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"An examination of the impact of Tax Cuts Jobs Act on tax avoidance strategies of US firms"

RELATORE:

CH.MA PROF.SSA ANNA ALEXANDER VINCENZO

LAUREANDO: MATTEO SCHIAVOLIN

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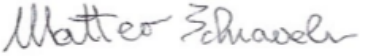
Firma (signature) 

Table of Contents

1. Introduction

Taxes represent one of the major costs borne by the firm, affecting its decisions in corporate investments and financing decisions. Literature in tax research involves multidisciplinarity, as finance, accounting, economics and law research studies with their different approaches and language make tax research difficult but at the same time exciting (Hanlon and Heitzman, 2010).

In the last decades, governments' concern and attention about tax avoidance strategies and consequent loss of corporate tax revenues surged. Moreover, also public attention on this topic increased dramatically, especially after the big scandals of Panama Papers in 2015 and Pandora Papers in 2021. The first suspect when we focus on tax avoidance is multinationals. Multinationals' habit is to engage in complex cross-border movements of capital and profits to pay fewer taxes with several consequences. The home country (usually an advanced country) has to borne the loss of tax revenue, and the country where taxes are paid (usually a tax heaven country) has to maintain a minimum level of attraction for tax purposes since these revenues coming from tax payments are crucial resources. Managers of multinationals have a twofold goal, the first aspect is to make the firm as much profitable as possible maximizing tax avoidance activity, and the second aspect is to engage in tax avoidance for pure opportunistic scopes. As we can notice, tax avoidance schemes and the actors involved are challenging to understand and unearth.

Tax avoidance and Base Erosion and Profit Shifting (BEPS) are sizable issues from decades in the agenda of politicians of advanced economies. In 2012, on the margins of the G20 meeting, many ministers and politicians urged for more coordination among countries to strengthen international tax standards and fill the gaps arising from loopholes in tax codes.

In 2017 Trump Administration generated one of the most sweeping US corporate tax reform changes since 1986, that is the Tax Cuts Jobs Act. The main changes concern the reduction of corporate tax rate and new three international provisions designed to affect multinationals' income shifting and taxes. Forecasts of the benefits of this reform on firms and on government balance are tricky since the provisions overall considered can have opposite effects, however, the aim of this dissertation is to try to disentangle the effects of the Tax Cuts Jobs Act on tax avoidance level of US firms.

In the first part of the dissertation, I present a literature review of tax avoidance and its main consequences on firms. Tax avoidance definition is not unique in literature due to the complexity of what it represents and implicates. Researchers have built many metrics to capture the extent and the different shades. In the end tax avoidance effects on firms and judgment depend on the ability to plan a balanced and meticulous tax strategy, affecting positively firm

value, cost of capital, and shareholder wealth; on the other side excessive aggression can be detrimental to the firm and for the managers that have engineered the strategy.

In the second part, I focus on evaluating the effects of the Tax Cuts Jobs Act on a sample of US firms, testing if its enactment has increased or decreased tax avoidance in US firms. Data has been collected in Orbis Bureau Van Dijk for a time frame from 2013 to 2019, the last available year not affected by the COVID-19 outbreak. A difference-in-differences model has been adopted to compare affected US firms against not potentially affected Canadian firms with similar characteristics.

In the third and last part, I present the main findings and conclusions found through empirical models. Even though evaluating the overall Tax Cuts Jobs Act effect on US firms' tax avoidance results challenging, data shows that US firms decrease their tax avoidance attitude after TCJA enactment but, conversely, increase their conforming tax avoidance propensity.

2. Literature review of the main consequences of tax avoidance

2.1 Tax avoidance strategies conducted by multinationals

Firm income can be generated by two sources: the sale of goods and services (active income) and investing cash on hand (passive income). The country tax authority can claim taxes on the basis of the source of the income, meaning the location where the main investments in labor and capital take place with respect to the achievement of certain thresholds; and the residence of the corporate taxpayers, that is the primary location in which the income generated by the company is attributed. International law establishes that taxes derived from the active income of foreign affiliates are collected by the source countries, whereas taxes derived from passive income are collected by the residence countries. More specifically, active income is only taxed in the source country under a territorial system (used in Europe and Japan); under a worldwide system, mostly used in BRICS countries, the residence country taxes the income from all source countries. In order to avoid double taxation of income, the residence country grants a foreign tax credit against its own tax, in this way only the excess of the residence country's effective tax rate over that in the source country would represent the residence tax (Beer et al., 2020).

Tax avoidance methods initiated by multinationals are mostly legal, exploiting provisions and loopholes granted by the jurisdictions of different countries. Contractor (2016) presents seven different types of tax avoidance strategies adopted by multinationals:

1) ***Exemption/deferral of foreign affiliate income***: usually a country taxes multinationals' income generated within the jurisdiction, not considering the income produced by the foreign affiliates of the multinationals. Instead, US and other countries tax multinational income as worldwide, considering both domestic and foreign income as taxable. After paying taxes in each country, US multinationals can postpone indefinitely the foreign taxable income by parking this wealth in tax haven countries or reinvesting in foreign operations. It's worth underlining that this strategy is legal and permitted by the loophole in US law. The amount of missed proceeds of the US government is about 2,1 to 3 trillion of dollars. The literature shows empirically how US multinationals increase their dividend payout thanks to lower tax rates applied to income earnt abroad.

2) ***Transfer Pricing***: when two affiliates are established in two different jurisdictions and they trade, the affiliate that is in the lower tax rate jurisdiction tends to artificially increase the sale price so as to increase revenues whereas the affiliate in the higher tax rate jurisdiction would pay higher costs and so a lower taxable income would arise. As an overall result, the after-tax income of the multinational would increase thanks to the

tax saving. The tax authority can identify and penalize this practice only if the fair value of goods and services traded is available. In the case where there is no market to compare or there are no reliable information or estimates, the "Arm's Length" principle helps tax authority prevent opportunistic transactions. Arm's Length principle establishes that the price negotiated between the affiliates must be equal to the price that an unrelated customer should pay for the same goods and services and circumstances. Again, the application of this principle is quite straightforward for basic goods and services transactions, but more difficult for unique intangible assets or patents or licenses with almost no comparable transactions.

3) ***Royalty payments***: usually multinationals are technology-intensive, own several intangibles and invest in R&D. In this case the patent or the brand is transferred to an affiliate established in a low or zero-tax rate country to which the headquarter would pay royalties for the use of the license. The result is a reduction of the tax liability of the headquarter thanks to the deductions allowed by almost all governments for royalty payments. As in the cases of Google, Apple, and some pharmaceutical firms, it can happen that the license or the rights are transferred to an even lower tax rate country as Ireland with the resulting royalty payments; this chain can carry on until royalties are collected by a zero tax rate country as the Cayman Islands or Bermuda.

4) ***Intracorporate loans***: one affiliate can lend money to another affiliate in a high tax rate country. Since interest payment is an expense, it can be deducted and lowers the taxable income of the high-tax rate affiliate. The debt shifting strategy reduces the overall tax bill without increasing the bankruptcy risk since the debt exposure of the group has not changed.

5) ***Other central overheads and costs***: R&D expenditures are mostly borne by the parent in the home nation and this holds also for other categories of overheads such as global IT, supply chain management, human resources, etc. These costs should be allocated and borne proportionally to each foreign affiliate that benefits from these expenditures but in many cases, multinationals bias and allocate a larger slice in the higher tax rate countries. US multinationals expense fully the R&D cost of intangible assets during the exploration phase since the capitalization criteria is not met, in order to reduce taxable income. Once the company will start making profit the license will be transferred to a low-tax rate country.

6) ***Round-tripping in tax havens***: besides of holding patents and brand rights, licensor of royalties, and park of foreign affiliates profits not repatriated back, tax havens can be used for "round-tripping". In the case of China's foreign direct investments (FDI) outflows, about 70% of them go to affiliates or subsidiaries in Hong Kong and the Caribbean. This capital then returns in China masked as "foreign investments" thanks to the more generous legislation and constraints applied to foreign investments than domestic. In Europe, this strategy is largely exploited by multinationals that create special purpose entities or shell companies[1] in Luxembourg and Netherlands.

7) ***Inversion***: in this tactic, the multinational headquarter is shifted to a low-tax rate jurisdiction thanks to the acquisition or merger with a foreign firm previously established in the low-tax rate country. Examples are Pfizer with Allergan established in Ireland escaping from a 35% American tax rate to a 12,5% Irish tax rate; Burger King to Canada or Mylan to the Netherlands, all of them escaping from the US higher tax rate. CBO (2017), using a sample of 60 US multinationals restructuring from 1983 to 2015, finds that the average saving in each company's global corporate taxes is about 45$ million in the year after the inversion.

Contractor (2016) continues listing ethical advantages and disadvantages originating from tax avoidance strategies carried by US firms. Some claims that tax avoidance strategies are ethically defensible and necessary to maximize shareholder wealth:

- Tax avoidance is the only way to survive and maintain a competitive advantage vis-à-vis firms located in lower tax rate countries. Fewer taxes paid means higher free cash flow available to be distributed to shareholders as dividends and higher resources allocated to R&D with a further bound in competitiveness.
- Taxes are money given to the profligate government to finance public programs with no or residual benefit for firms
- The US tax rate was at 35%, one of the highest in the developed world, and also applied to some worldwide operations of US companies. If the law permits loopholes, why US firms should not exploit them legally to avoid higher tax payments?
- During inversions, jobs would remain in the original nations even though the domicile for tax purposes has changed

[1] Company that has no economic activity or purpose but the only purpose is the encirclement of capital controls

Others criticize that:

- Law has been written in a way to maintain loopholes and provisions to favor corporate interests; this was allowed by lobbies' power and political influence that large companies have. 35% can be considered as the actual marginal rate applied to the last dollar of wealth against an average effective tax rate that is tremendously lower
- Higher cash flow available doesn't mean necessarily happier shareholders and a growth in the R&D budget, larger after-tax profit can be diverted by top managers for example in fatter bonuses and more valuable stock options
- Shifting the headquarters to a low-tax rate country could increase the probability of additional job creation there rather than in the original country
- During the last decades, countries have tried to limit these strategies and mitigate the tax avoidance trend of multinationals. Transfer pricing regulations explain the methods to calculate adequately transfer prices with the application of the arm's length principle and a set of penalties if rules are not respected. Thin capitalization rules don't permit the deductibility of interests after that a certain limit on net interest or net debt is reached. Controlled foreign corporation (CFC) rules fix limits on the ability of foreign subsidiaries to defer domestic taxes.

2.2 What is tax avoidance?

Among all the literature there's no unique definition of tax avoidance.

Hanlon and Heitzman (2010) define tax avoidance as a continuum of tax planning strategies where, from one side, we have a less aggressive form of tax avoidance like municipal bonds and from the other side the most aggressive form as evasion or tax sheltering. It's about the firm deciding the degree of aggressiveness in order to meet its strategies and plans. Mills et al. (1998) find that an additional 1$ in investment in tax planning generates a 4$ reduction in tax liability. The authors don't distinguish between legal tax avoidance behavior and illegal evasion for two reasons: first, most of these strategies concern legal transactions that are considered often technically legal; second, the legality of a tax avoidance operation can be determined only after the fact.

In an agency theory framework tax avoidance permits the firm to maximize its activity by transferring wealth from the state to corporate shareholders.

US companies must present a measure of income for financial accounting purposes and one for tax purposes. Differences in pre-tax accounting earnings and taxable income can be temporary, as differences on the time of recognition with a future reversal (depreciation, warranty, bad debt expenses), or permanent, as we will not have a reversal (interest of municipal bonds only deducted in the calculation of taxable income).

Dyreng et al. (2008) measure tax avoidance as the ability to pay a low amount of cash income taxes compared to corporate pre-tax income, this mismatch can be found on the financial statements of the firm where the GAAP tax expenses don't coincide with the amount of cash paid. In this case, the causes are holes and grey areas in the law and deductions lawfully established. Slemord (2004) describes tax avoidance as anything that corporations do to reduce their tax liability, the more the firm is aggressive the more is likely "pushing the envelope of the law".

The primary aim of tax avoidance is to make the firm look more profitable from shareholders' perspective, moreover, executives can engage in sheltering strategies for opportunistic selfish purposes. On the other side, the firm has to bear some costs due to its behavior: a lower amount of taxes paid now could lead to a higher amount of taxes in the future causing a dramatic shrink of the cash flow, stock price crash, and reputational costs. Managers should engage in tax avoidance until the marginal benefit earnt in decreasing the cash flow paid for tax equals the marginal benefit of this strategy.

Dyring et al. (2020) analyze the relationship between tax avoidance and tax incidence. In their framework, a profit maximizer firm invests in capital and labor, and tax avoidance activity represents a cost for the firm and affects the optimal mix between the two factors. They suppose the firm can only partially deduct investment costs on capital, whereas costs on labor (wages) are fully deductible for tax purposes. A firm with more highly skilled workers results in more tax avoidance activity. In a labor market with a high elastic supply, an increase in the tax rate is sustained more by the firm rather than workers, so the firm will enlarge its investments in capital to the detriment of labor. Since capital investments benefit from a reduced tax deduction it means that lower income can be exploited for sheltering purposes increasing the marginal benefit of tax and so tax avoidance propensity as showed by the positive relation between Cash ETR and % of highly skilled workers in the model. This hypothesis is reinforced by analyzing the labor and capital productivity. If the productivity of capital is higher with respect to work, the firm will tilt towards the capital. Tax avoidance will increase thanks to the limited deduction of capital.

2.3 Measures of tax avoidance

2.3.1 Effective Tax Rates (ETRs)

It's possible to find information about income tax expenses, tax assets, and liabilities in the financial statements of the firm, taxable income is reported in the tax return even though this report is not publicly available. Researchers need to begin with the financial statements and come out with estimates of taxable income, usually resulting in errors and distortions because of the discretion of managers in the drafting of financial statements.

Graham and Tucker (2006) point out that S&P 500 firms reduced their ETR of about 30% in the early 90s to less than 20% after ten years as an effect of the increasing tax sheltering strategy of firms against the reduction in tax collections of the government (Figure 2.1), where ETR is calculated as taxes paid measured in cash flow statement over pretax net income.

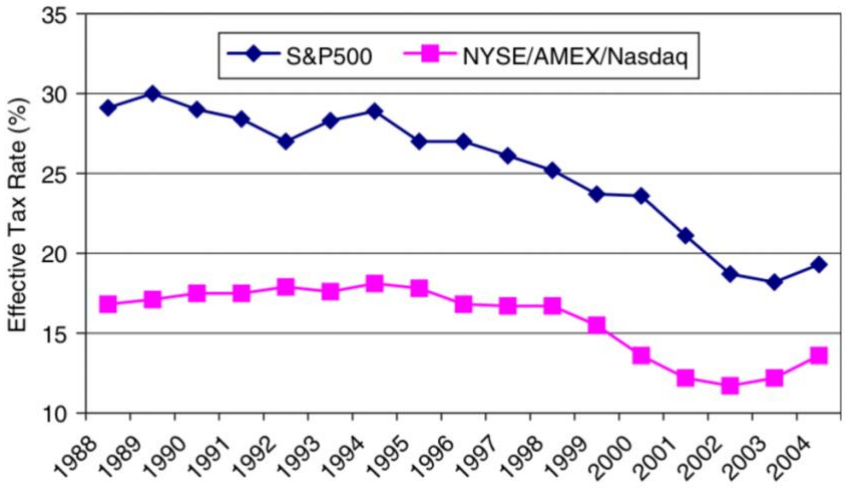


Figure 2.1: Mean effective tax rate for US corporations. Source: Graham, J. R. and Tucker, A. L.

Probably, the most used measure of tax avoidance is the Cash ETR, computed as cash taxes paid over the pre-tax accounting income found in the Income Statement. Unlike GAAP ETR, which displays the total tax expenses on the numerator, Cash ETR has the advantage of not being affected by manipulations of accruals but it can include also outflows of cash taxes originated by earnings belonging to previous fiscal years. Furthermore, GAAP ETR accounts also for deferred taxes that will be paid in the future. For example, a firm that adopts accelerated depreciation for tax purposes would book higher deductions and so a lower amount of taxable income if compared to the book income, increasing deferred taxes that will be paid in the future with the reversal of the depreciation method. Since GAAP ETR includes both current and deferred taxes, it's not able to capture this strategy of tax avoidance.

Dyreng, Hanlon, and Maydew (2008) build their "long-run cash effective tax rate" by summing the total cash paid for taxes for a time period of ten years and dividing the corresponding year-outflow by its total pre-tax income. Measuring over a longer period than one year smooths the action of manipulation and reversal of accruals, moreover, if a firm reports a negative pre-tax income, it doesn't invalidate the entire index. Given a fixed amount of taxes during the time period, lower long-run Cash ETR can be the result of earnings management rather than a specific tax-saving behavior, with an upward estimate of earnings in the first years and a downward reversal of earnings in the second period, on average the result of this measure will not be affected by the manipulation.

They use a sample of US firms during the years 1995-2004 ending with 24.390 firm-years with an unbroken string of cash taxes paid, income tax expense, and pretax income. In their analysis, they find that usually firms are able to maintain a high level of tax avoidance even in long periods of time as highlighted by a greater number of firms belonging to the 5th and 25th percentile in the CASH ETR10 distribution than in the CASH ETR1 distribution. In order to test the association of CASH ETR1 with its long-run counterpart (CASH ETR10) they regress different measures of CASH ETR1 (low, medium, high) on CASH ETR10:

Dependent Variable	Condition	Intercept	*CASH ETR1*	Adj. R^2	n
CASH ETR10	All Observations	0.206***	0.299***	0.146	1,891
CASH ETR10	*CASH ETR1* <= 0.2	0.195***	0.366***	0.019	712
CASH ETR10	0.2 < *CASH ETR1* <= 0.4	0.199***	0.337***	0.027	810
CASH ETR10	0.4 < *CASH ETR1*	0.251***	0.221***	0.064	369

Table 2.1: Association of CASH ETR1 and CASH ETR10. Source: Dyreng, Hanlon and Maydew (2008)

- In the first row, the results of the entire sample are displayed. The coefficient of CASH ETR1 is 0,299 and significant, showing a positive association between one-year rates and long-run measures.
- In the second line, we have a subsample where a low CASH ETR1 is observed (CASH ETR1<= 0,2). The coefficient of CASH ETR1 is 0,366 and significant, showing a positive relationship between the two measures
- In the third line we have a subsample where a medium CASH ETR1 is observed (0,2 < CASH ETR1 <= 0,4). The coefficient of CASH ETR1 is 0,337 and significant, also here a positive relation is showed
- In the fourth line, we have the subsample of less aggressive firms in tax avoidance where a high CASH ETR1 is observed (0,4 < CASH ETR1). In this case, the coefficient drops to 0,221

The model shows that the magnitude of low CASH ETR1 (higher tax avoidance) is higher in affecting CASH ETR10 meaning that lower ETRs today are more likely to persist even in 10 years.

Guenther, Matsunga and Williams (2017) deepen the investigation of the persistence of low ETRs. They establish that firms in the lowest CASH ETR quintile remain in the lowest CASH ETR in 40% of cases but also firms in the highest CASH ETR quintile remain in the highest CASH ETR in 33% of cases, signaling that persistence of ETRs is true both for high and low tax avoidance firms. Successively they establish that the likelihood of remaining in the same ETR quintile is significantly higher for ETR quintile 1 than for ETR quintiles 2 through 5. This prediction is not consistent with the initial hypothesis stated by the authors where lower ETRs were expected to be less persistent since they were constructed with strategies with high reversal future probability.

