for his help with the data, and participants at the 2018 and 2019 ETSG Annual Conferences, 2018 RIEF Doctoral Meeting, 2019 FIW Research Conference on International Economics, 2019 Université Catholique de Louvain Doctoral Workshop, 2020 WIEM Annual Conference, ECARES PhD Seminars, and CEPS Seminar at ENS Paris Saclay for insightful discussions. Website: `www.baptistesouillard.com`. Mail: `baptiste.souillard@gmail.com`.

1 Introduction

Corporate income is subject to taxation, and corporate income taxation distorts firms' decisions: to lighten this burden, firms adapt how they operate (De Mooij and Nicodème, 2008) and how they invest (Devereux and Griffith, 1998; De Mooij and Ederveen, 2003; Buettner and Ruf, 2007). Some of them also avoid taxes, i.e., exploit technicalities of the law and mismatches between tax systems to reduce tax liability, and tax aggressiveness of large and multinational firms (MNEs) has become a salient policy concern in a context of tax scandals, economic downturn, budget deficits, and rising inequalities. Globalization and digitalization have made possible to dissociate economic activity and profits and created opportunities to save taxes. For example, it has been shown that multinational firms artificially shift profits towards low-tax countries and especially towards tax havens (Dharmapala, 2014; Beer, de Mooij, and Liu, 2020). Given that these firms are major actors in the 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 motivates profit shifting and more broadly corporate tax avoidance is of foremost interest.

In this paper, I study the effect of one aspect of globalization: import competition. The methodology builds on two distinct lines of the literature. A strand of research in economics pioneered by Autor, Dorn, and Hanson (2013) has explored the aftermath of the rapid surge of China's exports. In the same vein, I interpret this episode as a sizable import competition shock and assess its impact on tax avoidance of publicly traded manufacturing firms headquartered in the US between 1990 and 2005. In parallel, a stream of research in accounting has worked on the measurement of corporate tax avoidance. [2]

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.
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).

As corporate tax avoidance cannot be perfectly gauged by nature – obviously, firms do not disclose the amount of taxes they avoid –, scholars have tried to infer it from balance sheets and income statements. On this basis, I construct four indicators of tax aggressiveness: (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 aspects of corporate tax avoidance as they account for conforming, non-conforming, permanent, and temporary strategies.

The analysis begins with three stylized facts. First, Chinese import competition and corporate tax avoidance exhibit a positive correlation between 1990 and 2005. While the former continuously increased throughout the period, the aforementioned indicators of corporate tax avoidance fell between 1990 and 2005. 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 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; it is crucial to control for typical determinants of tax liability (e.g., tax loss carry forward); and investigating the causal effect of import competition on tax avoidance requires a systematic method.

The following question naturally emerges: did Chinese import competition really drive corporate tax avoidance upward? To respond to this question, I 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. More notably, they remain valid when I use instrumental variables, instrumenting the import penetration ratio with imports from China of eight similar countries to better capture the supply-driven changes in import competition, and when I use the US conferral of the Permanent Normal Trade Relations status on China in October 2000 as a quasi-natural experiment in a difference-in-difference (DiD) estimation. 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. The advantage of this approach is three-fold: (i) the granting was unanticipated, (ii) the shock differentially exposed sectors to Chinese import competition, and (iii) this exposure mostly depended on non-normal-trade-relations tariff rates, set in 1930, so the treatment is plausibly exogenous (Pierce and Schott, 2016). Besides, effective tax rates' evolution is unrelated to this exposure before the shock.

To gain insights into this, I investigate through which channel(s) import competition affects corporate tax avoidance. As a first step, I allow for heterogeneous effects and distinguish between MNEs and domestic firms. In theory, the former have more possibilities to dodge taxes because they can shift profits to their affiliates located in low-tax

jurisdictions. I note that the effect is in fact not pervasive but on the contrary totally driven by MNEs, and thereby reminiscent of profit shifting. As a second step, I examine what technique MNEs employed to shift more profits in reaction to the China shock. The quantification exercise performed by Heckemeyer and Overesch (2017) places intra-firm royalty payments as a prominent profit shifting technique, and Bloom, Draca, and Van Reenen (2016) and Hombert and Matray (2018) notice that the China shock increased innovation, technical change, and product differentiation. Drawing on these three papers, I examine whether import competition fosters profit shifting indirectly through intangible assets, and I provide strong evidence going in this direction. I demonstrate that (i) the effect of import competition on tax avoidance becomes statistically insignificant when I control for intangible assets, (ii) intangible assets reduce corporate income taxes of MNEs exclusively – which confirms the use of intangibles as a tool to shift profits –, and (iii) the China shock made MNEs invest in intangible assets. All in all, these results mean that import competition prompts MNEs to invest in intangible assets, and these assets spur their income shifting activities.

These findings are novel in that they reveal a positive effect of import competition on corporate tax avoidance and profit shifting. They have important policy implications as well. They help understand the decline in the average effective tax rate (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 firms and globalization (Helpman, 2017; Ravallion, 2018; Rodrik, 2018) and emphasizes that import competition and corporate taxes are closely connected. Against a background of lively debates on trade and tax policies, the paper reaffirms the need to pursue these policies jointly and suggests that governments could devote more resources auditing firms in highly competitive sectors to curb profit shifting.

Related literature This paper resonates with two separate lines of research. On the one hand, a stream of the literature focuses on corporate tax avoidance. Evidence suggests that multinational firms transfer part of their profits towards 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 corporate income 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 (2019) for reviews on the determinants of corporate tax avoidance. This paper adds to this literature by underlining that import competition plays a role too, and my counterfactual estimates imply that its role is significant. [3] On the other hand, an area of research addresses the consequences of the boom of China's exports in the early 2000s. A first wave of papers has concentrated 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). Subsequent papers have studied the impact of this competition shock on firm product scope and factors' reallocation (Iacovone, Rauch, and Winters, 2013; Chakraborty and Henry, 2019), firm productivity (Chen and Steinwender, 2019), prices (Bai and Stumpner, 2019; Amiti, Dai, Feenstra, and Romalis, 2020), and firm innova-

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). Nevertheless, avoidance differs from evasion. Unlike tax evasion, tax avoidance is legal. Consequently, the strategies that are adopted and the firms that are involved are not the same in both cases. Small and medium-sized firms are more prone to do tax evasion to the extent that 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 this paper, the accent is placed on tax avoidance, large firms, and import competition.

tion (Bloom et al., 2016; Hombert and Matray, 2018; Autor, Dorn, Hanson, Pisano, and Shu, 2019). In this regard, my work shows that the China shock has also exacerbated corporate tax avoidance, and more specifically profit shifting of multinational firms.

The article is organized as follows. Section 2 introduces the data. On this basis, section 3 lays out three stylized facts, mainly correlations. Section 4 then establishes causality and section 5 explores one particular mechanism whereby import competition affects tax aggressiveness. Lastly, 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, how the key variables are created, and how the sample is chosen.

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) and income statements (revenues, costs, and expenses) of publicly held companies 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). 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).[4] Lower values are associated with more tax avoidance and exact formulas with Compustat codes are attached in appendix A table AT1. Taken together, these 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, facilitating the comparison of the results.[5] Last but not least, they cover conforming, non-conforming, permanent, and temporary tax avoidance strategies.[6] Accordingly, they give an overall picture 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 same time. One limitation is that they can vary regardless of tax avoidance strategies. To identify the effect of import competition on aggressive tax planning, I will control for factors determining tax liability and avoidance in the econometric analysis.

4. 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 accounting rules. This is why income cash income taxes do not necessarily align with income tax expense. 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.

5. Alternative measures of tax avoidance are book-tax differences, tax shelter scores, and unrecognized tax benefits. See also Lev and Nissim (2004) and Henry and Sansing (2018). The fact that measures based on book-tax differences are by construction similar to those used in this article (De Simone et al., 2019) and that US firms are required to report unrecognized tax benefits as of 2006 strengthens the choice of ETR, $ETR2$, $CASHETR$, and CFM. 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 the sample. More extensive discussions on the measurement of corporate tax avoidance can be found in Hanlon (2003), Dyreng, Hanlon, and Maydew (2008), Dyreng, Hanlon, and Maydew (2010), Hanlon and Heitzman (2010), Guenther (2014), Badertscher et al. (2019), and De Simone et al. (2019).