As appointed by Hanlon and Heitzman (2010) ETR measures can only explain "non-conforming tax avoidance": operations that are booked differently for book and tax purposes with the aim of reducing tax liability and increasing book income. In the case of "conforming tax avoidance", where operations are recorded even for book and tax purposes and book income is reduced as well as the taxable income for tax strategy, effective tax rates measures would be useless like in the case of a firm that lowers its taxable income and also its explicit taxes reporting a lower book income.

2.3.2 Book-tax differences

Another useful measure is the book-tax differences, capturing the gap between taxable income and accounting income. This gap arises for different reasons: these measures aim to represent distinct objectives and so they are also subject to different rules. Book income must follow financial accounting standards in order to provide reliable and useful information for the decisions of different stakeholders; income taxes must follow rules written and enforced by a political process used to collect the greatest amount of revenues, necessary as a macroeconomic policy tool for stimulating or cool off the business cycle. The taxable income calculation method is a mix of cash and accrual basis and is based on the location of earnings instead of book income (for example consolidated financial statements include all income and losses of the parent and subsidiaries with no interest of their jurisdiction).

Hanlon (2003) finds three main reasons for the existence of the book-tax differences: stock options, tax reserves for a corporation's uncertain tax positions, and intra-period tax allocation. When employees exercise their stock options, the difference between the market value of the stock and the strike price paid for the exercise decreases equity and not the tax liability, leading

to an overstatement of tax expenses. Tax expenses could be higher because of changes in the liability of valuation allowance for an uncertain tax position, even if the payment of the possible future taxes is not expected in the current or future years. Tax expenses in the financial statements are based on income from continuing operations, disregarding gains and losses from discontinued operations and extra-ordinary items, instead of tax liability that incorporates all income.

Book-tax differences are a good metric for detecting earnings management. Desai and Dharmapala (2006) disentangle the measure of book-tax differences in order to assess the magnitude of earnings management that affect and widens the gap between book and tax income. Through Compustat dataset, the authors build a sample of firms restricting the time period to 1993 to 2002, which is the period where managerial compensation is available. The OLS model is represented as:

$$BT_{i,t} = \beta_1 TA_{i,t} + \mu_i + \epsilon_{i,t}$$

Where:

- $BT_{i,t}$ is the book-tax gap for firm *i* in year *t*, scaled by the lagged value of assets
- $TA_{i,t}$ is the total accruals for firm *i* in year *t*, scaled by the lagged value of assets
- $\mu_{i,}$ is the average value of the residual for firm *i* over the sample period 1993-2002
- $\varepsilon_{i,t}$ is the deviation in year t from firm *i*'s average residual μ_i

This model can be synthesized as the regression of book-tax differences on accruals (measure of earnings management) and on a residual component (proxy of tax avoidance). In this setting, we can define the accruals component as the "temporary book-tax differences" directly related to pre-tax accounting accruals and the residual component as the "permanent book-tax component" that reflects the most aggressive strategy of tax avoidance since its persistent nature is not subject to future reversals. As shown by the second regression presented by the authors:

$$TS_{i,t} = \mu_i + \epsilon_{i,t}$$

$TS_{i,t}$ (proxy of tax sheltering activity) is the part that explains variations in book-tax differences beyond total accruals.

Chen et al. (2012) and McGill and Outslay (2004) define permanent differences between book-tax income as tax planning strategies recording deductions and expenses only for the purpose of reducing taxable income and recognizing non-taxable book income to increase net income. Temporary differences are mechanisms that reduce only the cash paid to the tax authority, not affecting book income, tax expense, and net income.

Desai (2005) displays book income and tax income both reported to the IRS from 1987 to 2000, as shown in Figure 2.2. Simulated book income is defined as the book income that legitimates

differences in reporting between tax income and book income, counting for the different treatments of stock options, foreign reinvested earnings, and depreciation. The graph shows how actual book income was well tracked by simulated book income but from the mid-1990s actual book income rose more than simulated book income and taxable income, remarking the more and more weak power of book income in explaining tax income dynamics.

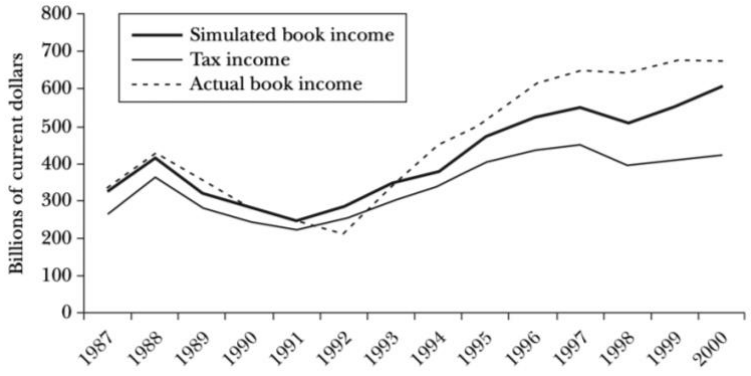


Figure 2.2: the evolution of Tax Income, Simulated Book Income and Actual Book Income, 1987-2000. Source: Desai (2005)

2.3.3 Tax shelter

Tax shelter has no universally accepted definition.

The US Congress (Joint Committee on Taxation, 1999) specifies tax shelter as an endeavor principally designed to avoid taxation without exposure to economic risk or loss.

Brian et al. (2015) define tax shelter as any method taxpayers create to reduce their taxable income without valid business purposes, it can be placed on the most aggressive side of the tax avoidance strategy range usually attracting legitimacy controls from the IRS authority.

Hanlon and Slemrod (2008) refer tax shelter as complex transactions used by firms to obtain significant tax benefits probably never intended by the tax code; these transactions may not be illegal per se and their use, if detected, may provoke an IRS assessment. The authors classify tax shelter as a subset of tax aggressive behaviors and provide some examples of different types of tax shelters. In the corporate owned life insurance (COLI) the firm purchases life insurance for many employees of the company – even lower-level workers. The firm then borrows against this cash outflow usually from the life insurance company in order to deduct the interest of the loan. In the future, the firm will receive the proceeds from the insurance once the worker will die, even if he's no more working in the firm. Another example is the case of the Lease-In-Lease-Out tax shelter (LILO) and Sale-In-Lease-Out (SILO) tax shelter. A US corporation will lease (LILO) or purchase (SILO) an asset from a municipality entity that is tax exempted and then sublease the asset to the latter. The US corporation gets accelerated depreciation deductions on the calculation of taxable income, whereas a slower depreciation for the calculation of book

income in the financial statements. Lastly, the case where a firm transfers its intangible assets to a corporation in a tax haven country. Once the transfer succeeds the firm has to pay for the use of intangible, recording deductions in the tax return; on the other hand, the corporation in tax haven books revenues but it will not pay taxes.

Hanlon and Heitzman (2010) pinpoint several tradeoffs of tax sheltering as a measure of tax avoidance. First, samples of firms used in previous studies of tax sheltering include only firms caught in shelter activities or that have disclosed them because of recent disclosure rules, in this way the part of tax avoidance activity less aggressive would miss. Secondly, an endogeneity problem can arise since shelters are single transactions and may not capture the firm's overall avoidance measure, a broader definition of tax avoidance is needed to capture firms that engage in tax avoidance without resorting to shelters.

2.3.4 Unrecognized tax benefits (UTB)

They can be seen as a reserve cushion that a firm has to accrue because of future likely payment of tax liability arising from its uncertain nature. This can arise from the fear of possible interventions of tax authorities and auditors that ascertain an incorrect lower amount of taxes paid that has to be settled in the future. A higher amount of UTB means a greater engagement in tax avoidance by the firm. UTB is a contingent liability and is subject to managers' discretion and manipulation. Before FASB Interpretation Number 48 (FIN 48), managers rarely disclosed in detail this item since its sizable ability in signaling the tax planning strategy of the firm. It could have been estimated by taking the difference between domestic current tax expense and the total tax liability (Graham et al. 2012).

Hanlon and Heitzman (2010) point out that if managers want to increase even tax and book income by taking an aggressive position both for financial accounting and tax purposes, they would simply avoid recording the UTB causing a loss of information about this tax avoidance strategy. The UTB measure would be able to exhibit both conforming and non-conforming tax avoidance strategies.

Dyreng, Hanlon, and Maydew (2014) utilize additions to the UTB account in the financial statements as a proxy for tax uncertainty, defined as the potential losses of tax savings, stored with tax avoidance behaviors, caused by the challenge of the tax authority. They show that the positive relation between tax avoidance and tax uncertainty is not always so straightforward: firms can achieve high levels of tax avoidance by undertaking strategies with low risks of tax uncertainty (municipal bonds or bonus depreciation rules). The positive relation between tax avoidance and tax uncertainty is stronger in firms with higher intangible assets since R&D tax credits are one of the first items audited issue by IRS; the relation can be even reinforced if the

firm use extensively tax haven subsidiaries since the activity of shifting intangible assets in tax haven subsidiaries is considered riskier than other activities regarding shifting to tax havens.

2.4 Tax avoidance in an agency theory framework

In an agency theory framework, the separation of ownership between managers and shareholders leads to opportunistic behaviors of managers in the costly and time-consuming activity of monitoring of shareholders. In order to align the incentives of managers, stock options have been offered as a part of their compensation.

CEOs face a trade-off in tax avoidance activity: a high tax avoidance tendency brings shareholders to worry about future possible penalties and payments of missed taxes from an IRS audit, reputational costs, and negative reactions of consumers; whereas a low tax avoidance means lower cash flow in the pockets of shareholders triggering general dissent and CEO layoff.

Philips (2003) investigates the role of an accounting-based bonus plan in affecting the level of ETRs, including CEO and Business-Unit managers. Evidence shows that only after-tax BU managers' accounting-based compensation is consistent in lower ETRs and so increasing tax avoidance. The same result doesn't hold for CEO measures.

Desai and Dharmapala (2006) develop a framework in a managerial agency context where tax sheltering can be used as a tool by opportunistic managers to divert earnings, and managers' incentives can be one instrument employed by shareholders to disincentive tax avoidance and rent diversion. In order to estimate the degree to which managerial incentives are aligned with shareholder interests (θ in the paper), they aggregate managerial compensation measures across all managers for each year and for each observation to obtain a measure of the structure of the managerial compensation of that specific firm. The variable $\text{STKMIXGRANT}_{i,t}$ defines the percentage of stock options over the total manager compensation that is formed by stock options, salary, and bonus. Then a governance index is employed (G), developed by Gompers et al. (2003). The index is composed of 24 antitakeover provisions, it can take a value from 0 to 24: lower G is associated with better quality governance since it signals lower insulation of incumbent managers from hostile takeovers.

The basic specification built by the authors is:

$$TS_{i,t} = \beta_0 + \beta_1 IC_{i,t} + \text{Firm Fixed Effects} + \text{Year Dummies (+ Controls)} + v_{i,t}$$

where IC_{it} measures incentive compensation[2] as a proxy for θ, firm fixed effects to capture unobserved heterogeneity across firms, a year dummies, and a set of control variables to count firm-specific characteristics as an asset, market value, and sales. The model using $STKMIXGRANT_{i,t}$ as control exhibits a negative and significant coefficient of -0,0104. The authors stress that it can be counterintuitive a negative and significant effect of incentive compensation on tax sheltering, they motivate this effect by explaining that in a scenario where corporate governance is poor, an increase in the alignment of shareholder and manager interest (that is an increase in $STKMIXGRANT_{i,t}$) has the primary effect of inducing more discipline on managers and so reducing their diversion behavior sheltering less income to the advantage of shareholders.

Successively, they insert corporate governance variable in the model, resulting in:

$$TS_{i,t} = \beta_0 + \beta_1 STKMIXGRANT_{i,t} + \beta_2(WELLGOV_i * STKMIXGRANT_{i,t}) + \text{Firm Fixed Effects} + \text{Year Dummies (+ Controls)} + v_{i,t}$$

$WELLGOV_i$ defines a dummy for well governed firms ($G_i \leq 7$). Dividing between well-governed firms and poorly-governed firms β_2 is significant and negative only for poorly-governed firms and positive and not significant for well-governed firms.

In general, their findings suggest that incentive compensations are an effective tool to decrease tax avoidance activity but this statement holds only for firms with a weak corporate governance structure. Incentive compensations would dissuade poor quality managers to engage more in tax avoidance to divert rent since their compensation would be more tied to after-tax income. For well-governed firms, they find a surprising null or weak positive relationship between tax sheltering and incentive compensation.

High quality managers are executives able to efficiently convert capital, labor, and intangible assets into revenues in a greater measure than competitors. Koester, Shevlin and Wangerin (2016) shed light on how much the expertise and quality of a manager can contribute to the level of tax avoidance. Regressing a set of variables including firm characteristics and year fixed effects on CASHETR, they find a negative relation between MASCORE (measure of managerial ability) and tax avoidance proxy, this holds even adding firm fixed effects to separate the effects of firm and manager characteristics and industry fixed effects to eliminate the cross-sectional variation between firms. Moreover, high quality managers reduce taxes paid

[2] For the sake of simplicity I only present $STKMIXGRANT_{i,t}$ as proxy of incentive compensation. The authors present other measures that account for restricted stock grants, option grants and stock option exercises. For more detail see Desai, M and Dharmapala D., (2006). Corporate Tax Avoidance and High Powered Incentives, pp 17-18.

by exploiting tax haven subsidiaries, R&D tax credits and greater application of accelerated depreciation.

Zolotoy et al. (2021) provide an explanation of the link between tax avoidance and CEO stock option incentives exploring the attitude of the CEO in anticipating a firm's corporate tax rate and comparing it to a benchmark corporate tax rate that is the peer firms' tax.

In the first scenario, if the corporate ETR of the firm is anticipated to be lower than that of peer firms, the CEO will behave in a less tax aggressive manner in order to move closer to the ETR industry benchmark, this behavior is justified by the likely hostile reaction of stakeholders that are aware of all the possible drawbacks and consequences that an aggressive tax avoidance could trigger. Following this hypothesis, the authors empirically find a negative relation between tax avoidance and CEO option wealth. Since the already high level of tax avoidance, an additional increase in tax avoidance activity leads the CEO to bear additional risk in its option wealth, increasing the possibility of triggering the already known harmful consequences of tax avoidance that lead to a crash in stock options value.

In the second scenario, if the corporate ETR of the firm is anticipated to be higher than that of peer firms, the CEO will engage in more tax aggressive tax planning so as to increase after-tax income and meet stakeholders' profit expectations. In this hypothesis, the authors empirically found a positive association between tax avoidance and CEO option wealth. They explain that CEO's attitude to mitigate losses through higher tax avoidance is related to the personal wealth he's tied to firm performance. Higher tax avoidance means higher after-tax income and so more valuable stock option that is part of the manager's personal wealth. Moreover, these two main findings are amplified by activist institutional ownership and limited by the hedging ability of CEO to safeguard its wealth on share price volatility.

McGuire, Wang and Wilson (2014) examine agency costs of tax avoidance in a dual class ownership structure. In a dual class ownership structure stocks can be divided into superior stock usually not traded, owned by directors and officers (insiders) that have the advantage of multiple votes per share but less claim on dividend cash flow than an inferior share (one vote per share and publicly traded). They find that the divergence between voting rights and cash flow rights with managers owning superior stock type brings a lower level of tax avoidance. Managers are not incentivized in inflate earnings of their lower claim in dividends. In their model, they estimate a positive association between WEDGE (proxy of the difference between voting rights and cash flow rights of insiders) and CASHETR.

2.5 Capital structure

When we analyze the capital structure of a firm is essential to start with the milestone propositions of Modigliani and Miller (1958, 1963). They claim the value of a firm is not affected whatever it would be financed with more debt or more equity in a world with no taxes, agency and bankruptcy costs and information asymmetries. The next step is recognizing that a firm is more valuable the more it finances its needs with debt since interest costs would provide a debt tax shield reducing the cost of capital.

After, the literature presents new researches inserting leverage costs as bankruptcy and agency costs, loss of non-debt tax shields, and personal taxes on equity and bond income. In this way a trade-off between the tax advantage of debt and the costs that it causes arises, influencing the optimal capital structure of a firm. Bradley, Jarrell and Kim (1984) identify three main firm-specific factors that affect the optimal capital structure of the firm:

1) the variability of firm value decreases debt. Higher volatility of stocks brings to greater future probability of financial distress costs and so the loss of interest tax shield opportunities.

2) the level of non-debt tax shields. Higher non-debt tax shields increase the leverage ratio of the firm. Non-debt tax shields such as higher levels of depreciation or tax credits are generated by high investments in tangible assets financed by debt. This explanation doesn't follow the general literature consensus of substitutability between non-debt tax shields and debt issue since non-debt tax shields offer the opportunity of decrease taxable income without the need of having interest expenses as a mean of tax sheltering.

3) the magnitude of the costs of financial distress has a negative association with debt financing.

Graham and Tucker (2006) explore the substitutability between non-debt tax shields and interest tax shelters, supposing that firm resorts less to debt to decrease taxable income if non-debt tax shield opportunities are available. This theory supports the initial research conducted by DeAngelo and Masulis in the early 80s. The authors form a sample of firms involved in tax sheltering cases, that is firms accused by the government of sheltering practices. Then, they identify two different samples, one including tax shelters firms and one for matched firms (firms with assets within +/- 25% of the sheltering firm's assets in the year before the sheltering activity began). In the matching procedure, if the procedure identifies more than one firm, one observation is created by the average of all the matches. They show that firms adopting a non-debt tax shield present smaller debt-to-assets and debt-to-value ratios and the differences with the matched firms are statistically significant. An OLS regression is run, testing the relation that a set of controls has on debt to assets ratio. The most interesting regressors are a dummy variable equal to one if the firm engages in tax sheltering; ROA that captures the extent in which more profitable firms exhaust firstly internal funds and then resort to debt (pecking-order theory); a

dividend dummy and the proportion of collateralized assets. Tax shelter coefficient is significantly negative supporting the idea that firms engaging in non-debt tax shields rely less on debt as mean of decreasing taxable income. Firms that pay dividends, which are more profitable and with a higher percentage of collateralized assets finance their needs with more debt.

Lin, Tong and Tucker (2014) set a two periods model dividing firms in tax planning attitude (aggressive or passive) and if the assets are financed entirely with equity (no-debt) or with a mix of equity and debt (debt). In this setting, firstly a firm decides about tax planning and then in the next period the proportion of debt in order to maximize the following equation that represents the value of total assets:

$V_{TA} = \{(M)\ (1-\alpha)\ (1-t_i) - B(1+r) + Br(t_i) + B(1+r) - pQ\} / (1+k_j)$

Where V_{TA} represents the value of total assets, M is the firm's forecasted pre-tax cash flow for the period, t_i is the effective tax rate, B is the debt, p is the probability of penalty because of tax avoidance behavior, Q is the penalty and k_j is the cost of capital.

The model explains that the value of a firm, with at time 0 passive tax planning strategy, would enhance if the benefit of the higher interest tax shield due to the increase of debt overcomes the added agency cost and the higher cost of capital used to discount the cash flows. On the other hand, a firm with an aggressive tax strategy at time 0 would increase less its proportion of debt than the passive firm since the costs of increasing debt would be equal but the benefit of an interest tax shield would decrease because of its lower ETR. More profitable firms, since their higher cash flow, are more likely to reach any limit in tax aggression and debt level. Then, transaction costs associated with a lumpy debt retirement are introduced and they cushion the propensity of the firm to retire debt. The more the costs of lumpy debt retirement increase, the more the firm would require higher tax aggressive benefits to offset these costs.

Using a 4765 firm-year observations sample from 2006-2011 they regress different measures of leverage on a set of control variables where tax aggression is the main explanatory variable of interest. The model is built as:

$$LEV = \alpha_0 + \alpha_1 TAX\_AGGRESSION + \alpha_2 NI + \alpha_3 SALES + \alpha_4 MB + \alpha_5 DIV + \alpha_6 COLLATERAL + \alpha_7 SIZE + \alpha_8 INDUSTRY\_DUMMY + \alpha_9 YEAR\_DUMMY + \varepsilon$$

Where LEV can take different measures as leverage measured by the total debt over total assets (ALEV), the ratio of long-term debt over total assets (BLEV), the ratio of total debt over the sum of total debt and equity (CLEV) and industry-adjusted firm leverage multiplied by firm assets and divided by total assets (IND-ADJ LEV). Also, TAX_AGGRESSION can take different proxies already presented as discretionary permanent differences (DTAX), tax shelter (SHELTER), five-year cash etr (CASH_ETR) and effective tax rate (ETR).

The coefficient of tax aggressive measures captures a negative association with firm debt level, this result is consistent in adopting different measures of tax avoidance. The analysis goes further showing that a firm is more levered when is less profitable since it's less able to finance its needs with self-generated income, is able to guarantee collaterals, is in the first-stage of growth and is larger in size. Dividing firms in high profit and low profit depending if their EBIT is below or above the median EBIT, tax aggressiveness coefficients are significantly negative for low-profit firms. For high-profit firms tax aggressiveness and debt can be defined as complementary since the overall positive relation. In all their analysis tax shelter measure is the fittest one with the highest explanatory power.

From the creditor's point of view, he could be worried about tax avoidance activity of the debtor firm for its future cash flow volatility and less transparent information. Debt covenants, stringent collaterals and higher risk premium could be solutions. In some cases, operations are so complex and disclosure is so inadequate that creditors require the power of renegotiating their claims more often as a tool of monitoring; in this way, in the meanwhile of a future renegotiation, bondholders can reap more information. In this perspective, tax avoidance is correlated with firms issuing debt with short maturity. IRS audit could be considered as a substitute for the monitoring role of debt renegotiation, it reduces asymmetries information and improve the quality of disclosure but it could also mean lower available cash flow for debt repayment since the likely penalties. So, creditors of bondholders, rather than lose money for settling the bill to IRS, prefer to protect their interests by relying more in debt renegotiation as a monitoring tool.

Platikanova (2015) empirically proves the negative association between the standard deviation of tax avoidance measures and debt maturity. From Compustat Industrial Annual database she draws a sample of US firms from 1989 through 2012 ending with a baseline sample of 36.152 firm-year observations for 5954 unique firms. The model:

$$DEBT\ MATURITY_{it} = \beta_0 + \beta_1\ TAX\ RISK_{it} + \sum_{k=2}^{K} \beta_k\ Controls_{it} + \gamma\ Time + \delta\ Industry + \varepsilon_{it}$$

explains the variance in debt maturity with different measures of tax avoidance plus other determinants of a firm's debt maturity structure. Time fixed effects have been added to control for the decreasing trend in debt maturity; industry fixed effects account for sector-specific demand. β_1 is positive and statistically significant meaning that tax avoidance brings to shorter debt maturity: considering the effective tax rate, a one-standard-deviation increase in ETRs causes an increase of 1,8% in debt maturity.

2.5.1 The under-sheltering puzzle

Under-sheltering puzzle theory tries to explain why a firm doesn't fully exploit all the possible and available benefits that tax avoidance could bring, choosing a level of tax avoidance lower than a higher potential level. It seems that advantages coming from tax aggressiveness behavior don't overcome possible future penalties. Weisbach (2002) ascribes this defect to the extreme risk aversion propensity of firms that prefer leaving money on the table for fear of reputational consequences. Gallemore, Maydew and Thornock (2012) test if the fear of bearing reputational costs affects the propensity of a firm in engaging in tax avoidance activity. Examining a panel of firms with high reputational levels, they conclude that high reputation firms don't avoid engaging in tax avoidance.

Desai and Dharmapala (2006) explain managers could forego tax avoidance opportunities if they are not able to really commit to shareholders they are not engaging in rent diversions. Even if an increase in tax avoidance would be value enhancing either for managers and shareholders, if shareholders retain managers' behavior opportunistically, this could lead to a stock market discount with negative consequences in the stock option plans of managers.

Kaldonski and Jewartowski (2020) shed some light on why some firms are less tax aggressive than their peers in the industry. They examine a sample of non-financial firms listed on the Warsaw Stock Exchange in 2005-2007 with the aim of detecting real earnings management. They conclude that firms engaging in real earnings management are more likely in decreasing tax avoidance attitudes strategically in order to avoid unpleasant tax audits and strengthen external monitoring.

Graham and Leary (2014) attribute a lower level of tax shelter to an erroneous approach of researches that don't incorporate deductions from off-balance sheet activity as non-debt tax shields or defined benefit deductions. In this way, an underestimation of the overall tax sheltering arises.

The decision to invest more or less in tax shelter could be affected by investment opportunities, operating uncertainty and capital market pressures. McGuire, Omer and Wilde (2012) prove that firms with larger investment opportunities prefer to invest in other more valuable strategies than tax avoidance rejecting the hypothesis that larger investments could create greater information asymmetry, higher tax shelter and lower probability of tax avoidance detection. Greater operating uncertainty leads to lower tax shelter; since the volatility of future cash flow is high, forecasts of future tax benefits are particularly imprecise. The firm would choose other value creating strategies. Greater capital market pressure leads to higher tax shields that firm adopts as a tool to meet or even beat agents' expectations of profits.

2.6 Earnings management

Since profit maximization, earnings management is one of the main tools used by managers to achieve profit targets. Usually, they tend to manipulate accruals seen the "hard" nature of cash flows. So, tax avoidance could be seen as a useful substitute of traditional earnings management strategies to affect cash flows, by reducing the cash flow paid to tax authority. Accounting accruals offer more discretion than taxes permit, so a temporary gap between income reported for accounting and tax purposes can signal discretion in non-tax accounting accruals (Hanlon and Heitzman, 2010).

Frank, Lynch and Rego (2009) explore the link between aggressive financial reporting and aggressive tax reporting. From the mid-1990s to the early 2000s financial and tax reporting aggressiveness popularity dramatically increased among US firms, bringing the Security and Exchange Commission to declare numerous accounting frauds and the Treasury Department to detect and preserve tax shelter activities. In the meanwhile, IRS documented a growing gap between taxable and accounting reported income. Exploiting the significant discretion that accounting standards provide, managers are able to artificially inflate book income and deflate taxable income but until a certain threshold or choose to manipulate only one item, otherwise, an excessively aggressive strategy would attract authority scrutiny. In their paper, the correlation between BTD (book-tax differences) and DTAX (discretionary permanent differences; representing accruals role) respectively is significant and positive with DFIN (difference between each firm's discretionary accruals measure and the median discretionary accrual measure), showing the positive correlation between tax aggressiveness and earnings reporting aggressiveness. This finding is consistent after regressing tax aggressiveness measures on accruals proxy and after regressing accrual proxy on tax aggressiveness measures.

Sanchez-Ballesta and Yague (2020) study the non-conforming tax avoidance of SMEs applied to earnings management in a sample of Spanish SMEs from 2006 to 2014. They find a negative correlation between the measure of discretionary accruals as proxy of earnings management and tax reporting aggressiveness, meaning that when SMEs adopt earnings management strategies to inflate income, tax aggressiveness is not deemed suitable.

Wang and Chen (2012), using a sample of listed companies in China during 2004-2006, find a positive correlation between the proxy of tax avoidance and discretionary accruals. The coefficient of the interaction between discretionary accruals and long-term performance is negative, meaning that firms with historical good performance don't need tax avoidance as a further instrument to implement to reach higher profitability. Interestingly, in firms that are more state-backed, they are less interested in improving their performance so the effect of long-

term performance on tax avoidance will be lower, increasing the magnitude of tax avoidance since the penalties in this type of firms would be riskless.

Blaylock, Shelvin and Wilson (2012), in accordance with Hanlon (2005), point that managers implement discretionary accruals for large book-tax differences. In this setting, earnings and accruals will show a lower persistence since the future reversal of accruals. So, book-tax differences arising from temporary strategies can be a powerful tool to explain the magnitude of accruals affecting earnings persistence. It's more likely to detect a firm reporting low earnings and accruals persistence when the main reason for a large book-tax difference is an upward earnings management, for example when a firm wants to mask financial distress or managers achieve bonus targets. On the other side, if large positive book-tax differences arise from tax planning strategies and not from earnings upward manipulation, earnings and accruals persistence will be higher than in the previous case. Evidence demonstrates that book-tax differences influence pre-tax book income of the next year, so they are useful variables in predicting earnings persistence. The authors, then, divide firms that show large positive book-tax differences into three subsamples on the basis if the firms manipulate accruals for earnings management, for tax avoidance purposes and neither of the two (BASE). In the earnings management subsample, OLS regression shows that the coefficient of the interaction between earnings management and present pretax income is significantly negative, meaning that when large book-tax differences arise from earnings management purposes, book-tax differences indicate a low persistence of the future measure of pretax income and so lower earnings persistence. For the tax avoider subsample, the authors don't find significant results.

Chen et al. (2012) explore to which extent book-tax differences consistency affects the informativeness of book and taxable income. Earnings persistence is more likely to be found in firms that don't engage in earnings management, whereas more persistent tax benefits are more likely to be found in firms that avoid aggressive tax avoidance. So, a firm that presents earnings persistence and persistent tax benefits will have consistent book-tax differences that lead to more informative book and taxable income. As suggested by Ayers (2009), earnings management and aggressive tax planning twist the real measure of economic performance and so the informative power of book income and taxable income decreases. The main findings suggest that, after controlling for tax planning, an increase in the earnings management attitude of the firm would decrease the informative power of book income and taxable income. Book-tax differences consistency are able to explain the effects that earnings management and tax planning have on the informativeness of book income and taxable income.

Cook et al. (2008) investigate if firms rely more on auditor services in tax planning for decreasing more their ETRs in order to meet the consensus about their earnings projections.

First of all, they examine all the controls that affect the propensity and ability of the firm to move from the fourth quarter ETR to the third quarter ETR (dependent variable). Tax_Fees rounds the fees paid by the firm to auditors for tax planning services and Miss is a dummy that equals 1 if the firm doesn't meet analysts' forecasts about earnings. They find that if the firm meets or beats analysts' consensus the coefficient of Tax_Fees is not significant; whereas if the firm announces lower earnings than analysts' projections it would engage in more tax planning paying higher fees to auditors to decrease the ETR and boost earnings, as clarified by the negative coefficients of Miss and of the interaction between by Miss and Tax_Fees.

2.6.1 Enron, Tyco and Xerox: three cases of earnings management and tax avoidance combination

Desai (2005) presents three different cases of misreporting of earnings and tax aggressiveness realized by managers, which utilize tax avoidance as a tool to inflate reported earnings and financial accounting discretion to limit taxes.

Before 1998, Enron's tax planning department used a structured transactions group to guarantee no tax payments in the near future. Once that tax avoidance strategy was fulfilled, structured transactions group were diverted in order to engage in earnings management, exploiting the reporting differences between book income and taxable income. Project Teresa, undertaken in 1997, was one of the cases where Enron engaged in transactions that increased currently operating income but the reduced tax obligations were due in the future. In 2000, Project Teresa permitted to record $226 million of accounting income, but thanks to the different accounting treatments of book income and tax income report, no taxable income was recorded. From 1993 to 1997, Enron issued $800 million in debt with the purpose of deducting interest expenses in the taxable income and preferred equity instruments in order to not dilute EPS but this tactic attracted the attention and the scrutiny of the IRS.

Tyco provides the case where tax avoidance was used as a tool for managerial diversion and expropriation, damaging shareholders' interests. In 1997 Tyco acquired a Bermuda-based corporation with a corporate inversion. It meant that Tyco transferred its tax domicile in Bermuda so as to pay lower taxes in US and foreign incomes. Figure 2.3 shows the consequences of this inversion in Tyco financial statements. The dashed line indicates revenues generated from foreign operations, steady at 35-40% of total revenues. The thick line with squares represents the portion of pretax income generated by foreign sources. They dramatically rose from 1997 (almost near inversion) for the shifting of pretax incomes from US and their declaration in the low-tax jurisdiction. The line with triangles exhibits the fall in the average foreign tax rate from an average of 60% in the 90s to 20% rate in 2000 as of consequence of

Tyco policy change from operating in foreign countries with high tax rates to low tax rates foreign countries. Income shifting and average foreign tax rate drop brought together to a reduction of the overall tax rate.

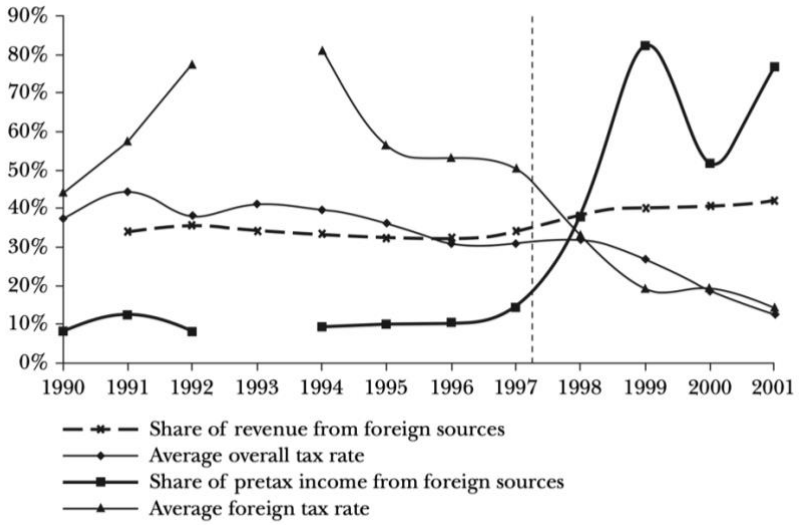


Figure 2.3: Tyco's Global Operations and Tax Avoidance Strategies, 1990-2001. Source: Desai (2005)

Tyco exploited the benefits of the combination between tax avoidance and financial performance manipulation. More precisely, a Luxembourg subsidiary called Tyco International Group (TIG), played as an intermediary to relocate profits from operating subsidiaries to financial subsidiaries through intercompany loans. Operating subsidiaries borrowed from financial subsidiaries located in tax haven in order to reduce their taxable income thanks to interest expense deductions; evidence shows that in 2001 10% of the operating income of highly levered operating subsidiaries was paid to TIG as interest expenses. From 1997 to 2002 Tyco CEO and CFO engaged in numerous rent diversions as the use of corporate funds for personal purposes, abuse of loan programs, unauthorized compensations and a series of misreports to hide these activities. Mainly, three strategies of tax planning were used by the CEO and CFO to divert funds:

1) since the complex and opaque nature of tax avoidance strategies, executives could obscure and mask operations conducted opportunistically with a guarantee that the likelihood of being uncovered would have been very low.

2) numerous income-shifting operations to foreign subsidiaries at a relatively low cost allowed the executives to divert some funds without appearing to have compromised operational performance.

3) In 2001 the executives sold $100 million of Tyco stocks to Tyco subsidiaries based in bank secrecy jurisdictions in order to hide this sale and their illegal strategies from investors until the end of the fiscal year.

Xerox in 2002 restated $2,1 billion of revenues and $1,4 billion of net income coming from earnings manipulation. Executives reported or ignored items in financial statements opportunistically manipulating the timing of recognition. The aim was to inflate earnings to permit the exercise of stock options but in contrast, at the same time, long-term shareholders experienced negative real returns. Xerox launched in 1999 Project Global to decrease the effective tax rate to improve net income, shifting about $3,4 billion of pretax income to Ireland and reaching an effective tax rate under 30% by 2002. In 2001 Project Global failed to result in an increase in the amount of tax burden, in low-tax jurisdictions losses were reported instead of profits, being extremally useless.

2.7 Cost of equity

Investors' measure of the cost of equity is influenced by perceptions and forecasts of firms' financial statement information. A great portion of the literature agrees on the positive effect that tax avoidance produces on the cost of equity, where the benefits of tax avoidance dominate costs. This relation strengthens with better outside monitoring and information quality.
Goh et al. (2016), through the model built by Lambert et al. (2007), use a single-period multi-security capital asset pricing model to explain the cost of equity:

$$E(\tilde{R}_j|\Phi) = \frac{R_f H(\Phi) + 1}{H(\Phi) - 1},\ where\ H(\Phi) = \frac{E(\tilde{V}_j|\Phi)}{\frac{1}{N\tau} Cov(\tilde{V}_j,\ \sum_{k=1}^{J} \tilde{V}_k|\Phi)}$$

Where:

- R_f is the risk-free rate
- Φ is the information available to market participants
- $E(V_j)$ is the expected future cash flow
- $Cov(Vj,\ \sum_{k=1}^{j} Vj|\ \Phi)$ is the covariance between the firm's cash flow with the sum of all firms' cash flows in the market. It's increasing in the riskiness of a firm's cash flow.

Tax avoidance increases the after-tax cash flow with no change in the variance of cash flows and covariances of the firm's cash flows with the sum of all firms' cash flows in the market. This is true if the firm engages in no or little risky activities like investments in municipal bonds. This does not hold with aggressive strategies such as transfer pricing or transfer to tax haven countries since they would increase the variance and riskiness of cash flows.

In order to test the effects of tax avoidance on the cost of equity, the authors estimate a pooled cross-sectional regression. The dependent variable representing the measure of the cost of capital is regressed on different measures of tax avoidance, a set of firm-level controls, time and industry fixed-effects. The dependent variable is measured at t+1 to assure that investors incorporate all information about tax avoidance activities before determining their expected returns; the independent variables are measured contemporaneously. Evidence shows that a one-standard-deviation increase in tax avoidance measures such as book-tax differences, permanent book-tax differences and cash-based ETR brings to a reduction of 26,13 and 19 basis points respectively on the cost of equity. Moreover, a higher number of analysts following the firm and greater institutional ownership reinforce the negative association. The idea is that better outside monitoring discourages rent diversion and so investors require a lower expected return. Shareholders' expectations of future cash flow could improve with higher quality information and disclosure leading to lower variance and covariances of cash flows.

Cook, Moser and Omer (2017) test if the change of perceptions of the tax avoidance level reported in the financial statements of the firm could affect its ex-ante cost of equity capital. In general, the ex-ante cost of capital increases the more the tax avoidance level deviates from that predicted by shareholders. If managers underinvest in tax avoidance opportunities, they will probably experience shareholders' dissatisfaction since the profitable low risk opportunity not exploited to increase the cash flow, moreover higher managers turnover will be more likely. Ex-ante cost of equity will be higher since the incapacity of managers to generate additional wealth for shareholders. Only expectations of a future increase of tax avoidance would lead shareholders to reward managers asking for a lower ex-ante cost of capital. In the other case, if managers overinvest in tax avoidance shareholders would predict lower cash flow because of likely penalties, interest and reputational costs. So ex-ante cost of equity would be higher since the demand for an additional premium of shareholders.