6. 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. To take one example, ETR 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 of tax avoidance variables within firms

	ETR	$ETR2$	$CASHETR$	CFM
ETR	1.00			
$ETR2$	0.54	1.00		
$CASHETR$	0.25	0.44	1.00	
CFM	0.20	0.29	0.66	1.00

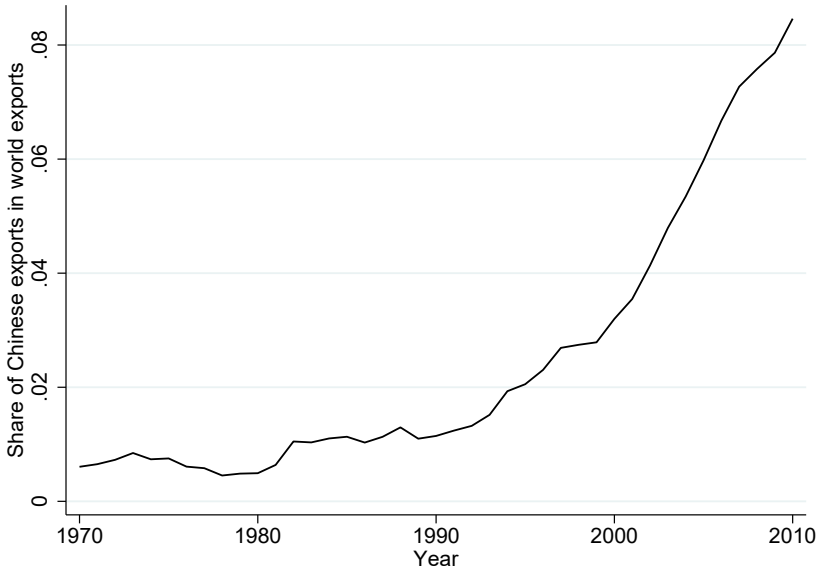
Notes. This table reports the mean Pearson's correlation coefficients between the four tax avoidance variables within firms. See section 2 and appendix A table AT1 for more details on the construction of these variables. For a firm-year observation to be included in the computation of a correlation coefficient, the two tax avoidance variables must lie in the [0,1] interval.

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. Combined with annual US trade flows from Schott (2008), 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:

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

$Imports_{jt}^{\text{China,US}}$ refers to US imports from China in industry j and year t, $Imports_{jt}^{\text{World,US}}$ to total US imports in industry j and year t, $Exports_{jt}^{\text{US,World}}$ to total US exports in industry j and year t, and $Shipments_{jt}^{\text{US}}$ to 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 exports of hardwood veneer and plywood products (SIC 2435) to the US was 12 percent – i.e., about twice the average – whereas that for softwood veneer and plywood products (SIC 2436) was forty times smaller. For simplicity and owing to data limitations, I will consider that firms mainly operating in the same industry j are equally exposed to Chinese import

FIGURE 1 – Exports from China between 1970 and 2010



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

competition: $IMP_{ijt} = IMP_{jt}$ for all firm i. In this regard, it is worth noting that firms' main industry does not change over time.

2.2 Sample

Only a subsample of the dataset described above is used for the study. I remove firms whose headquarters are not located in the US for comparability. Also, I drop observations before 1990 and after 2005. 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. I take 2005 as final year as I do not want the results to be tainted by the global financial crisis of the late 2000s. We will see in section 4 that this 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 since manufacturing products represented a major part of Chinese exports in that period. 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.

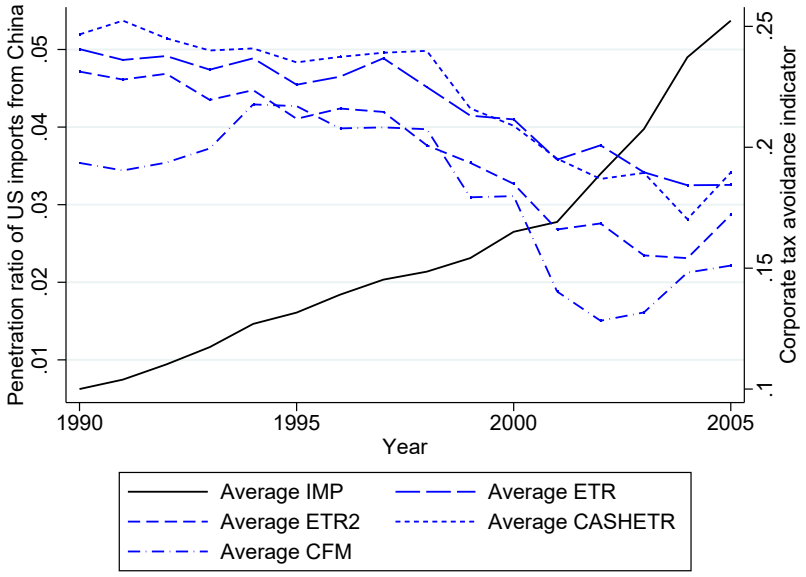
3 First evidence on import competition and corporate tax avoidance

The dataset enables to uncover three facts: (i) import competition and corporate tax avoidance variables are positively correlated, (ii) Chinese import competition exacerbated 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. On the contrary, indicators of corporate tax avoidance fell, in line with Dyreng et al. (2017). In appendix B table AT3, 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 percentage points decrease in the average $CASHETR$, and a 1.40 percentage points

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



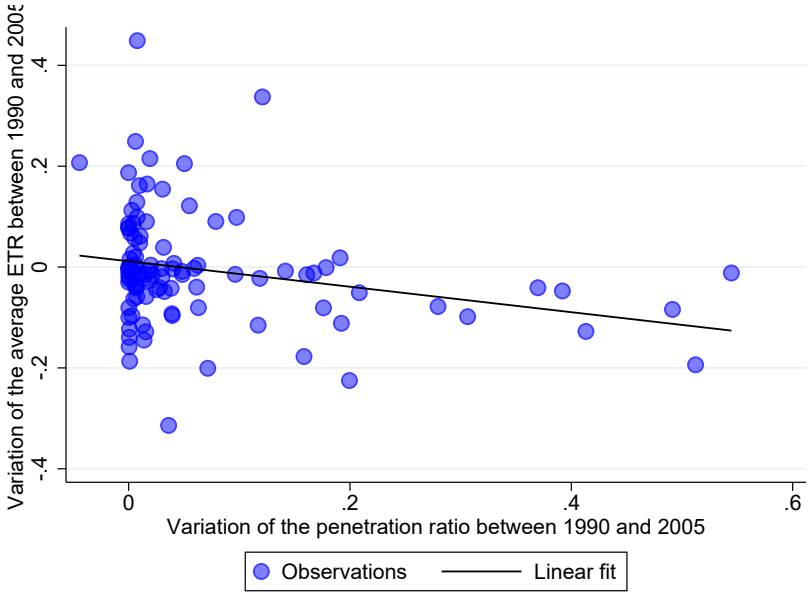
Notes. This graph depicts the average penetration ratio of US imports from China (left y-axis) and the mean value of each of the four corporate tax avoidance variables (right y-axis) between 1990 and 2005. For the latter, firm-year observations are set to missing when the tax avoidance variable lies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

decrease in the average CFM. The correlation even persists at the industry level, as outlined in figure 3 and appendix B table AT4. It should be noted that the four metrics of tax avoidance appear relatively low (compared to US statutory tax rates) and volatile. This is because some firms have very low effective tax rates, making the distribution bimodal. In appendix B, I show this distribution in figure AF1 [7] and I show in table AT5 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

7. The left peak disappears when firm-year observations with a tax loss carry forward are dropped (see appendix B figure AF2). Apropos of that, figures AF3 and AF4 suggest that tax loss carry forwards of domestic firms partly explain the discrepancy between the ETR of domestic firms and that of multinational firms 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 multinational firms' ETR.