Regression results support the hypothesis that deviation of the expected tax avoidance level leads to a higher ex-ante cost of capital as highlighted by the positive and significant coefficients of the three measures of tax avoidance (CETR, GAAPETR and UTB). Moreover, evidence suggests that the GAAPETR coefficient magnitude in explaining the positive relation is greater in the case where shareholders predict an overinvestment of tax avoidance level rather than underinvestment. This can be explained by the more frequent mention of the financial press of this measure against the other two measures of tax avoidance, pushing investors to be more sensitive in deviation of this ratio, in the case of asking higher premium. If the deviation from the optimal tax avoidance level expected by shareholders is costly for the firm, the firm then would batten down the hatches by reducing deviation and adjusting tax avoidance strategy in

the subsequent period. Using as dependent variable the change in each firm's reported tax avoidance from period t to period t+1, they find that if the absolute value of the difference between reported and expected tax avoidance in period t increases, in period t+1 the level of tax avoidance increases (decreases) depending if the firm in period t had underinvested (overinvested) converging to the optimal expected level.

2.8 Stock price reactions

The stock price can be determined as the discount of future cash flows that the firm will be able to generate. For sure information about future payments of penalties and cash flow reductions arising from tax avoidance are not a comforting signal for investors. Investors will incorporate this possibility in the formulation of their expectations asking for a discount on the stock price. Moreover, tax aggressive behavior carried out by managers could raise a red flag not only to shareholders and future investors but also to customers and suppliers, worried about dishonest actions that could also damage their interests. Announcements in newspapers and forced disclosure conducted by tax authority about tax shelters are these kinds of events that could lead to a crash in the stock price of the aggressive firm.

Hanlon and Slemrod (2008) build a simple model where after-tax income of shareholders depends positively on after-tax income and sheltered income and negatively on the amount of income diverted opportunistically by managers and by the probability that tax shelter would be detected by tax authority. In order to study the market reaction on the stock price after the announcement of the firm engaging in tax avoidance, they include 97 firms in their sample where firms have been accused of tax sheltering in press releases or articles. Using CASH ETR as tax avoidance measure, they find a negative and significant relation with CAR (cumulative abnormal returns), meaning that news about a firm that has engaged in tax avoidance lead to a negative CAR after the release of the news. Examining this result by subcategory they observe a more dramatic decrease in CAR in firms with CASH ETR below median (-1,53%) and in retail firms[3] (-2,6%), where the CAR mean is even lower for retail tax avoider firms belonging to the subsample of major press mentions (-4,13%). In addition, poorly governed firms characterized by a high NON-ENTRENCH SCORE experience a higher drop of CAR after news about tax aggressiveness. Surprisingly, Hanlon and Slemrod show that release of news in

[3] This result could be explained by the negative consumer reaction where consumer prefer to buy in "honest and patriotic citizen" firms that contribute to the state welfare.

involvement in a tax shelter can bring the CAR of a firm to increase, however this firm has to be a non-retail firm with high ETR and good quality governance.

Kim et al. (2011) state *"tax avoidance is positively related to crash risk because it can provide masks and tools for managers to withhold bad news and overstate financial performance"*. In a separation of ownership and control scenario, managers can adopt tax avoidance strategies not only for rent diversion as already explained in the agency theory framework, but also as tool to hide and store bad news for certain periods since the complex and opaque nature of tax avoidance operations. Bad news hoarding is possible until a tipping point is reached, after, bad news and projects must be revealed causing a dramatic drop in cash flows and a stock price crash. So, tax avoidance maximization can be the tool that managers use to hide their incapacity to engage in value-enhancing projects and avoid justifications to external investors. Al Mamun et al. (2020) reveals that powerful CEOs, that is CEOs considered as the founder or that perform simultaneously multiple positions as President and Chairman, justify a higher likelihood of future stock price crash risk. This can be due to their higher propensity in withholding bad news, arising for two reasons: 1) CEOs' wealth varies and depends in a great amount on stock price 2) lower skills CEOs need hoarding bad news to assure a good performance level and career opportunities growth. As showed by Crabtree and Kubick (2013), managers tend to delay the announcement of earnings as a manner to better mask tax avoidance.

Kim et al. (2011) implement two different measures of firm-specific crash risk: the likelihood of the occurrence of future, negative and extreme weekly returns and the negative skewness of future firm-specific weekly returns, in order to test the association between tax avoidance and stock price crash risk. The sample used contains firm-years from 1995 to 2008 with all non-missing values for all the control variables. Their multivariate regression shows positive (negative) and significant coefficients of SHELTER and BTDFACTOR (LRETR) as different tax shelter proxies, the negative and significant coefficient of the Long Run ETR (LRETR) suggest the ability of the firm to pay fewer taxes over a longer period of time increases the likelihood of a future stock price crash. Inserting analyst coverage and institutional shareholders as proxies for external monitoring, results show again a positive sign of the coefficient of tax avoidance measure but the magnitude is lower, signaling that the role of external monitoring is effective in avoiding managerial rent diversion and bad news hoarding and so decreasing the likelihood of potential stock price crash.

Robin and Zhang (2015) study the role of high-quality auditors as a guarantee of lower managers' opportunistic behaviors as bad news hoarding, higher quality financial statements and more timely disclosure of bad news. Moreover, their role helps in decreasing stock price crash risk as they shrink differences of opinion among investors that can be usually one reason

for the divergence of the stock price from its fundamentals. In their findings, they stress the importance of industry-specialized auditors in decreasing stock price crash risk, with the coefficient of auditor industry specialization negative and statistically significant. They explain that the auditor role benefits, further than on reporting and accrual quality, on corporate governance quality. Afterward, a tax avoidance measure is included in the model, it equals one if the firm's likelihood of engaging in tax sheltering is in the top quartile in the year. Tax avoidance coefficients are all positive and significant but the interaction term coefficients between tax avoidance and auditor industry specialization are negative signaling the mitigating role of the specialized auditor in tax avoidance in increasing stock price crash risk.

Garg et al (2020) deepen the link between managerial ability, tax avoidance and stock price crash risk. Higher quality managers can reverse the hypothesis that tax avoidance increases the likelihood of a future stock price crash risk mainly through two channels: 1) more skilled managers can provide timely and better quality earnings relying less on manipulations and earnings management, reducing the information asymmetry gap felt by investors; 2) more able managers can increase the amount and the quality of information disclosed, encouraging a higher number of analysts following the firm with an overall increase of the external monitoring. Moreover, a more able manager could affect auditors' opinions in order to take advantage. In their test the variable of interest is the interaction between a tax avoidance measure and an index of managerial ability (MA_SCORE). They show that, although the coefficient of the measure of tax avoidance leads to an increase in the stock price crash risk, the coefficient of the interaction is negative and significant decreases the harmful effect of tax avoidance on the stock price.

Blaufus et al. (2019) examine the consequences that respectively tax avoidance and tax evasion have on stock market prices. They define tax evasion as: "*present only if the taxpayer provides intentionally inaccurate or incomplete information to the tax authorities to reduce the tax burden*", whereas tax avoidance is: "*neither prohibited nor punishable as long as the taxpayer does not provide inaccurate or incomplete information to the revenue service*". Since the authors define tax avoidance as an activity with no penalty risk, they state that stock market price can rise after the disclosure of the information of the firm engaging in tax avoidance, since the benefit of future tax savings exceeds likely costs arising from the agency and reputational issues. Tax evasion has a dangerous effect on stock market prices since the future likely payment of sanctions. Reputational costs in this scenario are greater than in the tax avoidance case and they play a fundamental role. Consumers, but even citizens, could feel embarrassed and guilty for financing this immoral activity. In their research they evaluate the impact of tax avoidance and evasion news on cumulative abnormal returns of the identified firms, dividing all firms'

subsamples, only tax avoidance subsample and only tax evasion subsample. Results reveal that the estimate of CAR is only significant in the subsample of tax evasion. They also find a positive and significant CAR for firms with a low tax risk level. Overall, the findings suggest that tax avoidance could be a value-enhancing strategy for firms engaging in a more legal segment of tax avoidance and presenting a low tax risk.

3. The Tax Cuts and Jobs Act (TCJA)

On December 22, 2017 President Trump signed the final bill denominated as "Tax Cuts and Jobs Act" (TCJA) or Public Law 115-97. It represents the most important change in corporate and tax legislation since the Tax Reform Act of 1986. Since my analysis focuses on corporate tax avoidance, I will present the main provisions of TCJA that affects US multinationals' attitude toward profit shifting and tax preferences.

3.1 Before the TCJA

Before the TCJA came into effect, US tax system was considered "worldwide", where foreign income earnt by foreign subsidiaries of US multinationals was taxable also in the US but, in order to avoid a double taxation burden, tax credits were provided. In case a foreign subsidiary was established in a high tax rate country, tax credit originated could have been used by the multinational to offset lower taxes derived by low tax rate countries and so higher tax due in the domestic jurisdiction. Since domestic tax on foreign income should have been paid only in case of repatriation, US multinationals started to exploit the strategy to park income in tax havens. Temporary tax holidays on repatriated earnings[4] caused corporations to postpone repatriation, which would have occurred only with favorable tax rates. In short, the worldwide system revealed many flaws since US multinationals were usually able to completely balance the payment of domestic corporate taxes with foreign tax credits or, in case this strategy wasn't optimal, they would have waited for tax holidays for repatriate.

As underlined by Clausing (2020), US multinationals had trillions of income sitting offshore. In 2017 data shows $4,2 trillion in offshore countries where $3 trillion in tax haven countries such as Bermuda, Cayman Islands, and Luxembourg are among the main. Frequently, they took advantage of tax-free repatriation strategy where the US company, in order to raise funds for domestic investments, borrows cash from abroad; at the same time the interest cost is deductible in the US and taxable as revenue abroad but the transaction is tax neutral if the two interest amounts are equal. This permitted to bring back money from foreign countries and fuel US economy.

[4] For example, in 2004 in the American Jobs Creation Act the repatriation tax rate was only 5,25%

3.2 Implementation of TCJA

The main change of TCJA is the decrease of the statutory corporate tax rate from 35 to 21 percent. Even though the tax base broadens, the U.S. Joint Committee on Taxation estimates that the 14% rate drop would cause a loss of $650 billion in the US government budget in the coming decade.

TCJA changes the framework of the US tax system from “worldwide” to “territorial”, meaning that foreign income is taxed based on the territory where it is earnt in contrast to a worldwide system where multinationals must pay taxes also to income earnt in foreign countries once they repatriate. The United States, like many countries, has never adopted a pure worldwide system and now a pure territorial system: in the past taxes from foreign income were rarely collected because multinationals didn’t repatriate unless the US government granted a tax break on foreign income with favorable taxation; whereas now, albeit a territorial income is in force, some tax on foreign income is collected through a global minimum tax (Clausing, 2020). Under the territorial system, US multinationals don’t have to pay tax on dividends received from foreign subsidiaries which it holds at least 10 percent or more.

With the new legislation, US multinationals must pay a one-time deemed repatriation tax on unrepatriated earnings and profits of certain foreign subsidiaries, usually called as “deemed repatriation tax”. In this case, tax rates are 15,5% if the income is in the form of cash and liquid assets and 8% if it’s in other assets. The tax payment can be extended over a period of eight years and in certain cases can be used as tax credits to offset national corporate tax.

A minimum global tax, also known as the “Global Intangible Low-Taxed Income” (GILTI) tax is established. GILTI is defined as the income that is generated and booked by foreign subsidiaries of US multinationals thanks to intangible assets as patents, trademarks and copyrights. This income is useful to proxy the income generated by intangible assets that are held outside US jurisdiction and to which Congress applies a new minimum tax in order to disincentivize profit shifting, that is 10,5% but it’s scheduled to increase to 13,125% in 2026. The active income that a US foreign subsidiary earns above 10% of its depreciable tangible propriety refers as GILTI. The GILTI tax is a minimum tax that is imposed on all the foreign income of the US multinational, disregarding each subsidiary on a per-country basis. Therefore, the amount of GILTI tax depends on a sort of weighted average of all the foreign tax rates of each foreign country where the subsidiaries are located and its average return on foreign tangible assets.

The Tax Policy Center provides a numerical example to better illustrate the GILTI mechanism: there’s a US corporation with a foreign manufacturing subsidiary in Ireland where the tax rate is 12,5%. The subsidiary owns a plant valued $100 million; the foreign income is $30 million.

In this case, GILTI is calculated as the foreign income ($30) minus 10% of the depreciable assets ($10), resulting in $20 of GILTI. Then GILTI provision allows corporations to deduct 50% of GILTI and claim a foreign tax credit for 80% of foreign taxes paid or accrued on GILTI; so the US tax on GILTI would be $2,1: half of GILTI ($10) times the 21% corporate tax rate in the US. Successively, the net US tax after credits would be $0,1 which is US tax on GILTI ($2,1) minus the tax credit from Irish taxes ($2). The Irish tax credit is calculated as GILTI ($20) times the Irish corporate tax rate (12,5%) times the foreign tax credit granted by US law (0,8).

Another important element of TCJA is the "Foreign-Derived Intangible Income" (FDII) that is the income generated through exports of products manufactured with intangible assets such as patents, trademarks and copyrights that are located in US. In order to boost US multinationals' exports and the location of intangibles in US jurisdiction, TCJA foresees a reduced tax rate on the income tied to these operations of 13,125% rather than 21%. The measurement method of FDII follows the same procedure as GILTI income.

"Base-erosion anti-abuse tax" (BEAT) provision hits US multinationals that adopt interests, royalties and other deductible payments to related foreign subsidiaries in order to lower domestic taxable income. A US multinational calculates its regular corporate tax with 21% as tax rate and then calculates again the tax including in the taxable income all the deductible payments and applies the lower BEAT rate[5]. If the regular tax is lower than the BEAT tax, the multinational must pay the regular tax and the difference between the regular tax and the BEAT tax. The BEAT provision applies only to C corporations with gross receipts of more than $500 million averaged over the previous three years.

Other elements that it's worth highlighting (Wagner et al., 2020):

- Full expensing of capital expenditures (sunsets in 20% increments between 2023 and 2027)
- Limits on interest expenses deductions to the sum of business interest income and 30% of adjusted taxable income
- No possibility of NOL carrybacks and limit of NOL utilization to 80% of pre-NOL taxable income
- Possibility of capitalization of R&D expenditures from 2022

A summary of the main changes before and after TCJA implementation is presented in Table 1, based on the tables presented by Gale et al. (2018) and Clausing (2020) in their research:

[5] 5% in 2018, 10% in 2019 through 2025 and 12,5% from 2026 and beyond

Main changes produced by TCJA implementation in corporate tax and profit shifting		
	Before TCJA	***After TCJA***
Statutory corporate tax rate	35%	21%
Tax treatment of foreign income	Worldwide system with 35% tax rate less foreign tax credit once repatriated	Territorial system with no taxation of foreign income unless subject to GILTI
One-time deemed repatriation tax	N/A	15% for income in form of cash and liquid assets; 8% otherwise
Global minimum tax (GILTI)	N/A	Based on the foreign income earnt that exceeds 10,5% of foreign depreciable assets
Foreign-Derived Intangible Income Deduction (FDII)	N/A	Tax rate of 13,125% on income, generated through exports tied to intangibles held in USA, above a threshold
Base Erosion and Anti-Abuse Tax (BEAT)	N/A	Tax due if the multinational regular corporate tax is lower than the tax amount calculated with BEAT rates
Deduction of interest expenses	Generally fully deductible	No deduction if net interest exceeds 30% of business income
Deduction of Net Operating Losses	They can offset 100% of taxable income and carry back losses for 2 years and forward for 20 years	They can offset only 80% of taxable income, they are still allowed to carry losses forward indefinitely
New investments purchases	Bonus depreciation for qualified proprieties for 50% in 2017, decreasing year after year until 2020	100% bonus depreciation for qualified proprieties until 2022, then 80% in 2023, 60% in 2024, 40% in 2025, 20% in 2026 and 0% in 2027

3.4 Effects and estimates after TCJA implementation

Wagner, Zeckhausner and Ziegler (2020) divide the effects of TCJA into recurring effect; that is the result of several factors, such as lower corporate tax rate, Capex expensing, limitation on interest deductibility and so on, that influence firm's ETR. The nonrecurring effect arises from two elements: re-estimation of deferred tax assets and liabilities of the firm due to the drop of statutory corporate tax rate and the effect of the deemed repatriation tax for involved firms. The nonrecurring effect should be present in 2017 accounting period whereas the annual recurring effect is present in the financial statements of the following years. In order to estimate the magnitude of the recurring effect of TCJA, the change in the firm's ETR between the first year after the TCJA entered in force (2018) and the last (or last five) year(s) prior to the TCJA is analyzed. In the observed sample, GAAP ETR felt, from 2016 to 2018, from 26% to 19%; Cash ETR from 24% to 20%. The result is similar considering the distribution of ETRs in the post-TCJA year compared to the average 5-years before TCJA distribution, where both GAAP and Cash ETRs experienced a shift to left. The nonrecurring effect result in the distribution shows a large increase of GAAP ETRs for a significant number of firms and no particular changes for Cash ETRs; this result comes from the large impact of nonrecurring charges and the possibility for the firms to spread the payment of deemed repatriation tax over a period of eight years not affecting so much current Cash ETR.

Then, the authors present an OLS regression of changes in ETRs on features affected by the TCJA and firm characteristics. The coefficient of 5-years average GAAP ETR is highly significant and negative indicating that previously high tax avoidance firms find it harder to maintain a similar tax planning after TCJA. On the other side, the sign of the coefficient of the percentage of foreign revenue is significantly positive signaling that firms with foreign profits don't experience benefit from the corporate tax drop but a relative tax increase. Capital expenditures lead only to Cash ETR reduction.

Dyreng et al. (2020) indicate a drop of 12 percentage points in the average GAAP ETR from pre-TCJA to post-TCJA, from 32,5% to 21,1%; Cash ETR lowers from 27% to 19,5%. Moreover, the authors find a peak of GAAP ETR during 2017, considered as the transition period, since it's the first year where financial statements reflect reform effects. The peak is caused by the impact of the revaluation of deferred tax assets and one-time deemed repatriation tax. Considering US domestic firms and US multinationals split in two different subsamples, domestic US firms show a lower GAAP ETR post-TCJA if compared to US multinationals; the same result is consistently utilizing CASH ETR. Domestic firms benefit more from TCJA changes thanks to the lower corporate statutory tax rate, whereas US multinationals' tax burden on foreign income seems unchanged since the change in a territorial tax system.