FIGURE 3 – Import competition and corporate tax avoidance: industry-level evidence



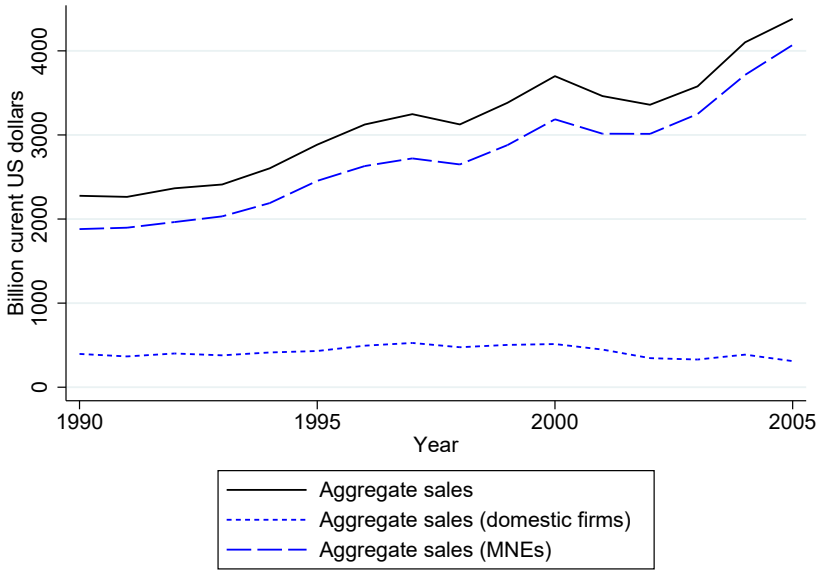
Notes. This graph depicts the variation of the penetration ratio (x-axis) and that of the average effective tax rate (y-axis) by industry between 1990 and 2005. For the latter, firm-year observations are set to missing when the tax avoidance variable lies outside the [0,1] interval. The slope of the linear regression fit is -0.25, with a standard error equal to 0.09. When sectors for which the penetration ratio increases by more than 20 percentage points are removed (observations on the right-hand side of the graph), the slope of the linear regression fit is -0.38, with a standard error equal to 0.22.

TABLE 2 – Chinese import competition and firm sales

	$log(sales_{ijt})$
IMP_{jt}	-1.15^{b}
	(0.51)
Controls	Yes
Firm FEs	Yes
Year FEs	Yes
Nb. of obs.	31,855

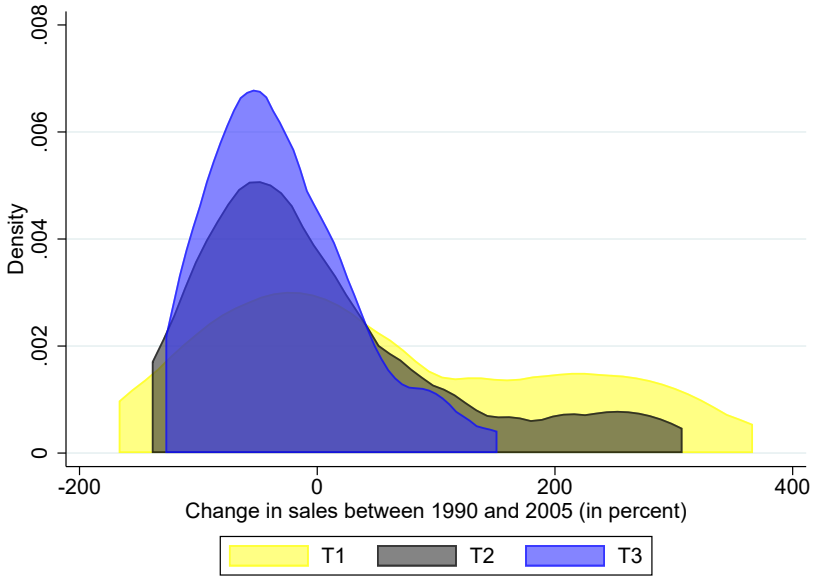
Notes. This table reports regression results obtained with ordinary least squares. The dependent variable is firm-year sales, in logarithm. See section 3 for more details. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$,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

FIGURE 4 – Aggregate sales



Notes. This graph depicts the aggregate sales of firms included in the sample between 1990 and 2005.

FIGURE 5 – Chinese import competition and sales of domestic firms



Notes. This graph 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. Accordingly, T3 contains the sectors that are the most affected by rising Chinese import competition.

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

Figure 4 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 multinationals' sales. Sales of domestics firms, in contrast, dwindled by 22 percent. In table 2 and figure 5, 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 and statistically significant, reflecting a negative impact of the China shock on sales. All else equal, a 1 percentage point increase in the penetration ratio of China entails a 1.15 percentage points decrease in sales. The same applies to pre-tax income (see table AT6) 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. [8] The negative correlation is clear in figure 5. 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 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 6. 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 cor-

8. Figures 4 and 5 with pre-tax income and/or constant US dollars are available upon request.

relation 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 the variation in effective tax rates and the variation in Chinese import competition shown in figure 3 is potentially attributable to losses in sales induced by the China shock. In the subsequent 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 import competition actually decreased the effective tax rate of multinational firms only, for which sales doubled.

4 Causal effect of import competition on corporate tax avoidance

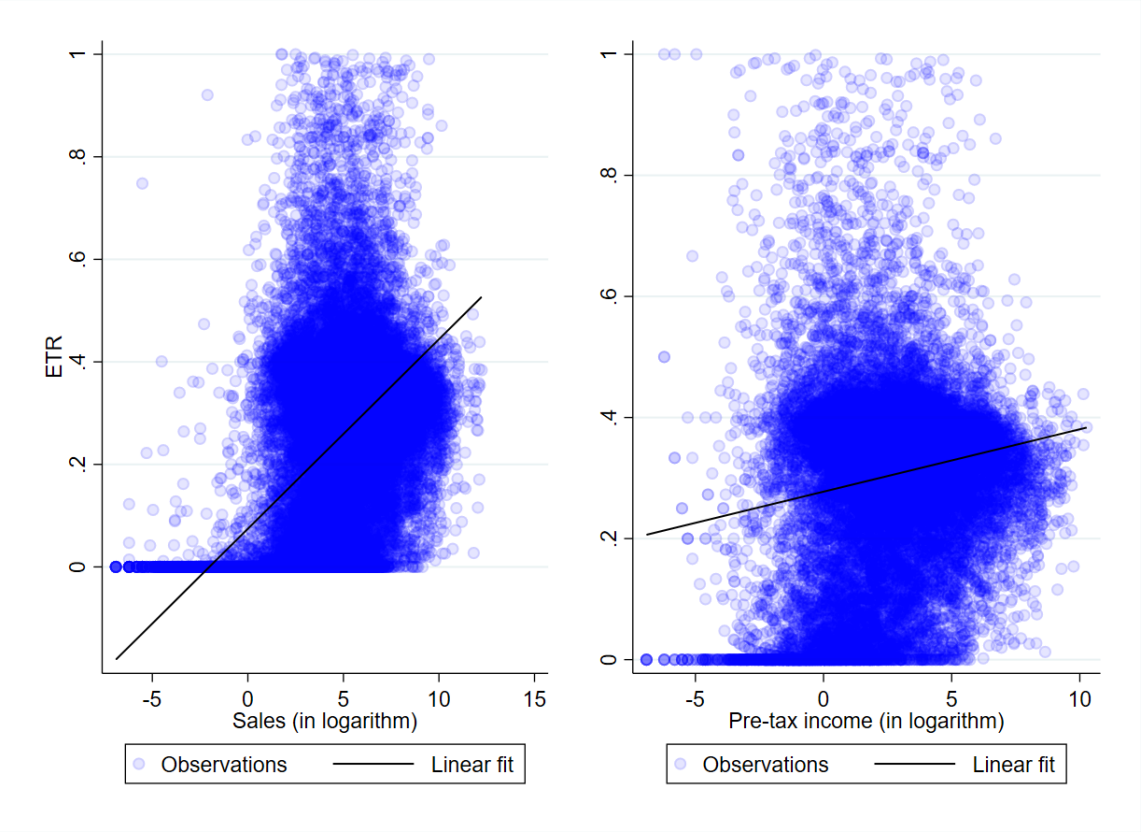
In this section, I go beyond correlations and provide robust evidence of a positive and causal effect of import competition on corporate tax avoidance. I start with the baseline estimates and a simple counterfactual analysis, and next address endogeneity concerns.

4.1 Baseline estimates and counterfactual analysis

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

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

FIGURE 6 – Sales, pre-tax income and effective tax rates



Notes. The graph on the left depicts the logarithm of sales on the x-axis and the effective tax rate on the y-axis, while the graph on the right depicts the logarithm of pre-tax income on the x-axis and the effective tax rate on the y-axis. In each graph, firm-year observations are set to 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 of 3.1e-4. The slope of the linear fit in the second graph is equal to 1.0e-2, with a standard error of 4.0e-4.

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. Finally, I add year dummies v_t in order to absorb time-trends – without imposing any structure – and any year-specific unobservable like macroeconomic shocks. I will focus on the coefficient of interest β_1 for clarity and thus only report $\hat{\beta}_1$ in the regression tables.

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. 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 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, 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 7. 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

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. The set of explanatory variables is described in section 4 and appendix A. See also section 4 for more details. Standard errors, in parentheses, are clustered at the 4-digit 1987 SIC industry. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

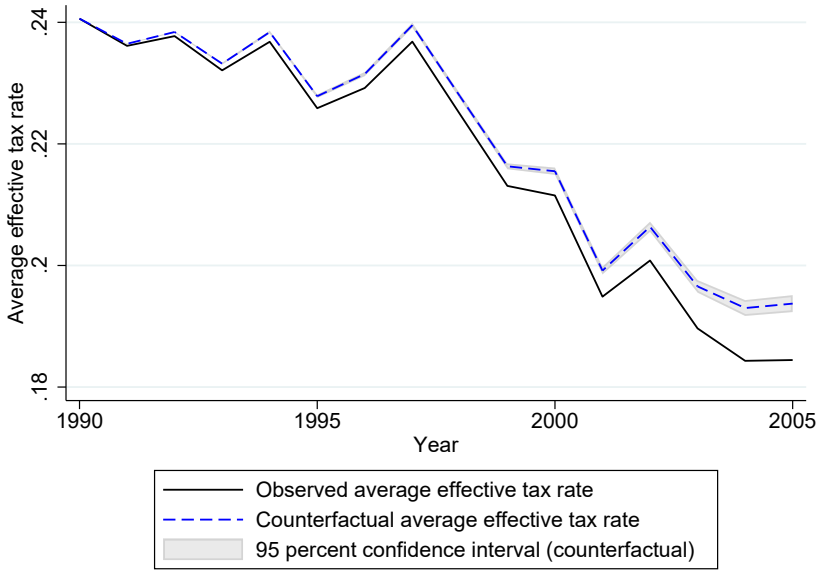
over the period. Put otherwise, the China shock contributed 17 percent to the decline in the average effective tax rate observed between 1990 and 2005 through tax avoidance, so the effect is far from negligible.

4.2 Robustness

I gauge the robustness of these 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 the findings are not affected by outliers. 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 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

FIGURE 7 – Observed and counterfactual average effective tax rates



Notes. The graph depicts the observed and counterfactual average effective tax rates for each year between 1990 and 2005. It is constructed using the results displayed in table 3 column (2). See section 4 for more details.

out any compositional effect.[9] In all four cases, the results are similar to 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 played by import competition.

In panel B, I verify 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

9. 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}	-0.11^{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 replicates the regression results of equation (1) obtained 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. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

other foreign countries (from Schott, 2008), and the intensity of Chinese import competition in the input market. I proxy the intensity in 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. 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 and neutralize the effect of the check-the-box regulations enacted in 1997, accused by specialists to have facilitated tax avoidance of multinational firms 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 chiefly 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 by construction do not appear in table 3. 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 noise is introduced in the competition variable, 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, in panel D, I conduct two falsification tests. I assign each firm to a random industry j' and substitute IMP_{ijt} with $IMP_{ij't}$ in panel D1 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 I am not capturing long-run trends in tax avoidance correlated with Chinese import competition. [10] 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 relate 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 in table 5 panel A the results of table 3 when all variables in X have pre-determined values. I employ one-year lags of these controls in panel A1 and two-year lags in panel A2, and the results are still consistent.

10. 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. Not surprisingly, the scale of the effect lessens, but it is still significantly different from zero. These results are untabulated but more details are available upon request.

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 in eight other high-income countries: Germany, Switzerland, Spain, Denmark, Finland, Japan, Australia, and New Zealand. 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. Nevertheless, the identification relies on three assumptions, some of which can be debated: high-income countries are exposed to the supply-driven growth of exports from China in a comparable way, increasing returns to scale in Chinese manufacturing are moderate, and demand shocks are uncorrelated across these economies. Even though it is difficult to categorically reject that demand shocks are correlated across these high-income countries, the literature suggests that a significant part of the rise of China's 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). In the same vein, the exclusion restriction can be debated for multinational firms, for which the median ratio of foreign profits to worldwide profits is 17 percent.

To overcome these problems, an alternative strategy consists in exploiting a quasi-natural experiment: the US conferral of the Permanent Normal Trade Relations (PNTR) status on China in late 2000. US imports from non-market economies are normally

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. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

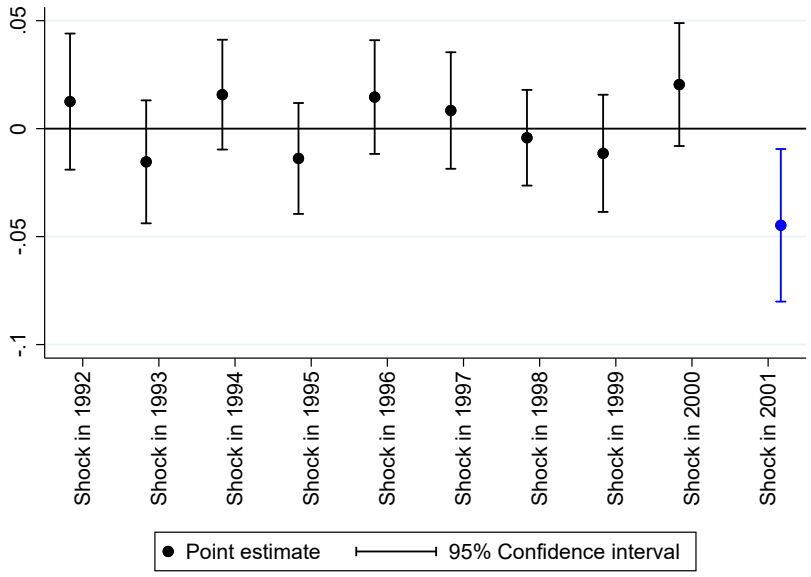
subject to high tariff rates, called non-normal-trade-relations (NNTR) tariff rates. Nonetheless, the US Trade Act of 1974 allows US Presidents to grant most-favored-nation (MFN) tariff rates to non-market economies on an annual basis, upon approval by the US Congress. This explains why China's exports to the US were subject to normal-trade-relations (NTR) tariffs (equivalently, MFN tariffs) between 1980 and 2000 although 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. 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. 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 in absence of the granting, firms operating in sectors relatively more exposed to the shock (high $PNTR$) would have experienced the same trend in tax avoidance as firms in sectors that are relatively less exposed (low $PNTR$). The particularity of $PNTR$ resides in its plausible 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. They are significant at lower levels though, and 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 8, I prove that the evolution of the effective tax rate prior to 2001 is unrelated to the NTR gap in 1999. It can be seen as a placebo test and as a test of the common trend assumption for panel C column (1). Also, it 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. All in all, these

FIGURE 8 – Difference-in-difference estimation: a placebo test



Notes. This graph depicts the coefficients obtained when replacing in the DiD equation (2) $PNTR$ by a set of 11 variables defined as follows: $\mathbb{1}_{t \geq x} \times (NNTR_{j1999} - NTR_{j1999})$, with $x \in \{1991, ..., 2001\}$. The variable is omitted for 1990 due to collinearity. The dependent variable is ETR_{ijt}. See section 4 for more details.

sensitivity tests give credence to a positive and causal effect of import competition on corporate tax avoidance.

5 Multinational firms and the role of intangible assets

I now explore 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.