Clausing (2020) estimates the effects of the GILTI tax measure. She divides companies with deficit credits from companies with excess foreign tax credits. Companies with deficit credits have a positive amount of tax to pay since they have not been able to generate enough foreign tax credits to offset the GILTI tax. In this scenario, companies will try to increase the income generated in high tax rate foreign countries in order to increase foreign tax credits and to lower their overall tax burden. US tax rate on GILTI goes from 10,5% in case of foreign country with zero tax rate to a 10,5 + (0,2 * T_f) for high tax rate countries[6]. On the other side, companies with enough foreign tax credits to balance the GILTI tax will have no incentive to book more income abroad since the marginal consequence of earning an additional dollar, whether haven country or high tax rate country, would be the haven rate or the high tax rate, respectively. This happens because no more benefits from foreign tax credits can be exploited and so the inclination to park profits in havens is still alive.

Estimates show that GILTI tax will decrease income booked in haven countries by 12-16 percent and increase income generated in high tax rate countries by 8-9 percent. US tax base will enlarge by $17-30 billions and government will collect further $3-6 billions of tax revenues each year.

Donohoe et al. (2019) examine the potential effects of the TCJA in 25 US multinationals among pharmaceutical, technological and medical devices sectors comparing ETRs for 2014-2016 period to ETRs in 2018, the tax saving of US corporations thanks to decrease of tax rate from 35% to 21% and the GILTI tax. In Figure 3.1 the comparison between the tax savings of statutory tax rate decrease and tax cost of GILTI among examined sectors is displayed. The graph shed light on the positive result that tax rate reduction has brought, surpassing the costs associated with the new GILTI measure.

[6] T_f is the foreign tax rate

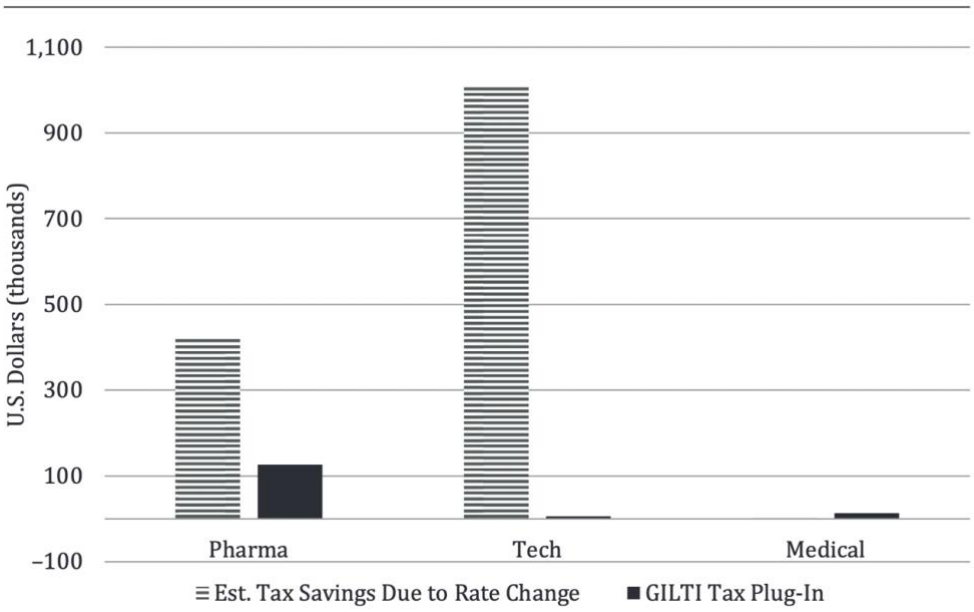


Figure 3.1: Median US Tax Saving Due to Tax Rate Change and GILTI Plug-In by Industry. Source: Donohoe et al. (2019)

Gravelle and Marples (2019) indicate an amount equal to $3 trillion of unrepatriated foreign income, which only $1 trillion was held in form of cash whereas the residual part has been invested in physical assets[7]. Figure 3.2 shows $664 billion returned to US in 2018 with a consequent sharp decline of reinvested earnings; this amount suggests a significant repatriation trend if compared to the amounts in the previous three years that ranged from $144 to $158 billion.

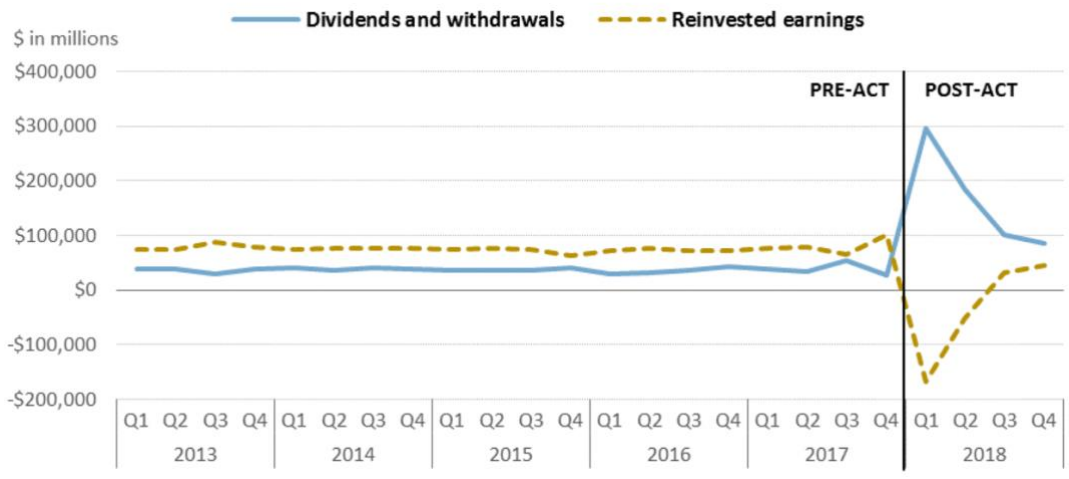


Figure 3.2: Repatriations, First Quarter 2013 through Fourth Quarter 2018. Source: Bureau of Economic Analysis

[7] See Smolyansky, M., Suarez, G., and Tabova A., "US Corporations' Repatriation of Offshore Profits"

Henry and Sansing (2020) analyze if the corporate tax preferences would change with the enactment of the TCJA and how this change would impact on the financial performance of the companies and other company characteristics. They generate a balanced panel of 576 firms with positive profits splitting in 2012-2017 (pre-TCJA) and 2018-2019 (post-TCJA). They remark that the considered period ends in 2019 because the analysis would be otherwise tarnished by the COVID-19 impact and the CARES Act signed in 2020. As measures of tax preferences, they utilize Cash ETR and Δ/MVA proposed by Henry and Sansing (2018), where the second measure is calculated as the difference between the cash taxes paid (adjusted for the change in tax receivables) and the product of a firm's pretax income in the income statement and the statutory rate, this cash tax difference is then divided by the market value of assets (MVA) since it's not affected by the financial performance of the firm. The authors explain that the usefulness of Δ/MVA is the possibility of including also firms with negative pretax income in the sample, normally discarded by empirical studies that adopt ETR indicators. Considering only the subsample of profitable firms prior to TCJA enforcement, 75 percent of them present a negative Δ/MVA, the average is -0,54%, and a Cash ETR well below the 35% statutory tax rate, the average is 25,13%. After TCJA entered into force, data reveal a Cash ETR (21,48%) almost equal to the statutory tax rate and a Δ/MVA (-0,05%) very close to zero. Results show how the TCJA reduced the extent to which firms are tax favored, bringing, on average, firms to pay more to what is stated by law and to almost void cash tax difference. This doesn't hold if the full sample including firms with losses is analyzed: on average firms were tax disfavored prior to TCJA (Δ>0) and Δ/MVA is almost zero prior and after TCJA.

In order to study the impact of a set of firm characteristics on the tax preferences of the companies, they regress the measures of tax preferences on a set of controls that describe firm characteristics, an indicator of the effects of changes post TCJA and interactions of firm characteristics controls with post-TCJA indicator. Considering the full sample and only the profitable subsample, there's a negative and significant relation between EBIT and Δ/MVA in the pre-TCJA period, signaling that the more the company is profitable the more the cash tax difference becomes favorable. Even though a lower magnitude of the effect of EBIT on Δ/MVA was expected since the lower numerator was caused by the drop of the statutory tax rate, the interaction between post-TCJA and EBIT is not significant in the profitable subsample and positively significant in the full sample, whereas EBIT coefficient remains negative and significant in both the samples. TCJA only softens the association between cash tax differences and performance in the full sample, but has no effect for the profitable subsample. More broadly, TCJA has no impact on the change of firm characteristics in profitable firms, probably because they have little incentive to alter their corporate policies.

Carrizosa et al. (2020) explain the impact that TCJA limitations on interest deductions have in leverage. Putting a limit on tax deductions for interests would promote equity investments rather than debt, less risk-taking and a lower systematic risk since less attitude toward overleveraging. On the other side, limitations can affect investments increasing the cost of capital. According to the classical model of capital structure, a limit on the deductibility of interests reduces the tax benefit and so the firm should decrease its amount of debt. The authors use a difference-in-differences approach with the change of leverage pre and post-TCJA enactment as the dependent variable as the first difference and a control group of firms not affected by interest deduction limitations of TCJA as the second difference. Evidence shows leverage level for both affected and unaffected firms follows a similar trend with simultaneous increases and decreases; in 2018 we observe a break where firms affected by TCJA lower their leverage whereas unaffected firms present an increase. The negative coefficient of the interaction term that represents the change in 2018 leverage for firms subject to the interest limitation in 2017 (*InterestLimit*Post*) reinforces the statement that firms affected by TCJA limitation on interest deductibility have decreased their leverage in 2018. The authors estimate a reduction of $125,9 million of total debt per firm with respect to unaffected firms and a total decrease of leverage of $32,4 billion for affected firms.

The authors continue building a pseudo-treatment group and a group of unaffected Canadian firms. The pseudo-treatment group is composed of Canadian firms that would have been subject to interest limitation if they had been in US jurisdiction. The aim is to compare Canadian firms' difference-in-differences with the original benchmark of US firms. Evidence shows both groups of Canadian firms move in tandem and the pseudo-affected group increases leverage level in 2018, rather than US affected firms.

US affected firms reduced leverage in 2018 thanks to decreasing in debt issuances rather than debt repayments. The reduction hit longer-term debt if compared to short-term debt, since longer-term debts are the greatest source of tax benefits to exploit but also the financing form with higher interest rates that are no more useful. The analysis reveals that the aforementioned firms switched to more foreign debt diminishing national debt percentage since interest deductions are still fully exploitable in foreign jurisdictions.

TCJA had a big impact on firms' financial decisions even though the literature doesn't fully agree on who are the primary beneficiaries, how firms behaved in terms of investment projects, payouts and share repurchases.

Wagner, Zeckhauser and Ziegler (2018) highlight how volatility in the stock market was already present just after the election of Donald Trump, with extraordinary momentum for the three

days after the election. During the legislative period, from November 2 through December 22, TCJA had a positive impact on high tax rate companies, as shown by the positive coefficient of Cash ETR on the CAPM-adjusted returns dependent variable. The shift into a territorial system negatively affected multinationals since the tax rate on repatriation tax increased progressively from a starting proposal of 12% to a definite rate of 15,5% and so with a progressive worsening of expectations of market agents. The capital expensing change had little impact whereas interest expense deductions limitation hit negatively affected firms.

Wagner, Zeckhausner and Ziegler (2020) conducts a detailed analysis of how well the stock market anticipated and incorporated financial consequences of TCJA, comparing pre and post-TCJA ETRs on the basis of information found in financial statements of US affected by the law. The authors explain that only half of the variation of ETRs change in their specifications comes from TCJA provisions, and so, the other half of change of the TCJA comes from firm-specific factors not considered, and so this flaw can reverse on possible investors and analysts' projections based on these proxies. In order to investigate the stock price reaction during TCJA enactment, cumulative returns from November 2, 2017 through December 22, 2017 are employed. In the first specification ("proxy" specification) we have ex ante proxies that measure the impact of the different provisions of TCJA as explanatory variables; in the second specification ("actual" specification) actual recurring and nonrecurring effects from financial statements measure the ex-post impact of TCJA; finally, the third specification (horse race) includes both set of variables. Results indicate that investors estimated the effect of TCJA using proxies rather than more accurate estimates given by the actual impact. Indeed, in the "proxy" specification firms with high tax rate and large capital expenditures experienced higher abnormal returns, whereas firms with more foreign revenue and larger R&D expenditures lost; moreover, larger NOLs benefited firms, since they decreased deemed repatriation tax reducing the subpart F income where the tax is calculated. The same results hold analyzing the abnormal returns on December 4, 2017, first trading day after the TCJA passed in the Senate: variables in the "actual" specification show lower significance or even an opposite sign on what we should have expected.

For pricing the actual impact of TCJA after its passage, an analysis of quarters of 2018 and the full year of 2018 is conducted since the financial information is available and presumably impounded in stock prices. The actual change in GAAP ETR impacts negatively on firms' stock returns during the first and second quarters of 2018, this relation holds also for the entire 2018; it means that investors penalized firms higher tax rates. Overall, even though information were widely available and publicized, investors' capacity in predicting the consequences of TCJA is still scarce.

Kalcheva et al. (2020) utilize a cross-sectional multivariate regression for account the interrelation of more provisions of TCJA that affect firms, more specifically they test how abnormal returns vary with firm characteristics. Through the Fama-French-Carhart four-factors model, they obtain the abnormal returns for each stock on an event day and they sum to obtain the CAR; the average CAR on key event days (days where the probability of passage of the Act significantly changes) of the TCJA in the sample is 0,569% showing an average increase of shareholders' wealth. The authors examine the impact of specific TCJA provisions and firm characteristics on CARs by dividing the results into the 7 key days, 16 event days with a significant increase of probability of passage of the Act and 5 event days with decreasing probability of passage. Overall, evidence shows that the drop of the corporate tax rate to 21% has a positive impact on shareholders' wealth whereas the limit on interest deductibility and NOL and shift to the territorial system have a negative one.

Including controls that capture constrained firms, firms with high growth opportunities and payout policy the findings highlight that only the payout policy coefficient is positive and significant meaning that firms with a higher payout ratio have gained thanks to TCJA's new provisions since more cash flow now is free to be distributed, rather than invested in value-generating investments. This result holds even when authors report results of a multivariate regression for corporate payout and corporate investments respectively; corporate investments effects continue to be nonsignificant and even negative in the post-TCJA period probably because benefits of investment in new employees and assets can be evident in a longer period of time.

Gaertner et al. (2020) explore the spillover effects of TCJA on foreign firms' stock prices and foreign stock markets. They identify six event days during the TCJA passage and approval using Google Trends Index among US searchers and a set of 19.410 foreign firms. For US firms the sum of the average returns of the US stock market reacting to news about TCJA was 3,6% on the event day and on the t+1 event day (so in total 12 days as total event window return). In the sample of foreign firms, only five foreign country firms experience a negative return, belonging especially to Asia; on the other side 33 foreign countries benefit from positive externalities coming from tax reform. Figure 3.3 resume the reactions of US firms and foreign firms on a time period between t-2 and t+2 of the event day represented by 0. On average, in the event window [0, +1], return reaches about 2,5%. Since the US stock market is one of the last markets to open and close since its time zone, we can notice that foreign markets responded positively to news disclosed in the US on day 0 but incorporated in the local market on day +1; Chinese firms experienced with a significant drop in returns in the day +1 about news disclosed by US agencies in their day 0. Positive returns in the US simultaneously with negative returns in China

may indicate the positive impact of TCJA in making US businesses more competitive with respect to Chinese competitors and investors incorporated it.

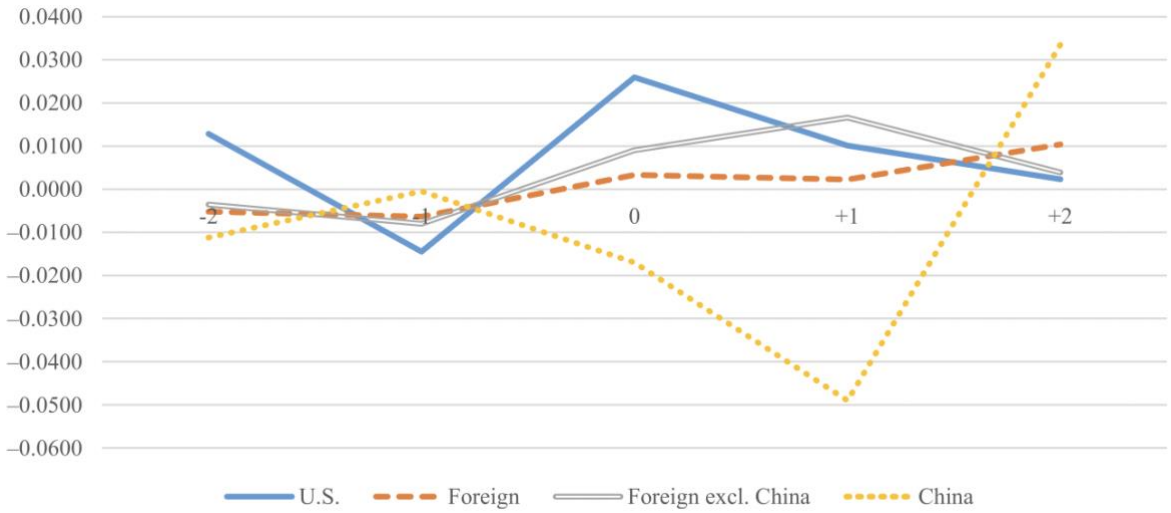


Figure 3.3: US and Foreign Stock Returns Around High Google Search Activity for "Tax Reform". Source: Gaertner et al. (2020)

4. TCJA and corporate tax avoidance: an empirical study

4.1 Research methodology and hypothesis formulation

In order to test TCJA effects after its implementation on US firms, a difference-in-differences (DiD) model is adopted. DiD is a technique employed in quantitative researches in social sciences. This technique combines the time-series explanatory power of the treatment effect on observations (variation over time of observations) and the cross-section explanatory power of the treatment effect on observations (that captures the difference between the treatment and control group).

First of all, in a DiD model we have two different time periods (pre-treatment and post-treatment) and two different groups called control group, that is the subsample not affected by the treatment in either of the two periods and a treatment group, that is the subsample affected by the treatment in the second post-treatment period. By comparing pre and post-treatment scenarios we can assess the effect of treatment.

Angrist and Pischke (2008) explain that one technique, beyond IV, to deal with unobserved confounders and to control for unobserved-but-fixed omitted variables is DiD. In order to clarify DiD model explanation, they use Card and Krueger (1994) study on the change of the minimum wage in fast food restaurants in New Jersey on April 1992. With the goal of testing the effect of this reform, they collect data also for fast food restaurants in Pennsylvania where the reform didn't affect minimum wage. As time reference periods they consider data on February 1992 as the moment before reform and November 1992 as the post-reform moment. In this setting, the control group is represented by fast food restaurants in Pennsylvania whereas the treatment group is represented by New Jersey ones, which are the fast food restaurants hit by the reform shock. The goal is to estimate the effects of the New Jersey minimum wage increase, comparing the change in employment in New Jersey to the change in employment in Pennsylvania around the time New Jersey raised the minimum wage.

Initially, they show the equation:

$$Y_{ist} = \gamma_s + \lambda_t + \beta D_{st} + \varepsilon_{ist} \quad (1)$$

Where Y_{ist} signals the employment level in the fast food restaurant i in the state s (New Jersey or Pennsylvania) at the time t (February, before reform or November, after reform); γ_s represents the sum of time-invariant state effect and λ_t, a year effect that is common across states. $E(\varepsilon_{ist} |$

s, t) = 0 holds. D_{st} is a dummy equal to one for a fast food restaurant run in New Jersey in February. Then, they get:

$$E[\mathrm{Y}_{ist}|s = PA, t = Nov] - E(\mathrm{Y}_{ist}|s = PA, t = Feb) = \lambda_{Nov} - \lambda_{Feb} \quad (2)$$

considering only Pennsylvania in November and February; and:

$$E(\mathrm{Y}_{ist}|s = NJ, t = Nov) - E(\mathrm{Y}_{ist}|s = NJ, t = Feb) = \lambda_{Nov} - \lambda_{Feb} + \beta. \quad (3)$$

For New Jersey in November and February. The population difference-in-differences is:

$$[E(\mathrm{Y}_{ist}|s = PA, t = Nov) - E(\mathrm{Y}_{ist}|s = PA, t = Feb)]$$

$$- [E(\mathrm{Y}_{ist}|s = NJ, t = Nov) - E(\mathrm{Y}_{ist}|s = NJ, t = Feb)] = \beta. \quad (4)$$

In Table 4.1, adapted from Card and Krueger (1994), the average employment at fast food restaurants in New Jersey and Pennsylvania before and after the reform change in New Jersey are displayed:

Variable	PA (i)	NJ (ii)	Difference, NJ-PA (iii)
1. FTE employment before,	23.33	20.44	-2.89
all available observations	(1.35)	(0.51)	(1.44)
2. FTE employment after,	21.17	21.03	-0.14
all available observations	(0.94)	(0.52)	(1.07)
3. Change in mean FTE	-2.16	0.59	2.76
employment	(1.25)	(0.54)	(1.36)

Table 4.1: Average employment per store before and after New Jersey wage increase. Source: Card and Krueger (1994)

Average employment in Pennsylvania decreases after the reform but it's still higher than in New Jersey, at all levels. Taking the difference considering rows or columns leads to the same result of β that is 2,76.

The strategy of DiD requires the common trend (or parallel trend) assumption holds, that is the counterfactual trend behavior of treatment and control groups to be the same.

Figure 4.1 represents DiD mechanism, where line *A* depicts the trend in the control state and line *B* depicts the trend in the treatment state. Both groups start at a different starting level of employment rate in the pre-treatment period: A_0 for the control group and B_0 for the treated group. After the treatment, the control group ends in A_1 and the treated group ends in *C*. The treatment modifies the slope inducing a deviation from the common trend: in absence of treatment, the employment trend would have been the same in both states, resulting treated group ending in B_1 (counterfactual). DiD calculates the difference between the two groups if

neither group experienced the treatment. The delta between points *C* and B_1 is the treatment effect, that is the difference between the observed employment rate in the treated group after the reform enforcement and the counterfactual outcome.

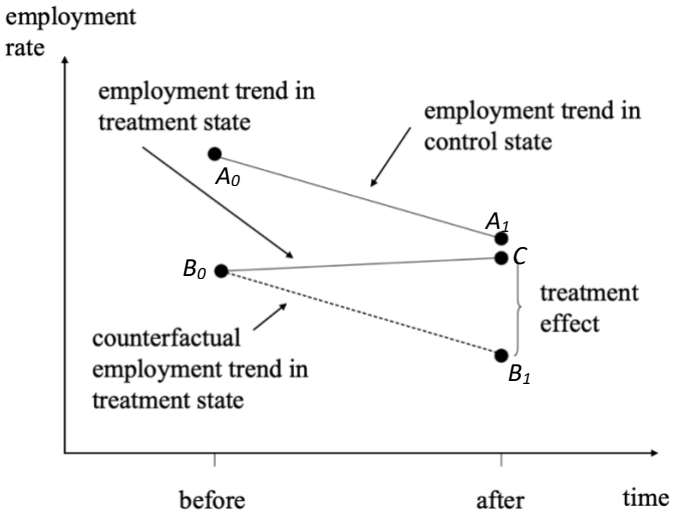


Figure 4.1: Casual effects in the differences-in-differences model. Source: Angrist and Pischke (2008)

First of all, in my study, I focus on the effects of firm-specific factors on the tax avoidance measures of US firms. Following Chairina and Sari (2018) that evaluate the influence of company size, fixed assets, leverage and profitability on a sample of Indonesian firms listed in the Indonesian Stock Exchange from 2011 to 2015, since my US sample is composed of publicly listed firms from 2013 to 2019, I expect to find similar results for company size, fixed assets, leverage and profitability effects on tax avoidance metrics in US firms. In line with Charina and Sari's findings, I expect that:

Hypothesis 1:

- *Company size has no effect on tax avoidance*
- *Fixed Assets have no effect on tax avoidance*
- *Leverage has no effect on tax avoidance*
- *Profitability has a positive and significant effect on tax avoidance (more profitable firms tend to reduce their ETRs)*

The OLS regressions created in order to test H1 are:

$$Cash\ ETR = \alpha_0 + \alpha_1 wln\_TA + \alpha_2 wlev1 + \alpha_3 wmtb + \alpha_4 wpt\_roa + \alpha_5 wcash\_flow + \alpha_6 winvest + \alpha_7 wppe + \phi_i + \gamma_t + \varepsilon$$

$$GAAP\ ETR = \beta_0 + \beta_1 wln\_TA + \beta_2 wlev1 + \beta_3 wmtb + \beta_4 wpt\_roa + \beta_5 wcash\_flow + \beta_6 winvest + \beta_7 wppe + \phi_i + \gamma_t + \varepsilon$$

where the dependent variables are respectively Cash Effective Tax Rate and GAAP Effective Tax Rate, regressed on the same control variables that are the natural logarithm of Total Assets (*wln_TA*), Leverage (*lev1*), Market-to-Book Value (*wmtb*), Cash Flow (*wcash_flow)*, Investment (*winvest*), PPE (*wppe*). "*w*" placed before the name or abbreviation of the variable name means that the variable has been winsorized[8]. To account for time-invariant features of the entity firm fixed effects for each entity have been added (ϕ_i) and also year fixed effects (γ_t) to account for variation in macroeconomic conditions over time. ε represents the error term.

Applying DiD approach, my goal is to evaluate the effect of the TCJA (treatment effect) on a sample of US firms (treated group) compared to a sample of Canadian firms (control group) theoretically not affected by the Act shock. The comparison of the difference in the average outcome before and after TCJA implementation of US firms with the difference in the average outcome on the same period for Canadian firms is the key finding in the DiD model.

Hypothesis 2: the implementation of TCJA influences tax avoidance strategies of US firms.

Hypothesis 2 is tested through the following models:

$$GAAP\ ETR = \beta_0 + \beta_1 treat\_post + \beta_2 treatment + \beta_3 post\_reform + \beta_4 wln\_TA + \beta_5 wlev1 + \beta_6 wmtb + \beta_7 wpt\_roa + \beta_8 wcash\_flow + \beta_9 winvest + \beta_{10} wppe + \varepsilon$$

$$ETR\_Diff = \gamma_0 + \gamma_1 treat\_post + \gamma_2 treatment + \gamma_3 post\_reform + \gamma_4 wln\_TA + \gamma_5 wlev1 + \gamma_6 wmtb + \gamma_7 wpt\_roa + \gamma_8 wcash\_flow + \gamma_9 winvest + \gamma_{10} wppe + \varepsilon$$

The main interest coefficients are β_1 and γ_1 because, on the basis of their sign and significance, show if being a US firm after TCJA implementation leads (or doesn't lead) to some change in tax avoidance behavior. Three dummies have been added to the model used to test Hypothesis 1. *Cash ETR* has been replaced as tax avoidance metric to ETR differential (*ETR_Diff*) for two reasons: first, because Orbis doesn't present data for cash paid for taxes for Canadian firms,

[8] A more detailed explanation about variables and how they have been calculated is provided in next section "Sample composition and variables description"

second because ETR differential allows to better distinguish and evaluate statutory tax rate reduction impact on tax avoidance.

Eichfelder et al. (2021) examine how a reduction in statutory tax rate affects conforming tax avoidance. More precisely, adopting a generalized difference-in-differences framework they evaluate if German firms, compared to firms in bordering countries, after the statutory tax rate drop in 2008, have reduced or not conforming tax avoidance attitude. They suppose and find that an increase in the statutory tax rate leads to an increase in conforming tax avoidance through a negative effect on Pre-Tax Income of the firms.

Hypothesis 3A: an increase in statutory tax rate has a negative effect on Pre-Tax Income and so it leads to an increase in conforming tax avoidance behavior

Hypothesis 3A is tested through the model:

$$Log\_PTI = \theta_0 + \theta_1 str + \theta_2 wln\_TA + \theta_3 wlev1 + \theta_4 wmtb + \theta_5 wcash\_flow + \theta_6 winvest + \theta_7 wppe + \varepsilon$$

where the dependent variable is the logarithm of Pre-Tax Income (*Log_PTI*), statutory tax rate (*str*) has been added as an additional control in this model beyond the already explained control variables.

Since one of TCJA's main provisions is the reduction of the corporate statutory tax rate from 35% to 21%, this cut should lead to a decrease in the conforming tax avoidance of US firms through higher declared Pre-Tax Income.

Hypothesis 3B: the drop of the corporate statutory tax rate established in the TCJA reduces the conforming tax avoidance behavior of US firms

The model adopted is:

$$Log\_PTI = \theta_0 + \theta_1 treat\_post + \theta_2 treatment + \theta_3 post\_reform + \theta_4 str + \theta_5 wln\_TA + \theta_6 lev1 + \theta_7 wmtb + \theta_8 wcash\_flow + \theta_9 winvest + \theta_{10} wppe + \varepsilon$$

As for the test in Hypothesis 2, θ_1 is the interesting coefficient since it captures if US firms after TCJA, that are firms that have experienced a drop in their statutory tax rate, altered their Pre-Tax Income and, on the basis of the direction of the change, if they have modified conforming tax avoidance strategy.

Figure 4.2 illustrates the common trend applied to the samples of US and Canadian firms distinguishing from the pre-TCJA, where the common trend hypothesis is tested. As pre-TCJA period, years from 2013 to 2016 (included) are considered. We can notice that in the pre-TCJA US GAAP ETR is, as expected, higher than the GAAP ETR level of Canadian firms. The lines follow the same positive trend, even though the Canadian GAAP ETR line is more sloped than the US one. I can claim the common trend requirement is satisfied, even weakly, since the line follows the same trend.

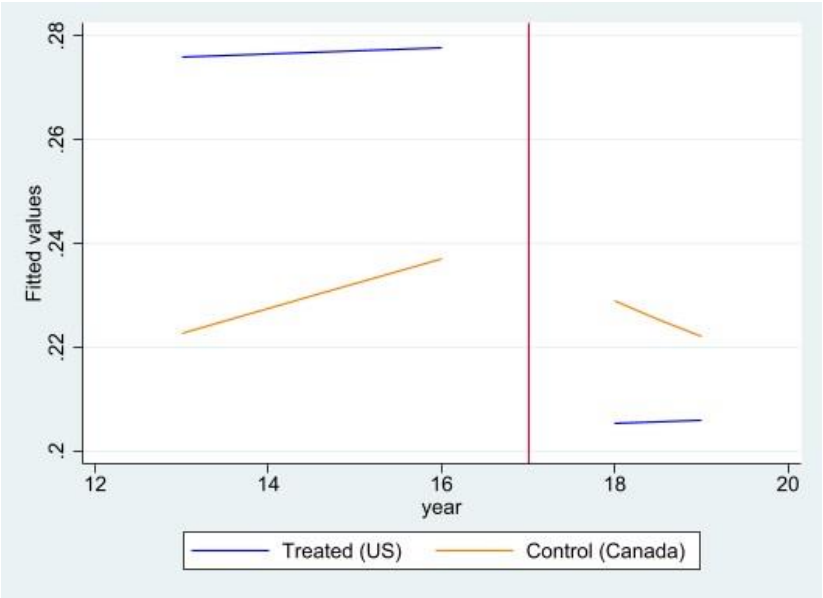


Figure 4.2: Evidence of the parallel trend assumption in the pre-TCJA period between US and Canadian firms. Source: personal processing

4.2 Sample composition and variables description

For my research, I used Orbis Bureau Van Dijk Database, which contains comprehensive information on companies worldwide. Since Orbis offers wider and more accurate accounting and financial information for US firms and a big branch of literature focus on US firms, I decided to focus on US firms. Moreover, I decided to filter for US firms publicly listed, more subjected to disclosure requirements by SEC about their financial statements and financial data. In this way, the probability of finding no missing data have increased. As time period, years from 2013 to 2019 have been considered. Initially, Orbis offered 2013 as the oldest available year for financial information of the firms; 2019 represents the year limit for the Covid-19 outbreak. Years after 2019 have not been considered since Covid-19 influence in bias firms

financial statements and the tax relief provisions included in the Coronavirus Aid, Relief and Economic Security (CARES) Act passed on March 2020.

The search steps for US firms are summarized in the following table:

Search step		Step result	Search result
1) World region/Country/Region in country	United States of America	69.283.700	69.283.700
2) Listed/Unlisted companies	Publicly listed companies	84.867	16.463

- In filtering overall data by only US firms, I end up with 69.283.700 firms
- Orbis presents 84.867 firms with the "Publicly listed companies" feature
- Among 69.283.700 US firms, only 16.463 are publicly listed

In conclusion, my sample of US firms that are publicly listed is composed of 16.463 firms.

I adopt the same search strategy for Canadian firms. Since my empirical model focus on examining the effects of TCJA on US firms, I built a sample of Canadian firms as the control group.

The search steps for Canadian firms are summarized in the following table:

Search step		Step result	Search result
1) World region/Country/Region in country	Canada	2.608.577	2.608.577
2) Listed/Unlisted companies	Publicly listed companies	84.867	4.321

- In filtering overall data by only Canadian firms, I end up with 2.608.577 firms
- Orbis presents 84.867 firms with the "Publicly listed companies" feature
- Among 2.608.577 Canadian firms, only 4.321 are publicly listed

In conclusion, my sample of Canadian firms that are publicly listed is composed of 4.321 firms.

By merging US and Canadian samples, I obtained the full sample of 20.784 firms.

Orbis uses a Boolean search method, which is an intuitive way to combine search steps when searching by more than one criterion. During my research in Orbis I made use of AND operator, this means that companies selected in the current search step are compared with those in the preceding ones and only records satisfying all steps are selected. In my case, only the firms that

satisfied the requirements of being American (or Canadian) AND publicly listed were selected by the database.

A panel data is used, that is repeated observations of the same firms over time, in order to exploit the longitudinal feature of data. In my analysis, I use a balanced panel dataset where all units are observed for the same number of periods. Since data from Orbis are presented in a wide format, I use the "*reshape*" command in Stata to convert data from a wide format to a long format, in this way each firm, identified by its personal ID, takes 7 rows because 7 years are considered in the analysis. From 20.782 firm observations I end up with $20.782 * 7 = 145.474$ firm-year observations. Thanks to the SIC code, a 4-digit code useful to classify firms in their corresponding industry, I drop financial firms (SIC codes from 6000 to 6999) and utility firms as gas and sanitary services firms (SIC codes from 4900 to 4999) because these firms tend to have different and highly regulated capital structures.
Unfortunately, Orbis doesn't provide full data of the variables, missing data are treated as a "." in Stata and, in case of even only one missing data in the entire row, this lack leads the software to exclude the entire row when utilized for the model.

Table 4.2 and 4.3 report the sample composition after the previously explained selection procedure respectively for the US subsample and Canadian subsample focusing on the different broad industry classification. Starting from the 4-digit SIC code, I cluster for practical purposes firms in wider macro industries categories ranked according to a 1-digit SIC code:

- 4-digit SIC from 0 to 1999: Agriculture, mining, oil, construction
- 4-digit SIC from 2000 to 2999: Food, tobacco, textiles, paper and chemicals
- 4-digit SIC from 3000 to 3999: Health, legal and educational services, other
- 4-digit SIC from 3000 to 3999: Manufactuting, machinery, electronics
- 4-digit SIC from 4000 to 4900: Transportation, communication, utilities
- 4-digit SIC from 5000 to 5999: Wholesale and retail
- 4-digit SIC from 7000 to 7999: Services
- 4-digit SIC from 8000 to 9999: Health, legal and educational services, other

Industry (1-digit SIC)	N	%
Agriculture, mining, oil, construction	620	9.47%
Food, tobacco, textiles, paper and chemicals	1001	15.28%
Health, legal and educational services, other	858	13.10%
Manufactuting, machinery, electronics	1454	22.20%
Services	1400	21.38%
Transportation, communication, utilities	291	4.44%
Wholesale and retail	657	10.03%
Missing	268	4.09%
Total	6549	100%

Table 4.2: US industry classification sample according to 1-digit SIC code

Industry (1-digit SIC)	N	%
Agriculture, mining, oil, construction	1663	59.35%
Food, tobacco, textiles, paper and chemicals	305	10.89%
Health, legal and educational services, other	141	5.03%
Manufacturing, machinery, electronics	218	7.78%
Services	295	10.53%
Transportation, communication, utilities	55	1.96%
Wholesale and retail	92	3.28%
Missing	33	1.18%
Total	2802	100%

Table 4.3: Canadian industry classification sample according to 1-digit SIC code

Comparing the two subsamples, the most obvious difference we can notice is the large stake that Agriculture, mining, oil and construction firms represent in the Canadian subsample (59,35%). In the US subsample all industries' macro-categories are quite equally distributed with Manufactuting, machinery, electronics and Services industries representing the most predominant industries. “Missing” are firms without a 4-digit SIC code in the dataset and so impossible to classify.

Control Variables

- ***Natural Logarithm of Total Assets (wln_TA)***: according to IFRS an asset is a resource controlled by the entity as a result of past events which has the potential to produce future economic benefits. Total Asset is a proxy used in economics and accounting literature to

proxy the size of a firm. The logarithm transformation is used to transform a highly skewed variable into a more normal distribution.

- ***Leverage (wlev1)***: calculated as (Long-Term Debt + Current Liabilities) / lag of Total Assets. Leverage in this case is a proxy of the level of the firm indebtedness. Since bigger firms have higher debt in absolute value if compared to smaller firms, the numerator is scaled by the Total Assets in order to relativize the measure. This reasoning can be applied to all next variables scaled by Total Assets, in this way it's easier to compare the same proxy coming from different firms. Then, the lag (so the measure at t-1 time) is used because of the economic nature of assets to affect and continue to provide benefits to the measure used at the numerator. In this case Assets at time t-1 is the baseline wealth the firm uses to forecast and negotiate debt level at time t, so it's more appropriate to divide the debt proxy to a measure of Assets that is more tied with.
- ***Market-to-Book Value (wmtb)***: calculated as (Market Price at Year End * number of Shares Outstanding) / Book Value. It's a metric used in finance and accounting to compare the current market value of the company to its book value. Market value is represented as the price of the firm stock at the end of the fiscal year times the number of shares that are issued and actively held by stockholders. Book value equals the net value of assets coming from the balance sheet of the firm. A high ratio (greater than 1) could signal the stock is overvalued whereas a low ratio (lower than 1) could indicate a bad investment since the investor is paying too much for what he/she would be repaid in the case of bankruptcy of the firm. Negative Book Value values found in the dataset and null Market-to-Book Value values have been dropped.
- ***Return-On-Assets (ROA) (wpt_roa)***: calculated as Earnings Before Taxes (EBT) / lag of Total Assets. ROA indicates the ability of the firm to generate earnings by employing its assets. EBT is used rather than Net Income to "clear" the metric of the influence of tax differences when companies are compared.
- ***Cash Flow (wcash_flow)***: calculated as Operating Income before Depreciation and Amortization / log of Total Assets. OIBDA is a measure to proxy the profits generated by the core business of the company excluding the effects of tax structure, capitalization as interest expenses, CAPEX and also non-recurring items. Since Depreciation and Amortization are non-cash items and are added back, OIBDA can be considered as a proxy of the Cash Flow generated by the Operating Activities of the firm.
- ***Investment (winvest)***: calculated as (Research & Development Expenses + Acquisition of Fixed Assets – Sale of Fixed Assets + Capital Expenditure) / the average of Assets at time t and t-1. The numerator includes several measures relating to the resources employed for

the improvement, upgrade, maintenance, sale and purchase of Assets. In this case, the average value of the assets is used to scale the numerator.