5.1 Domestic versus multinational firms

To better understand what lies behind the average effect estimated in the previous section, I investigate the existence of heterogeneous effects. More specifically, I differentiate between domestic and multinational firms. The latter have more possibilities to avoid taxes because unlike pure domestic firms they can artificially shift profits towards low-tax jurisdictions. Plus, an interesting feature of the dataset is that balance sheets and income statements are consolidated at the firm-level, enabling profit shifting activities to be reflected in the effective tax rates. [11]

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

In order to do so, I use a triple difference estimator. I construct a new variable denoted $PNTR \times MNE$ and plug it into the regressors of the preferred specification (see equations (2) and (3)). This variable is the product of the treatment variable $PNTR$ and the MNE 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 multinational firms and reminiscent of profit shifting. [12]

11. Multinational firms 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".

12. 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}	
				(6.81e-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 *intangibles* 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. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

5.2 The role of intangible assets

The literature has emphasized three major techniques used by MNEs to move profits towards low-tax countries: strategic location of intellectual property, manipulation of transfer prices, and intra-firm loans. Given that Compustat reports balance sheets and earnings statements for each corporation on a consolidated basis, I can identify neither transfer prices nor intra-firm loans at the firm-level. Hence, 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 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 multinational firms exclusively, supporting the view that these firms strategically locate their intangibles to avoid taxes.[13] Importantly, the effect of the China shock dissipates – the coefficient is divided by two and becomes not statistically different from zero at standard levels –, suggesting that import competition may indeed affect tax avoidance indirectly via intangibles. To verify this, I study the role of Chinese import competition on intangible assets and estimate the following equation in table 6 column (5):

$$intangibles_{ijt} = \gamma_0 + \gamma_{1,1} PNTR_{jt} + \gamma_{1,2} PNTR_{jt} \times MNE_{ijt} + \gamma_2 X_{ijt} + u_i + v_t + e_{ijt} \quad (6)$$

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 multinational firms differently. The point estimates reveal that the competition shock had little incidence on domestic firms' intangible assets but a positive and significant impact on intangible assets of MNEs.[14] In appendix B table AT7, I show that the results presented in this section are consistent when *intangibles* is expressed

13. The p-value of the test whose null hypothesis is $\beta_{2,1} + \beta_{2,2} = 0$ is 0.07. The equivalent test for table 7 gives a p-value equal to 0.04.

14. As in section 4, I conduct a test for the common trend assumption and a placebo test in one regression. The figure displaying the results is to be found in appendix B figure AF5

as a share of total assets or in logarithm. In appendix B table AT8, 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). In sum, Chinese import competition made multinational firms invest in intangible assets, leading to more profit shifting activities.

The positive effect of Chinese import competition on intangible assets found in this paper concurs with preceding contributions. They point out that the China shock led to more innovation and technical change (Bloom et al., 2016), more increased product differentiation (Hombert and Matray, 2018), and more investments in intangibles from industry leaders (Gutiérrez and Philippon, 2017). Perhaps a more interesting question is whether intangibles reduced income taxes paid by multinational firms thanks to credits and deductions offered by governments, or by facilitating profit shifting. In this regard, I argue that the estimation results of equation (5) speak for the second proposition. The fact that intangible assets lower the effective tax rate of multinational firms alone and not the one of domestic firms, yet eligible to these tax breaks, directly echoes the profit shifting literature.

5.3 Alternative definitions of intangible assets

Before concluding, I review an important threat to the validity of these 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). Ho-

TABLE 7 – Effect of import competition on corporate tax avoidance: mechanism (robustness)

	(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. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

wever, intangibles created within firms are generally not capitalized on balance sheets. Rather, they are mostly recorded as R&D expenditures or Selling, General and Administrative (SGA) expenditures. [15] 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 7 and align with the previous ones in all respects.

Lastly, instead of expanding the definition of intangibles, I narrow the definition of

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

intangibles and focus on patents. 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 appendix B table AT9, go in the same direction and thus further strengthen my findings.

6 Conclusion

To the best of my knowledge, the role played by import competition in corporate tax avoidance has not yet been studied in the literature. This paper fills this gap by studying the effect of the boom of China's exports on tax aggressiveness of US publicly listed manufacturing 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, instrumental variables, and an event study. Moreover, I show that this effect is specific to multinational firms. I provide evidence that these firms reacted to the China shock by investing in intangible assets, and that these assets allowed them to shift more profits to low-tax jurisdictions. These findings have important implications. They cast light on the evolution of effective tax rates by revealing that the tax avoidance effect triggered by the China shock has contributed 17 percent to the decline in the average effective tax rate between 1990 and 2005. More generally, this paper helps understand the recent backlash against large firms and globalization and attests that import competition and corporate taxes are tightly connected. Therefore, from a policy perspective, this paper reaffirms that trade

and fiscal policies should be pursued jointly and suggests that allocating more audit resources to highly competitive sectors could help limit profit shifting.

References

Acemoglu, D., D. Autor, D. Dorn, G. H. Hanson, and B. Price (2016): "Import competition and the great US employment sag of the 2000s," *Journal of Labor Economics*, 34, 141–198.

Alm, J. (2019): "What motivates tax compliance?" *Journal of Economic Surveys*, 33, 353–388.

Alstadsæter, A., S. Barrios, G. Nicodème, A. M. Skonieczna, and A. Vezzani (2018): "Patent boxes design, patents location, and local R&D," *Economic Policy*, 33, 131–177.

Amiti, M., M. Dai, R. C. Feenstra, and J. Romalis (2020): "How did China's WTO entry affect US prices?" *Journal of International Economics*, forthcoming.

Angrist, J. D. and J.-S. Pischke (2009): *Mostly harmless econometrics: An empiricist's companion*, Princeton University Press.

Armstrong, C. S., J. L. Blouin, and D. F. Larcker (2012): "The incentives for tax planning," *Journal of Accounting and Economics*, 53, 391–411.

Asker, J., J. Farre-Mensa, and A. Ljungqvist (2014): "Corporate investment and stock market listing: A puzzle?" *Review of Financial Studies*, 28, 342–390.

Autor, D., D. Dorn, and G. H. Hanson (2013): "The China Syndrome: Local labor market effects of import competition in the United States," *American Economic Review*, 103, 2121–68.

Autor, D., D. Dorn, G. H. Hanson, G. Pisano, and P. Shu (2019): "Foreign competition and domestic innovation: Evidence from US patents," *American Economic Review: Insights*, forthcoming.

Badertscher, B. A., S. P. Katz, S. O. Rego, and R. J. Wilson (2019): "Conforming tax avoidance and capital market pressure," *Accounting Review*, 94, 1–30.

Bai, L. and S. Stumpner (2019): "Estimating US consumer gains from Chinese imports," *American Economic Review: Insights*, 1, 209–224.

Beer, S., R. de Mooij, and L. Liu (2020): "International corporate tax avoidance: A review of the channels, magnitudes, and blind spots," *Journal of Economic Surveys*, 34, 660–688.

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

Brandt, L., D. Ma, and T. G. Rawski (2014): "From divergence to convergence: Reevaluating the history behind China's economic boom," *Journal of Economic Literature*, 52, 45–123.

Buettner, T. and M. Ruf (2007): "Tax incentives and the location of FDI: Evidence from a panel of German multinationals," *International Tax and Public Finance*, 14, 151–164.

Buettner, T. and G. Wamser (2013): "Internal debt and multinational profit shifting: Empirical evidence from firm-level panel data," *National Tax Journal*, 66, 63–97.

Cai, H. and Q. Liu (2009): "Competition and corporate tax avoidance: Evidence from Chinese industrial firms," *Economic Journal*, 119, 764–795.

Chakraborty, P. and M. Henry (2019): "Chinese competition and product variety of Indian firms," *Journal of Comparative Economics*, 47, 367–395.

Chen, C. and C. Steinwender (2019): "Import competition, heterogeneous preferences of managers, and productivity," *mimeo*.

Clausing, K. (2016): "The effect of profit shifting on the corporate tax base in the United States and beyond," *National Tax Journal*, 69, 905–934.

Clausing, K. A. (2003): "Tax-motivated transfer pricing and US intrafirm trade prices," *Journal of Public Economics*, 87, 2207–2223.

Cobham, A. and P. Janskỳ (2018): "Global distribution of revenue loss from corporate tax avoidance: Re-estimation and country results," *Journal of International Development*, 30, 206–232.

Cristea, A. D. and D. X. Nguyen (2016): "Transfer pricing by multinational firms: New evidence from foreign firm ownerships," *American Economic Journal: Economic Policy*, 8, 170–202.

Crivelli, E., R. De Mooij, and M. Keen (2016): "Base erosion, profit shifting and developing countries," *FinanzArchiv: Public Finance Analysis*, 72, 268–301.

Dabla-Norris, E., M. Gradstein, and G. Inchauste (2008): "What causes firms to hide output? The determinants of informality," *Journal of Development Economics*, 85, 1–27.

Davies, R. B., J. Martin, M. Parenti, and F. Toubal (2018): "Knocking on tax haven's door: Multinational firms and transfer pricing," *Review of Economics and Statistics*, 100, 120–134.

De Mooij, R. A. and S. Ederveen (2003): "Taxation and foreign direct investment: A synthesis of empirical research," *International Tax and Public Finance*, 10, 673–693.

De Mooij, R. A. and G. Nicodème (2008): "Corporate tax policy and incorporation in the EU," *International Tax and Public Finance*, 15, 478–498.