- ***Net Property, Plant and Equipment (PPE) (wppe)***: calculated as Net Property, Plant and Equipment / lag of Total Assets. It includes the value of buildings, land, furniture and other physical capital hold by the firm net accumulated depreciation expenses.
- ***Statutory Tax Rate (str)***: represents the top marginal statutory corporate income tax rate that the firm has to apply in the year *t* in the corresponding jurisdiction (US or Canada). The STR in the US is 35% in the years before TCJA (2013, 2014, 2015, 2016) and 21% after TCJA (2018 and 2019). The STR for Canadian firms is 26,5%[9] and is flat for all the time frame.

All the continuous independent variables previously presented have been winsorized at the 1st and 99th percentile. This means that the values in the lower and upper 1% of the distribution have been substituted with the next (previous) value counting inwards (outwards) from the two extremes. Winsorization is a useful procedure to reduce the influence of extreme outlier values and obtain more robust estimators.

Dependent variables

In total three different measures of tax avoidance are employed in this research:

The measure of ***GAAP Effective Tax Rate*** considered is calculated as: Total Income Taxes / (Earnings Before Taxes – Special Items)

- Total Income Taxes refers to all taxes related to the accounting period (paid, accrued or deferred). It's usually found in the Income Statement and reflects both current taxes (tax expenses calculated applying the current tax rate on the earnings of the year) and deferred taxes (the portion of taxes arising because of temporary differences).
- Earnings Before Taxes refers to profit before taxation, a measure that is not affected by tax avoidance strategy of the firm since is "cleaned" by the tax items.
- Special Items refer to unusual and exceptional items such as restructuring charges, severance pay, any significant nonrecurring item, goodwill impairments, inventory nonrecurring write-downs, nonrecurring gains and losses related to the sale of assets and securities, charges related to floods, fire and other natural disasters. This metric is introduced for limiting the volatility of the measure since this kind of item could be quite large (Scott et al., 2008).

[9] Source: https://home.kpmg/it/it/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html

I exclude from the model GAAP ETRs with negative denominators, that are firms with negative EBT or with EBT turned negative after subtracting the Special Items. Firms with negative GAAP ETRs (firms with negative EBT) have been replaced with a GAAP ETR measure of zero since is not possible to declare a negative amount of taxes; firms with a GAAP ETR over 100%, that is they declare an amount of taxes larger than their EBT (the basis measure where the statutory tax rate is applied to calculate Income Taxes) are capped with a measure of 1.

The second measure ***Cash Effective Tax Rate*** is calculated as: Cash Taxes Paid / (Earnings Before Taxes - Special Items). Cash Taxes Paid represents cash outflows for the payment of income taxes to federal, state, local and foreign governments. It's found in the Statement of Cash Flow. As for GAAP ETR, firms presenting a negative denominator are excluded moreover Cash ETR goes from 0 to 1 (100%): firms with a Cash ETR above 1 have capped with 1 and firms with a negative Cash ETR have been set with a Cash ETR of 0.

Unfortunately, data for Cash Taxes Paid are only available in Orbis Bureau Van Dijk for US firms so it will be taken into account only for analysis concerning exclusively US firms since the data are not available for Canadian firms.

The third measure ***ETR differential*** is presented as the difference between the country's Statutory Tax Rate (STR) and the GAAP ETR. Remembering that the STR (*str*) is the tax rate imposed by the government and applied to the income generated by the firm whereas the GAAP ETR is the accounting effective tax rate that gives a measure of the average tax rate per dollar of income earnt (Lee et al., 2015). GAAP ETR can be compared against the STR in order to present the magnitude of the firm tax avoidance strategy; a wider difference means greater tax avoidance. TCJA lowers STR by 14% so the effect of TCJA in lowering US GAAP ETRs is quite straightforward and mechanical: a lower STR for sure would cause a lower GAAP ETR but, what about tax avoidance attitude? ETR differential can be an effective measure to proxy changes in tax avoidance strategies of US firms after TCJA enforcement.

The Logarithm of Pre-Tax Book Income (***Log_PTI***) is included as the dependent variable in the section on conforming tax avoidance. Following Eichfelder et al. (2021) study and prior literature, conforming tax avoidance changes would reflect on Pre-Tax Book Income through an increase (or decrease) of the statutory corporate tax rate.

4.3 Descriptive statistics and Correlation Matrix

The aim of this paragraph is to give a deeper insight into the variables employed in the following models.

Variables	N	Mean	SD	Min	p25	Median	p75	Max
US firms Pre-TCJA								
gaap etr	2991	.285	0.167	0	.197	.305	.364	1
cash etr	2992	.268	0.210	0	.124	.247	.349	1
wln TA	2992	14.082	1.981	7.487	12.886	14.156	15.444	17.774
wlev1	2992	.426	0.193	.004	.286	.428	.554	.926
wmtb	2992	4.675	9.685	.123	1.708	2.752	4.482	134.211
wcash flow	2992	.16	0.088	-.21	.103	.142	.196	.574
wpt roa	2992	.105	0.091	-.334	.046	.086	.137	.69
winvest	2992	.024	0.048	-.065	0	.002	.035	.44
wppe	2992	.237	0.245	0	.077	.161	.33	4.337
Canadian firms Pre-TCJA								
gaap etr	476	.269	0.196	0	.174	.263	.307	1
wln TA	922	12.052	2.788	5.489	9.886	12.145	14.153	17.774
wlev1	922	.371	0.205	.004	.218	.376	.503	1.136
wmtb	922	3.723	8.960	.123	.968	1.719	3.315	134.211
wcash flow	922	-.221	0.879	-14.974	-.188	-.026	.04	.574
wpt roa	922	-.211	1.103	-19.35	-.143	.003	.074	.69
winvest	922	.029	0.086	-.022	0	0	0	.699
wppe	922	.319	0.349	0	.059	.241	.478	4.337
US firms Post-TCJA								
gaap etr	2228	.21	0.174	0	.12	.205	.251	1
cash etr	2230	.22	0.210	0	.085	.184	.265	1
wln TA	2230	14.364	1.931	7.766	13.257	14.475	15.658	17.774
wlev1	2230	.43	0.193	.012	.283	.438	.572	.966
wmtb	2230	4.782	9.919	.123	1.491	2.593	4.72	134.211
wcash flow	2230	.15	0.085	-.464	.097	.135	.182	.574
wpt roa	2230	.095	0.086	-.208	.038	.076	.126	.69
winvest	2230	.024	0.054	-.065	0	.001	.03	.638
wppe	2230	.268	0.285	.002	.091	.182	.35	4.337
Canadian firms Post-TCJA								
gaap etr	377	.252	0.190	0	.163	.246	.292	1
wln TA	782	12.099	2.593	5.566	10.037	12.029	14.015	17.774
wlev1	782	.383	0.208	.005	.214	.378	.539	.986
wmtb	782	3.428	7.612	.123	.927	1.665	3.06	97.222
wcash flow	782	-1.4	6.236	-38.35	-.289	-.062	.023	.574
wpt roa	782	-2.822	15.102	-116	-.258	-.013	.064	.69
winvest	782	.025	0.094	0	0	0	0	1.215
wppe	782	.479	0.810	0	.073	.269	.533	4.337

Table 4.4: Descrpitive statistics for US firms pre and post TCJA implementation and Canadian firms pre and post TCJA implementation. Source: personal processing

Table 4.4 (first section) describes summary statistics of US firms before the adoption of TCJA (from 2013 to 2016 included). All variables present 2992 observations, except for *gaap etr* with one less observation (2991). *gaap etr* presents a mean of 28,5% and a median of 30,5%,

meaning that the average firm in the years before TCJA used to declare 0,285$ of income tax expense per each 1$ earnt. Minimum and maximum values are respectively 0 and 1, this is due to the construction method of the variable previously explained. This statistic reports clearly tax avoidance strategies conducted by US firms before TCJA since the figure is well below the corporate statutory tax rate of 35%. Wagner et. al (2020) depict a GAAP ETR amount of 29,6% in the five years preceding TCJA for a sample of firms belonging to Russell 3000, so I can consider *gaap etr* coming out from my sample consistent with what was already found in the literature. *cash etr* is on average 26,8%, meaning that a US firm before TCJA had a cash outflow of 0,268$ for taxes paid per each 1$ earnt, with a reduction to 0,22$ after TCJA.

Since the transformation in natural logarithm is useful, especially for regression model purposes, I present statistics about Total Asset after "winsorization". 25^{th}, 50^{th} and 75^{th} percentiles are respectively 0,395, 1,405 and 5,095 billion dollars; the mean is 5,993. The distribution of the variable is highly skewed, with a big right-skewed tail and a mean larger than the median value. This is a signal of very few firms with a huge size in assets. Logarithm transformation is adopted to convey a more normal distribution.

US average firm pre-TCJA financed 42,6% of its needs by resorting to debt capital market; the residual and prevalent part of financial needs was covered in equity markets.

The *wmtb* mean is 4,675, meaning that the average US firm has a market value more than four times higher than its book value. Also in this case, the distribution is highly right-skewed with few firms showing very high share prices traded in the stock market as shown by the maximum value in the table of 134,211.

In *wcash_flow* we can find negative values since in certain cases firms can have a negative Operating Income causing deterioration of Cash Flow From Operating Activities.

On average a firm in this sample and period shows good profitability of more than 10%, even if it's worth remembering that firms come from different industries and sectors with their own benchmark threshold computed from peers, so there could be sectors where 10% can be very satisfactory whereas in others it's not.

The majority of firms tend to invest in R&D, acquisition of fixed assets and capital expenditure more than the sale of fixed assets, as shown by the positive value of the distribution variable from the 25^{th} percentile.

wppe represents about 23,7% of total assets. It could seem strange to find a maximum value of 433,7% since PPE should be included in the value of total assets but in some cases, firms can have experienced a giant growth from one year to the next of the investments in PPE, even exceeding the value of the total assets of the previous year.

Since the main objective of my research is tax avoidance analysis among US firms, the most interesting change comparing the figures of US firms pre and post TCJA is the GAAP ETR decrease. On average *gaap etr* dropped of 7,5% from pre and post TCJA period in a US firm, this is certainly due to the government's decision of reducing the corporate statutory tax rate to 21%. Adopting *gaap etr* as the tax avoidance metric, it seems that the average US firm's tax avoidance behavior disappears, seen the perfect alignment between the new statutory tax rate and average *gaap etr*.

Interestingly, *wlev1* after TCJA slightly increased (+0,4%). This can be surprising because the limitation on interest deductibility imposed by TCJA should have disincentivized, at least in a minimum part, US firms to raise debt to exploit the deductibility of interest expenses for tax purposes.

Surprisingly, an average Canadian firm presented a GAAP ETR of 26,9%, 0,4% above the corporate statutory tax rate in Canada of 26,5%.

Figure 4.3 and 4.4 display the distribution of GAAP ETR for US and Canada, distinguishing the GAAP ETR before TCJA and after TCJA. The most evident result is the massive shift to the left for US GAAP ETR distribution from the pre to the post TCJA period, consistent with the drop of the corporate statutory tax rate established by the Act. As expected, GAAP ETR of the Canadian sample doesn't experience the same shift of the American one, the distributions are almost similar for the pre and the post TCJA period, signaling no effect of TCJA on tax avoidance strategies of Canadian firms. Figure 4.5 depicts Cash ETR distribution for US firms, experiencing the same shift as GAAP ETR.

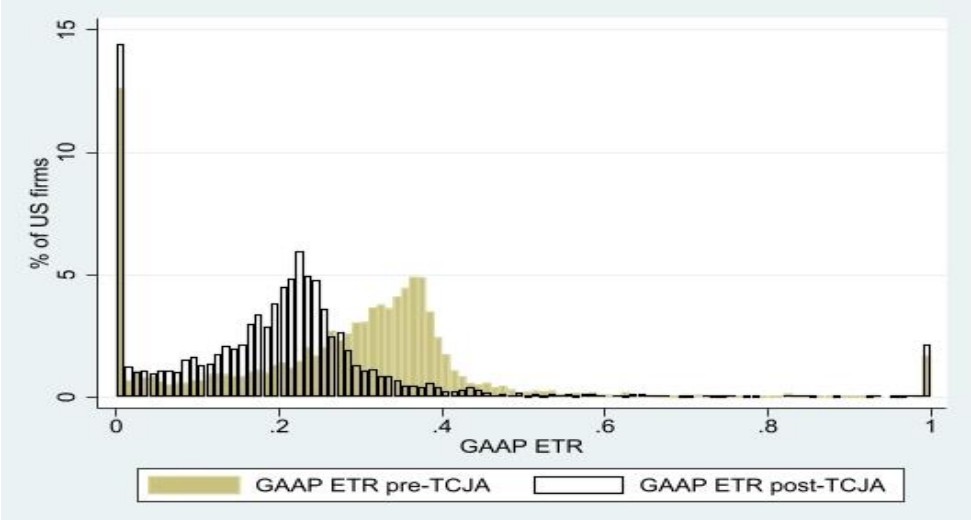


Figure 4.3: US GAAP ETR distribution in the pre and post TCJA period. Source: personal processing

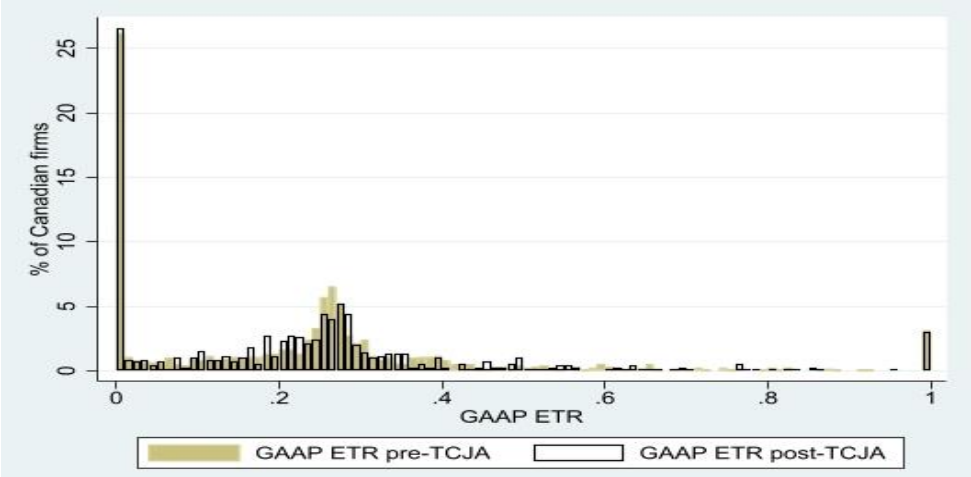


Figure 4.4: Canadian GAAP ETR distribution in the pre and post TCJA period. Source: personal processing

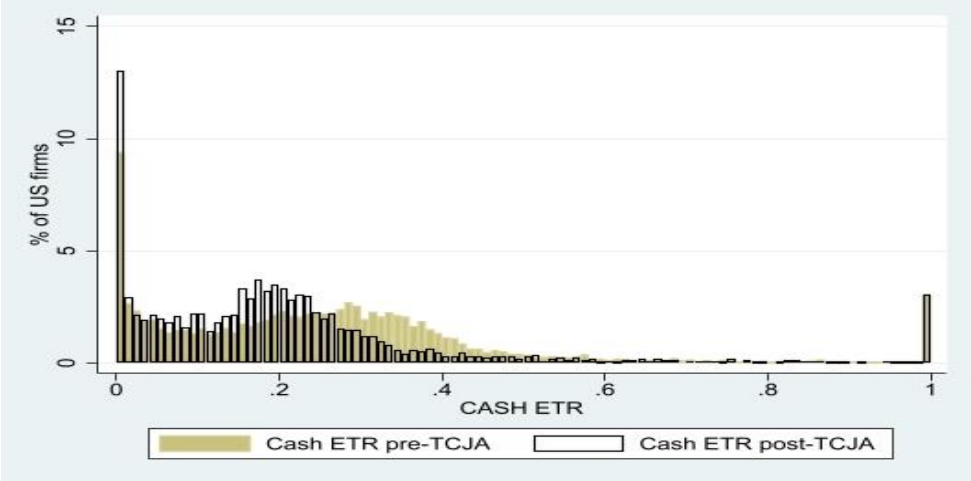


Figure 4.5: US Cash ETR distribution in the pre and post TCJA period. Source: personal processing

The average Canadian firm is about the half of size if compared to the average US firm in the pre TCJA period and the difference in size widens comparing the Total Assets statistics after TCJA. The average Canadian firm is less levered and interestingly shows an average negative value of *wcash flow* and *wpt roa*. *wpt roa* worsens if we consider the post TCJA subsample where the mean *wpt roa* is -282%. This is due to the presence in the subsample of extremely unprofitable few firms such as Alternate Health Corp or Claritas Pharmaceuticals Inc that compromise downward the mean value; the standard deviation indeed is very high. Canadian firms increased considerably the percentage of PPE in the years, going from 32% to 48% of PPE over Total Assets; if compared to US firms, Canadian firms, own almost the double PPE.

In order to give a more detailed view of descriptive statistics, the Pairwise Correlation Matrix is presented. This table displays all the pairwise correlation coefficients between the variables taken into account in the next models. An important warning that a matrix correlation can signal to the researcher is the multicollinearity issue: multicollinearity needs to be handled only when the correlation between two coefficients is above 0.8 in absolute terms.

Not surprisingly, *gaap etr* and *cash etr* display a positive and significant correlation showing the ability to capture the same underlying construct.

The dependent variable *gaap etr* shows a positive and significant correlation (significance level of 10%) with *wln_TA* and *wcash_flow*, this means that the more the firm is bigger the less it would engage in tax avoidance behavior. Then *gaap etr* shows a negative and significant correlation with *wlev1* and *wmtb*. We can notice that the majority of the controls exhibit significant correlation with the GAAP ETR tax avoidance measure, highlighting the importance of controlling for these factors in the multivariate tests.

cash etr presents the same correlations with the controls previously presented by *gaap etr*, except for *wcash flow* where the correlation is negative but not significant and for *wppe* where the more the firm invests in PPE the more reduces its cash paid for tax purposes.

However, these correlations must be handled with caution since they don't take into account the effects of other controls that may affect the relation of tax avoidance with other firm-specific characters.

The only correlation coefficient that signals collinearity issue is the correlation coefficient between *wcash flow* and *wpt roa* (0,893).