De Paula, A. and J. A. Scheinkman (2011): "The informal sector: An equilibrium model and some empirical evidence from Brazil," *Review of Income and Wealth*, 57, S8–S26.

De Simone, L., J. Nickerson, J. K. Seidman, and B. Stomberg (2019): "How reliably do empirical tests identify tax avoidance?" *Contemporary Accounting Research*, forthcoming.

Desai, M. A. and J. R. Hines (2002): "Expectations and expatriations: Tracing the causes and consequences of corporate inversions," *National Tax Journal*, 55, 409–440.

Devereux, M. P. and R. Griffith (1998): "Taxes and the location of production: Evidence from a panel of US multinationals," *Journal of Public Economics*, 68, 335–367.

Dharmapala, D. (2014): "What do we know about base erosion and profit shifting? A review of the empirical literature," *Fiscal Studies*, 35, 421–448.

Dischinger, M. and N. Riedel (2011): "Corporate taxes and the location of intangible assets within multinational firms," *Journal of Public Economics*, 95, 691–707.

Dyreng, S., J. L. Hoopes, P. Langetieg, and J. H. Wilde (2020): "Strategic subsidiary disclosure," *Journal of Accounting Research*, 58, 643–692.

Dyreng, S. D., M. Hanlon, and E. L. Maydew (2008): "Long-run corporate tax avoidance," *Accounting Review*, 83, 61–82.

——— (2010): "The effects of executives on corporate tax avoidance," *Accounting Review*, 85, 1163–1189.

Dyreng, S. D., M. Hanlon, E. L. Maydew, and J. R. Thornock (2017): "Changes in corporate effective tax rates over the past 25 years," *Journal of Financial Economics*, 124, 441–463.

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

Egger, P., W. Eggert, C. Keuschnigg, and H. Winner (2010): "Corporate taxation, debt financing and foreign-plant ownership," *European Economic Review*, 54, 96–107.

Eisfeldt, A. L. and D. Papanikolaou (2014): "The value and ownership of intangible capital," *American Economic Review*, 104, 189–94.

Frank, M. M., L. J. Lynch, and S. O. Rego (2009): "Tax reporting aggressiveness and its relation to aggressive financial reporting," *Accounting Review*, 84, 467–496.

Galiani, S. and F. Weinschelbaum (2012): "Modeling informality formally: Households and firms," *Economic Inquiry*, 50, 821–838.

Goerke, L. and M. Runkel (2011): "Tax evasion and competition," *Scottish Journal of Political Economy*, 58, 711–736.

Gokalp, O. N., S.-H. Lee, and M. W. Peng (2017): "Competition and corporate tax evasion: An institution-based view," *Journal of World Business*, 52, 258–269.

Griffith, R., H. Miller, and M. O'Connell (2014): "Ownership of intellectual property and corporate taxation," *Journal of Public Economics*, 112, 12–23.

Guenther, D. (2014): "Measuring corporate tax avoidance: Effective tax rates and book-tax differences," *mimeo*.

Gutiérrez, G. and T. Philippon (2017): "Declining competition and investment in the US," *mimeo*.

Handley, K. and N. Limão (2017): "Policy uncertainty, trade, and welfare: Theory and evidence for China and the United States," *American Economic Review*, 107, 2731–83.

Hanlon, M. (2003): "What can we infer about a firm's taxable income from its financial statements?" *National Tax Journal*, 56, 831–863.

Hanlon, M. and S. Heitzman (2010): "A review of tax research," *Journal of Accounting and Economics*, 50, 127–178.

Hanlon, M., J. L. Hoopes, and N. Shroff (2014): "The effect of tax authority monitoring and enforcement on financial reporting quality," *Journal of the American Taxation Association*, 36, 137–170.

Heckemeyer, J. H. and M. Overesch (2017): "Multinationals' profit response to tax differentials: Effect size and shifting channels," *Canadian Journal of Economics/Revue canadienne d'économique*, 50, 965–994.

Helpman, E. (2017): "Globalisation and wage inequality," *Journal of the British Academy*, 5, 125–162.

Henry, E. and R. Sansing (2018): "Corporate tax avoidance: Data truncation and loss firms," *Review of Accounting Studies*, 23, 1042–1070.

Higgins, D., T. C. Omer, and J. D. Phillips (2015): "The influence of a firm's business strategy on its tax aggressiveness," *Contemporary Accounting Research*, 32, 674–702.

Hoi, C. K., Q. Wu, and H. Zhang (2013): "Is corporate social responsibility (CSR) associated with tax avoidance? Evidence from irresponsible CSR activities," *Accounting Review*, 88, 2025–2059.

Hombert, J. and A. Matray (2018): "Can innovation help US manufacturing firms escape import competition from China?" *Journal of Finance*, 73, 2003–2039.

Hong, S. (2018): "Tax treaties and foreign direct investment: A network approach," *International Tax and Public Finance*, 25, 1277–1320.

Hoopes, J. L., D. Mescall, and J. A. Pittman (2012): "Do IRS audits deter corporate tax avoidance?" *Accounting Review*, 87, 1603–1639.

Iacovone, L., F. Rauch, and L. A. Winters (2013): "Trade as an engine of creative destruction: Mexican experience with Chinese competition," *Journal of International Economics*, 89, 379–392.

Jones, C., Y. Temouri, and A. Cobham (2018): "Tax haven networks and the role of the Big 4 accountancy firms," *Journal of World Business*, 53, 177–193.

Karkinsky, T. and N. Riedel (2012): "Corporate taxation and the choice of patent location within multinational firms," *Journal of International Economics*, 88, 176–185.

Khan, M., S. Srinivasan, and L. Tan (2016): "Institutional ownership and corporate tax avoidance: New evidence," *Accounting Review*, 92, 101–122.

Laffitte, S., M. Parenti, B. Souillard, and F. Toubal (2020): "Quantifying the effects of international tax reforms," *mimeo*.

Laffitte, S. and F. Toubal (2019): "A fistful of dollars? Foreign sales platforms and profit shifting in tax havens," *mimeo*.

Lev, B. and D. Nissim (2004): "Taxable income, future earnings, and equity values," *Accounting Review*, 79, 1039–1074.

Marrelli, M. and R. Martina (1988): "Tax evasion and strategic behaviour of the firms," *Journal of Public Economics*, 37, 55–69.

McGuire, S. T., D. Wang, and R. J. Wilson (2014): "Dual class ownership and tax avoidance," *Accounting Review*, 89, 1487–1516.

Mion, G. and L. Zhu (2013): "Import competition from and offshoring to China: A curse or blessing for firms?" *Journal of International Economics*, 89, 202–215.

Peters, R. H. and L. A. Taylor (2017): "Intangible capital and the investment-q relation," *Journal of Financial Economics*, 123, 251–272.

Pierce, J. R. and P. K. Schott (2016): "The surprisingly swift decline of US manufacturing employment," *American Economic Review*, 106, 1632–62.

Ravallion, M. (2018): "Inequality and globalization: A review essay," *Journal of Economic Literature*, 56, 620–42.

Rodrik, D. (2018): "Populism and the economics of globalization," *Journal of International Business Policy*, 1, 1–22.

Schott, P. K. (2008): "The relative sophistication of Chinese exports," *Economic Policy*, 23, 6–49.

Stock, J. and M. Yogo (2005): "Testing for weak instruments in linear IV regression," in *Identification and Inference for Econometric Models*, ed. by D. W. Andrews, Cambridge University Press, 80–108.

Swenson, D. L. (2001): "Tax reforms and evidence of transfer pricing," *National Tax Journal*, 54, 7–25.

Tørsløv, T. R., L. S. Wier, and G. Zucman (2018): "The missing profits of nations," *mimeo*.

Ulyssea, G. (2018): "Firms, informality, and development: Theory and evidence from Brazil," *American Economic Review*, 108, 2015–47.

Utar, H. (2014): "When the floodgates open: Northern firms' response to removal of trade quotas on Chinese goods," *American Economic Journal: Applied Economics*, 6, 226–50.

Utar, H. and L. B. T. Ruiz (2013): "International competition and industrial evolution: Evidence from the impact of Chinese competition on Mexican maquiladoras," *Journal of Development Economics*, 105, 267–287.

Wang, F., S. Xu, J. Sun, and C. P. Cullinan (2019): "Corporate tax avoidance: A literature review and research agenda," *Journal of Economic Surveys*.

Appendix A: Compustat variables

TABLE AT1 – Definition of 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 following 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.

Appendix B: supplementary figures and tables

TABLE AT3 – 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

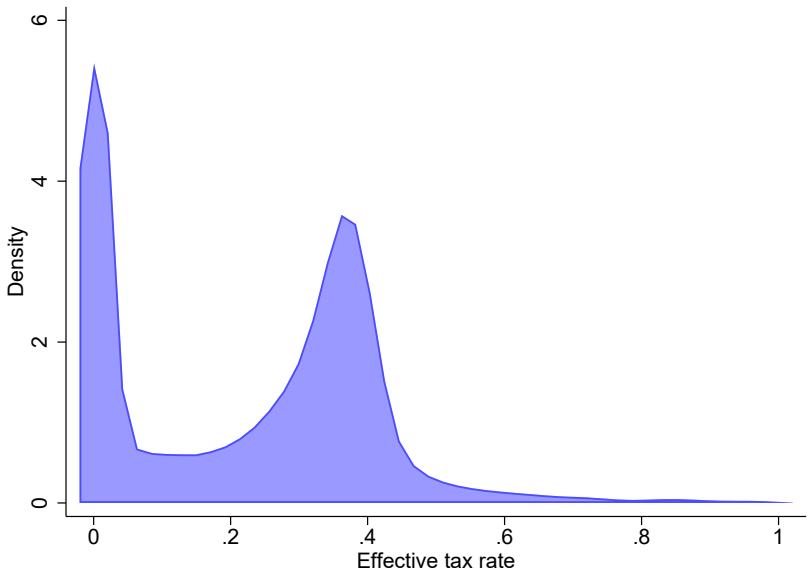
Notes. This table reports regression results obtained with ordinary least squares. The dependent variable is the year average of ETR in column (1), that of $ETR2$ in column (2), that of $CASHETR$ in column (3), and that of CFM in column (4). The independent variable $\overline{IMP_t}$ is the year average 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 AT4 – 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

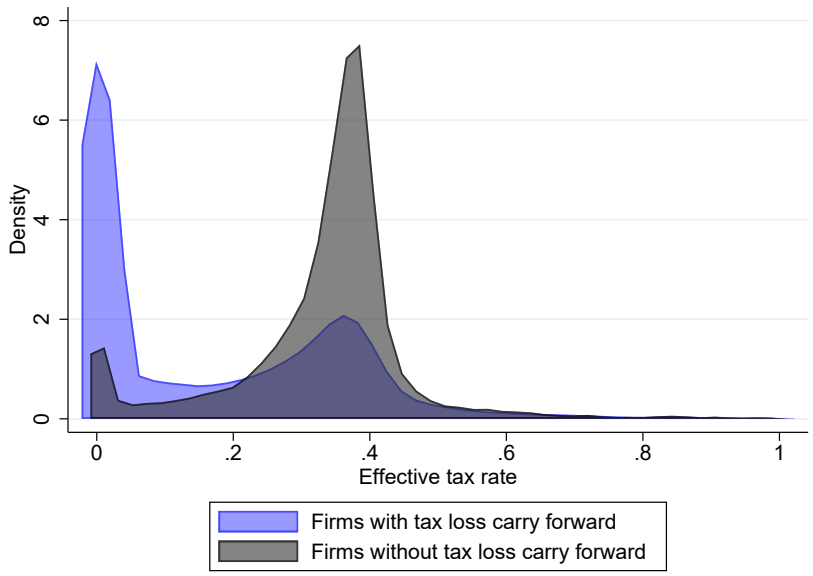
Notes. This table reports regression results obtained with ordinary least squares. The dependent variable is the industry-year average of ETR in column (1), that of $ETR2$ in column (2), that of $CASHETR$ in column (3), and that of CFM in column (4). The independent variable IMP_{jt} is the industry-year 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 AF1 – Distribution of effective tax rates



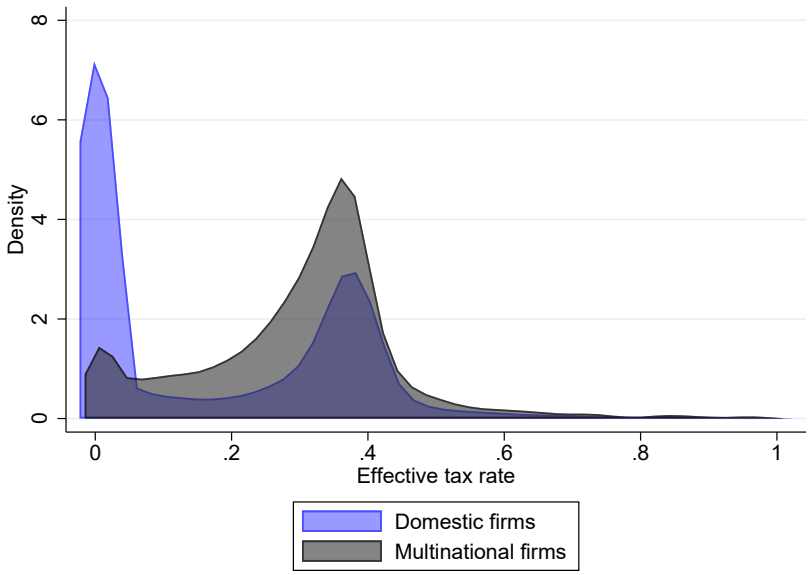
Notes. This graph depicts the distribution of effective tax rates. Firm-year observations with an effective tax rate outside the [0,1] interval are omitted.

FIGURE AF2 – Distribution of effective tax rates: firms with and without tax loss carry forward



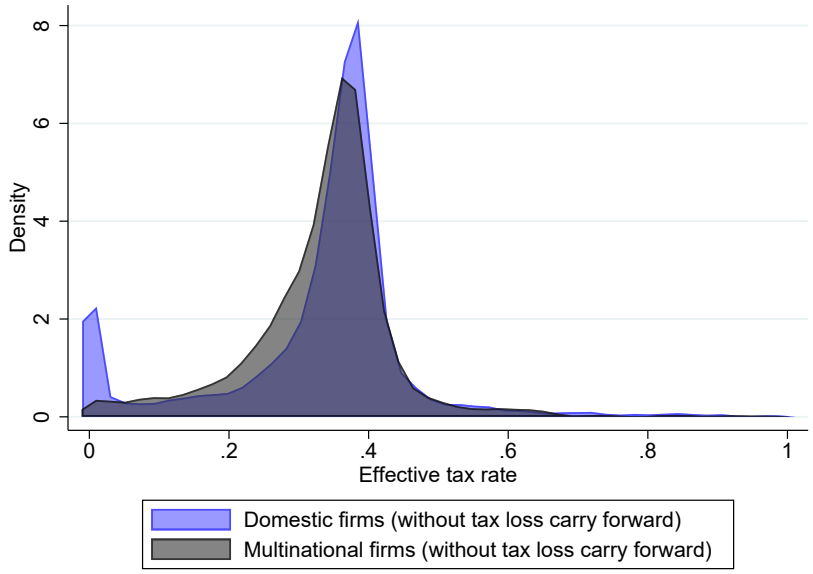
Notes. This graph depicts the distribution of effective tax rates. Firm-year observations with an effective tax rate outside the [0,1] interval are omitted.

FIGURE AF3 – 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 AF4 – 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 AT5 – 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

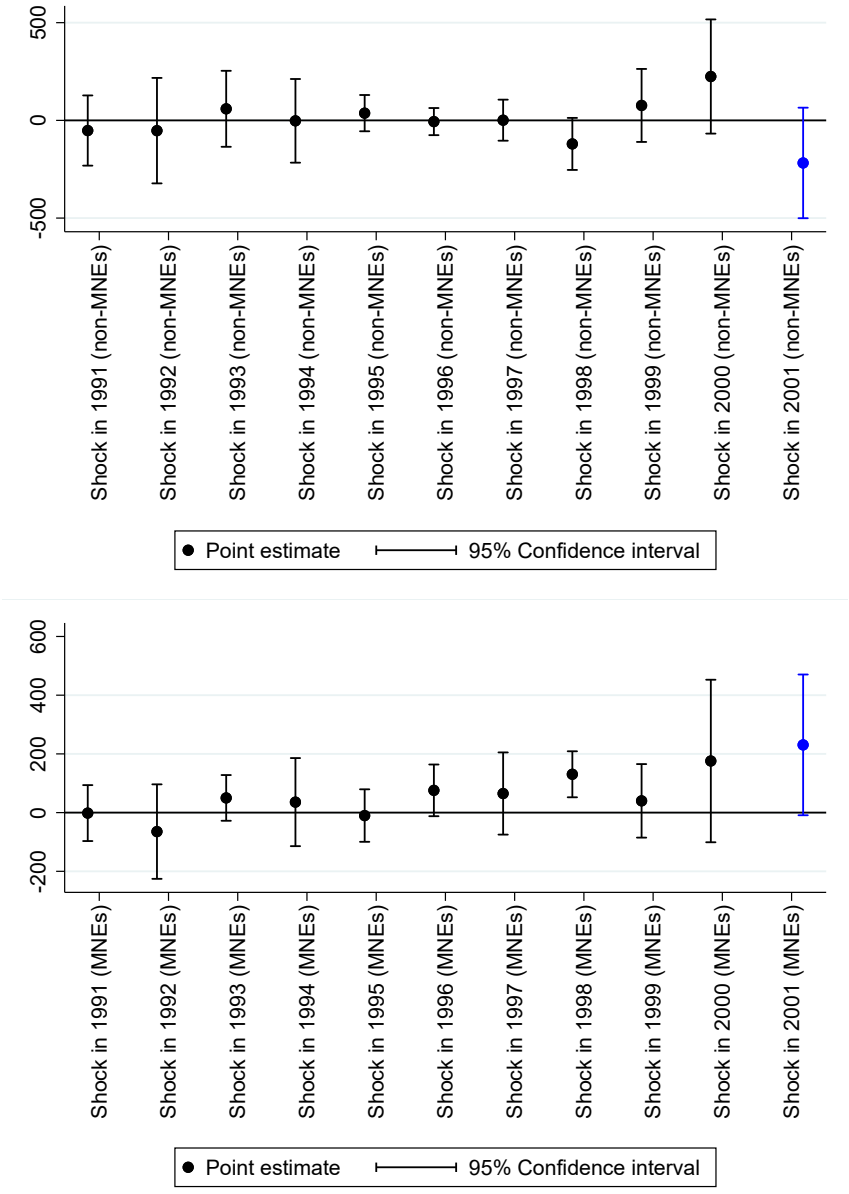
Notes. This table reports regression results obtained with ordinary least squares. In column (1), the dependent variable $\widetilde{ETR}_t$ is obtained by regressing, for each year, the numerator (income taxes) on the denominator (pre-tax income) with ordinary least squares. This way, the dependent variable minimizes the sum of quadratic errors for each year and approaches 0.35. 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 AT6 – Chinese import competition and firm pre-tax income

	$log(pre\text{-}tax\ income_{ijt})$
IMP_{jt}	-1.04^{b}
	(0.47)
Controls	Yes
Firm FEs	Yes
Year FEs	Yes
Nb. of obs.	17,735

Notes. This table reports regression results obtained with ordinary least squares. The dependent variable is firm-year pre-tax income, in logarithm. 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 AF5 – Difference-in-difference estimation: a placebo test for *intangibles*



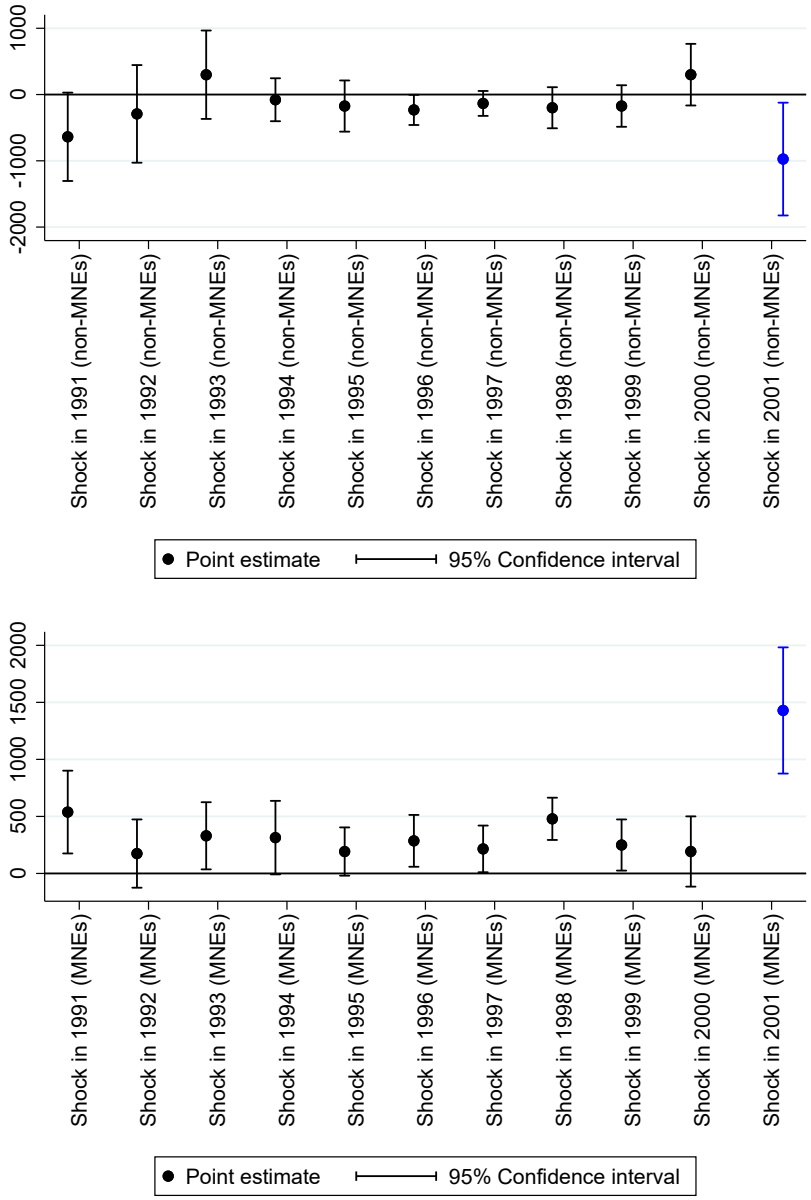
Notes. These graph depict the coefficients obtained when replacing in the DiD equation (6) $PNTR$ by a set of 11 variables defined as follows: $\mathbb{1}_{t \geq x} \times (NNTR_{j1999} - NTR_{j1999})$, with $x \in \{1991, ..., 2001\}$. The variable is omitted for 1990 due to collinearity. The dependent variable is $intangibles_{ijt}$. See section 5 for more details.

TABLE AT7 – 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. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.

FIGURE AF6 – Difference-in-difference estimation: a placebo test for *intangibles*2



Notes. These graph depict the coefficients obtained when replacing in the DiD equation (6) *intangibles* by *intangibles*2 and $PNTR$ by a set of 11 variables defined as follows: $\mathbb{1}_{t \geq x} \times (NNTR_{j1999} - NTR_{j1999})$, with $x \in \{1991, ..., 2001\}$. The variable is omitted for 1990 due to collinearity. The dependent variable is $intangibles2_{ijt}$. See section 5 for more details.

TABLE AT8 – 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^{d}	-0.03	-22.73
	(0.03)	(0.03)	(274.86)
$PNTR_{jt} \times MNE_{ijt}$	-0.04^{b}		648.93^{b}
	(0.02)		(277.57)
$intangibles_{ijt}$		-1.63e-6	
		(2.86e-6)	
$intangibles_{ijt} \times MNE_{ijt}$		-1.04e-6	
		(2.31e-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. See section 5 for more details. This time, the multinational activity dummy is defined using Exhibit 21 reports of Form 10-K filed by firms. More precisely, a firm is deemed multinational if it reports at least one significant subsidiary in a foreign country. A subsidiary is significant if its assets exceed 10 percent of consolidated assets or if its income exceeds 10 percent of consolidated income. Moreover, any subsidiary is significant if by combining all insignificant subsidiaries into one affiliate they exceed 10 percent of assets or revenues. See Dyreng and Lindsey (2009), where the data originate from, as well as Dyreng, Hoopes, Langetieg, and Wilde (2020) for more details on Exhibit 21 reports. In column (2), the p-value associated with the test for the joint significance of $intangibles_{ijt} + intangibles_{ijt} \times MNE_{ijt}$ is 0.06. 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 AT9 – 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), but with 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. $^{d}p < 0.15$, $^{c}p < 0.10$, $^{b}p < 0.05$, $^{a}p < 0.01$.