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) gaap_etr	1.000								
(2) cash_etr	0.348*	1.000							
	(0.000)								
(3) wln_TA	0.091*	0.077*	1.000						
	(0.000)	(0.000)							
(4) wlev1	-0.046*	-0.025*	-0.367*	1.000					
	(0.000)	(0.016)	(0.000)						
(5) wmtb	-0.027*	-0.038*	-0.202*	0.163*	1.000				
	(0.004)	(0.000)	(0.000)	(0.000)					
(6) wcash_flow	0.020*	-0.005	0.292*	-0.309*	-0.187*	1.000			
	(0.042)	(0.653)	(0.000)	(0.000)	(0.000)				
(7) wpt_roa	0.011	-0.130*	0.260*	-0.391*	-0.146*	0.893*	1.000		
	(0.242)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
(8) winvest	-0.096*	-0.045*	-0.094*	0.061*	0.173*	-0.190*	-0.114*	1.000	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
(9) wppe	-0.015	-0.117*	-0.002	-0.029*	0.033*	-0.416*	-0.412*	-0.101*	1.000
	(0.123)	(0.000)	(0.757)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4.5: Correlation matrix for dependent variables and control variables. Source: personal processing

4.4 Empirical results

4.4.1 Entropy balance method

An estimate coming from a simple comparison between the treated and control groups' average effects can result biased. The researcher must also take into account pre-treatment differences between observations belonging to the control and treated groups, otherwise, all the average effects would be attributed exclusively to the treatment.

In order to assess the effect of the binary treatment, matching and propensity score methods, such as neighbor matching or propensity score technique, have gained ground in political sciences and other disciplines. The aim is to find the fittest preprocessing method to apply to data in order to adjust the covariate distribution of the control group by reweighting or rejecting units in a way that the covariate distribution of the control group becomes more similar to the covariate distribution of the treatment group (Hainmueller and Xu, 2013). The matching process is useful for, every treated unit, to find one or more non-treated unit(s) with similar observable characteristics in order to assess the effects of the treatment. Matching the treated units to similar non-treated units makes one able to estimate the effect of the treatment reducing the distortion due to confounding. In many cases, low balance levels are found since the process of iteration between propensity score modeling, matching and balance checking until an adequate balancing solution is found can be very tedious and requires finding the correct model specification. Usually, it happens that researchers have to go back and forth between propensity score estimation, matching, and balance checking to manually arrive at a suitable weighting that balances covariate distributions. Moreover, the matching balancing procedure can expose the user to a trade-off: the balance of some covariates can decrease to the advantage of others.

Entropy balance is a preprocessing methodology with the goal of achieving covariate balance in observational studies with a binary treatment. It consists of a reweighting scheme that directly incorporates covariate balance into the weight function that is applied to sample units. More precisely, the preprocessing reweighting assigns a scalar weight to each sample unit in a way that the reweighted groups must satisfy a set of balance constraints that are imposed on the sample moments of the covariate distributions. The user initially imposes a potentially set of balance constraints in order to constrain that the covariate distributions of the treatment and control group in the preprocessed data match exactly. The moment constraints may include the mean (first moment), the variance (second moment) and the skewness (third moment). Once a prespecified level of covariate balance is set by the user, entropy balancing searches for the set of weights that satisfies the balance constraints but, at the same time, remains as close as possible to a set of uniform base weights to retain information. Entropy balancing

orthogonalizes the treatment indicator with respect to the covariate moments included in the reweighting reducing in this way the model dependence for the next steps in the analysis. Hainmueller (2012) presents a simple scenario where the goal of reweighting the control group to match the moments of the treatment group is to estimate the difference in mean between observations in the treated and reweighted control group. The reweighted control group mean (counterfactual mean) is estimated as:

$$\mathbb{E}[\widehat{Y(0)|D} = 1] = \frac{\sum_{\{i|D=0\}} Y_i \, w_i}{\sum_{\{i|D=0\}} w_i}, \tag{5}$$

Meaning that the estimated expected value of the reweighted control group ($Y(0)$) after the treatment ($D = 1$) is defined by the weight w_i chosen for each control unit. Weights are chosen by the following reweighting procedure:

$$\min_{w_i} H(w) = \sum_{\{i|D=0\}} h(w_i) \tag{6}$$

Subject to balance and normalizing constraints:

$$\sum_{\{i|D=0\}} w_i \, c_{ri}(X_i) = m_r \quad \text{with} \quad r \in 1, \ldots, R \quad \text{and} \tag{7}$$

$$\sum_{\{i|D=0\}} w_i = 1 \quad \text{and} \tag{8}$$

$$w_i \geqslant 0 \quad \text{for all} \quad i \quad \text{such that} \quad D = 0, \tag{9}$$

Where in equation (6), $h(.)$ describes a loss function that measures the distance between the distribution of estimated control weight defined by the vector $W = [w_i, \ldots, w_{no}]'$ and the distribution of base weights described by the vector $Q = [q_i, \ldots, q_{no}]'$. The loss function (6) is nonnegative and decreases the more W is closer to Q, reaching a value of zero when $W = Q$. The first constraint (7) (the balance constraint) has the goal of equalizing the moments of the covariate distribution between the treatment and the reweighted control group. The second constraint (8) imposes the sum of weights equals to one; one is an arbitrary number representing the normalization constant but other constants can be adopted by the researcher. The third constraint (9) sets that the distance metric, $h(.)$, must be nonnegative since it's not defined for negative values of the weights.

Instead of the conventional propensity score weighting where the researcher, first of all, has to estimate a logistic regression to estimate the unit weights and then execute the balance checking

to verify if the estimated weights equalize the covariate distribution, in the entropy balance approach the researcher directly exploits her knowledge about the sample moments and is able to specify the balance constraints, needed for the achievement of adjusted weights. This procedure has the advantage of directly adjusting the unit weights to the known sample moments such that the exact match is obtained in finite samples, making the balance checking in the conventional method unnecessary.

Hainmueller (2011) presents an example of the application of entropy balance to the LaLonde (1986) dataset, where data are drawn from two different datasets: the first one includes a randomized evaluation of a large job training program (National Support Work Demonstration or NSW), the second one is composed by elements drawn from the Current Population Survey-Social Security Administration (CPS-1). In the NSW dataset, it's estimated that the job program has the effect of increasing earnings by $1794, using a simple difference in means; this increase in earnings can provide a benchmark estimate for the program effect. Then, the control group previously identified and employed in the NSW dataset is replaced by a control group drawn from the CPS-1 dataset where the same covariates are used to estimate the impact of the job training program. Adopting the second dataset (CPS-1), Lalonde found that many of the covariate adjustment methods (for example regression) were not able to replicate the goodness of the estimate obtained from the randomized experiment. The model contains 10 covariates to control for the selection into the training program, all their pairwise one-way interactions and squared terms for age and years of education controls, with an overall total of 52 covariates.

Figure 4.6 depicts the covariate balance obtained from several matching methods such as Mahalanobis distance matching, genetic matching, propensity score matching and entropy balance. The left panel shows the standardized difference in means between the treatment and control group; the right panel displays p-value for a difference of means test. In the Unadjusted data (open circles) we can notice how the differences in the covariate means between participants of the job training program and the general population is very wide, signaling a heavy imbalance between the two groups; in the right panel, we can see almost the totality of p-values of Unadjusted data near 0, meaning that all mean differences are significantly different from zero at conventional levels. On the other hand, if we consider entropy balancing statistics (black squares), the balance is significantly improved as the black squares lay on the zero line in the right panel, meaning that the reweighted control group has the same means compared to the treatment group on all covariates and so the standardized means are null; also p-values in the left panel are all 1 leading the research to reject the hypothesis that the mean differences between treated and reweighted control group are, on average, negligible.

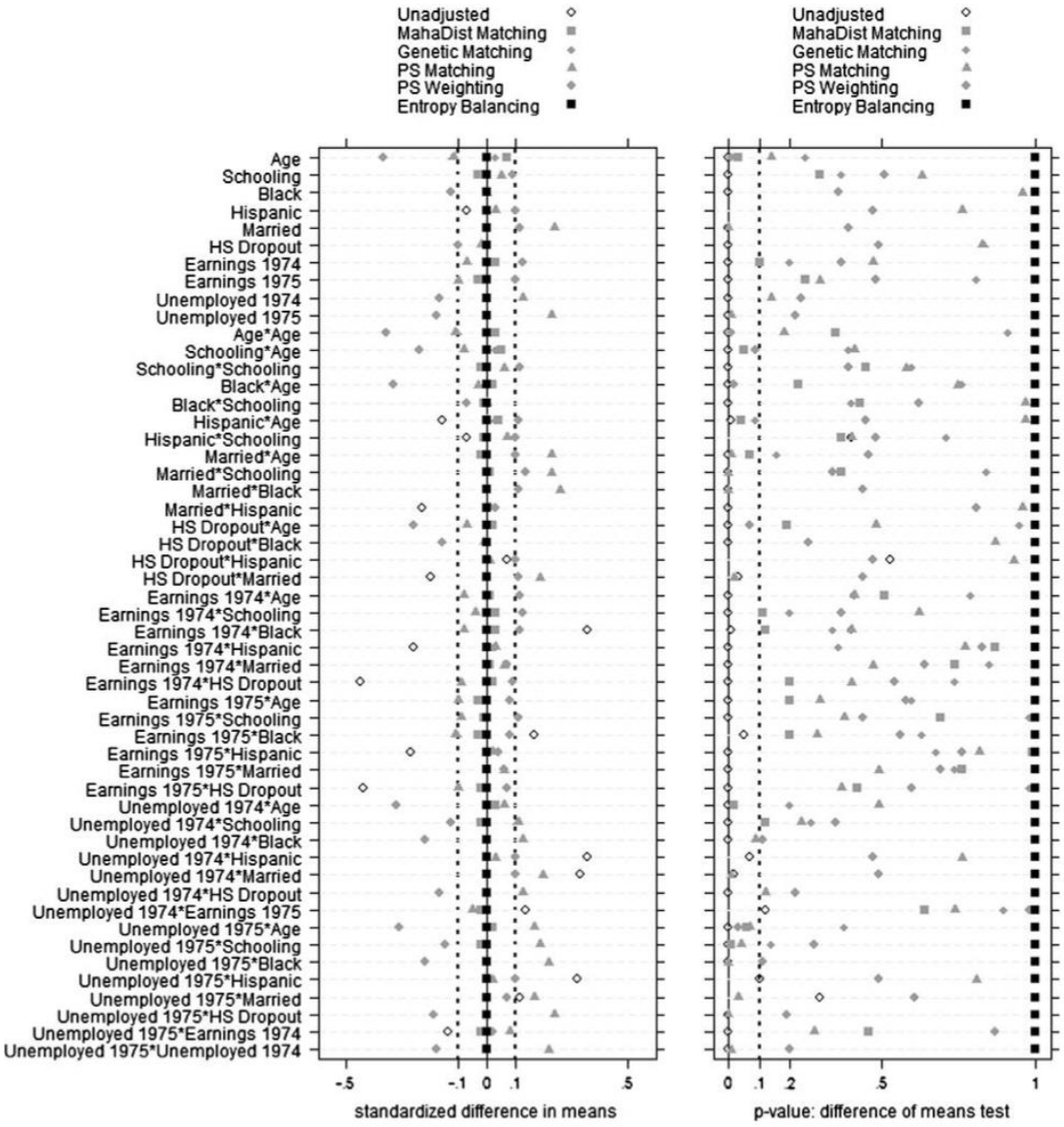


Figure 4.6: Covariate balance in the LaLonde data. Source: Hainmueller (2011)

Generally, entropy balance provides a more accurate balance between covariates if compared to all the adjustment techniques previously named; in some cases, after the use of an adjustment method such as logistic regression propensity score adjustment, the bias of some covariates surprisingly increases as shown by the wider distance of the means if compared to the Unadjusted statistics. With the entropy balance method, the difference in means between the treatment group and the reweighted control group is $1.571; this estimate is closer and more efficient than the estimate of $1734 presented by Diamond and Sekhon (2006) with a genetic matching procedure.

ebalance is a Stata command used to perform entropy balance. It assumes that the user has data both for a treatment and a control group. The goal of this command is to reweight the data from the control units in order to match the set of moments that is computed from the data of the treated units. The code specifies the treatment binary variable (1 for treated observation and 0 otherwise), the set of covariates to balance and "*targets*" which is probably the most important part of the code. The user has to specify a number (1, 2 or 3) in the "*targets*" command, which is the highest covariate moment that should be adjusted for each covariate. In my case I request that the first moment of the variables *wln_TA*, *wlev1*, *wmtb*, *wpt_roa*, *wcash_flow*, *winvest*, *wppe*, *i.sic1*[10] that belong to the year 2015 to be adjusted. More precisely, the software through this command computes the means of these covariates in the treatment group data and searches for a set of entropy weights in a way that the means in the reweighted group data match the means from the treatment group.

Hereafter in Figure 4.7, Stata output is reported after the *ebalance* command run. We can observe in the first table "Before: without weighting" that the means before the reweighting are far away from the match and present differences from the Treat and Control groups. In the second table "After: entropy as the weighting variable", the means in the reweighted control group match the means in the treatment group.

[10] *i.sic1* represents a categorical variable where, to each firm-observations, the first digit of the 4-digit SIC is assigned.

```
Data Setup
Treatment variable:   treatment
Covariate adjustment: wln_TA wlev1 wmtb wpt_roa wcash_flow winvest wppe 1.sic1 2.sic1 3.sic1 4.sic1 5.sic1 7.sic1 8.sic1

Optimizing...
Iteration 1: Max Difference = 4869.26174
Iteration 2: Max Difference = 1791.10726
Iteration 3: Max Difference = 658.719286
Iteration 4: Max Difference = 242.141748
Iteration 5: Max Difference = 88.9034343
Iteration 6: Max Difference = 32.557796
Iteration 7: Max Difference = 11.8792771
Iteration 8: Max Difference = 4.31433361
Iteration 9: Max Difference = 1.49532306
Iteration 10: Max Difference = .428948023
Iteration 11: Max Difference = .073255901
Iteration 12: Max Difference = .003276879
maximum difference smaller than the tolerance level; convergence achieved


Treated units: 1937    total of weights: 1937
Control units: 778     total of weights: 1937

Before: without weighting
```

	Treat			Control		
	mean	variance	skewness	mean	variance	skewness
wln_TA	12.87	6.389	-.2652	10.33	8.189	.3881
wlev1	.4022	.4211	36.91	.2816	.05294	.7171
wmtb	5.759	220.1	6.735	3.161	75.54	8.125
wpt_roa	-.304	19.1	-23.76	-.246	.4671	-6.908
wcash_flow	-.124	3.041	-17.85	-.2095	.294	-6.67
winvest	.06631	.01923	3.33	.01576	.004786	6.324
wppe	.2434	.09877	5.456	.2949	.1744	3.762
1.sic1	.07383	.06841	3.26	.626	.2344	-.5206
2.sic1	.1915	.1549	1.568	.09383	.08514	2.786
3.sic1	.316	.2162	.7918	.1054	.09441	2.57
4.sic1	.05731	.05405	3.809	.03599	.03474	4.982
5.sic1	.1198	.1055	2.342	.03728	.03593	4.885
7.sic1	.1621	.1359	1.834	.07069	.06578	3.35
8.sic1	.07434	.06885	3.245	.02828	.02751	5.691

After: entropy as the weighting variable

	Treat			Control		
	mean	variance	skewness	mean	variance	skewness
wln_TA	12.87	6.389	-.2652	12.87	9.347	-.4403
wlev1	.4022	.4211	36.91	.4022	.03955	.2819
wmtb	5.759	220.1	6.735	5.758	310.6	6.491
wpt_roa	-.304	19.1	-23.76	-.3039	1.766	-5.091
wcash_flow	-.124	3.041	-17.85	-.124	.1784	-5.681
winvest	.06631	.01923	3.33	.06629	.02572	2.934
wppe	.2434	.09877	5.456	.2434	.06442	2.06
1.sic1	.07383	.06841	3.26	.07413	.06872	3.251
2.sic1	.1915	.1549	1.568	.1915	.155	1.568
3.sic1	.316	.2162	.7918	.3158	.2164	.7923
4.sic1	.05731	.05405	3.809	.05729	.05408	3.81
5.sic1	.1198	.1055	2.342	.1197	.1055	2.343
7.sic1	.1621	.1359	1.834	.1621	.136	1.834
8.sic1	.07434	.06885	3.245	.07432	.06888	3.246

Figure 4.7: Stata output of entropy balance after ebalance command. Source: personal processing

4.4.2 Firm-specific factors and tax avoidance

OLS regressions in Table 4.6 illustrate the effect of firm-specific factors on the level of tax avoidance strategy among US firms in the time period considered (years from 2013 to 2019). Two measures of tax avoidance, *Cash_ETR* and *GAAP_ETR*, are respectively used as dependent variables in order to evaluate with a deeper analysis the effect of the control variables on tax avoidance.

The first variable is *wln_TA*, utilized as proxy of firm size. As stressed by a branch of the literature, bigger firms tend to have more political power and more complex transactions and accounting practices that increase the scope for tax avoidance. On the other hand, other authors find that bigger firms are more subject to audit and government controls since their dimension and public reputation, decreasing in this way their tax avoidance propensity. In my model, the coefficient displayed is negative in both regressions but only highly significant in reducing *GAAP_ETR*, supporting the hypothesis that bigger firms tend to have more power and are skilled in booking fewer income taxes but data doesn't tell us the same for cash paid for taxes. *wlev1* exhibits a positive coefficient, only weakly significant in affecting *GAAP_ETR*.

A positive coefficient would signal that the more a firm increases debt for financing its needs, the less is tax avoidant but this is in contrast with the milestone Modigliani and Miller theory where firms increase debt to exploit debt tax shield, expecting a negative sign on *wlev1* coefficient. As stated by Shevlin et al. (2019), a firm that raises leverage level could experience higher volatility in its cash flows and so attracting lenders' attention and concern; in this way, the firm could feel more pressure from lenders and would resort less in tax avoidance strategies because its worry about a more likely audit by IRS and possible penalties. Moreover, the positive coefficient can be explained by possible interest deduction limitations or the substitutability with non-debt tax shield opportunities, less risky but with the same result.

The coefficient of *wmtb* is negative and only significant in *Cash_ETR* regression, even though the coefficient (-0,001) is almost null. Literature findings in this branch are mixed. The traditional view suggests that tax avoidance is a value-enhancing tool for investors since it permits free additional cash flow to reward lenders and shareholders, having a positive impact on value firms. The traditional view can be considered valid until the expected marginal benefit exceeds the expected marginal cost of tax avoidance (Desai and Dharmapala, 2009b). On the other side, shareholders can consider tax avoidance as a tool for managerial opportunism and rent diversion making the investment in the firm a hazard.

wpt_roa coefficient is significant and has a different impact on *Cash_ETR* and *GAAP_ETR*, even if it's less significant in *Cash_ETR* regression. The negative coefficient in the regression with *Cash_ETR* as dependent variable signals the ability of more profitable firm managers to

exploit tax avoidance strategies to pay less cash for tax purposes, making use of these savings for rent extraction purposes for example (Chairina and Sari, 2018). The same reasoning can be extended by adopting *GAAP_ETR* as tax avoidance metric, where more profitable firms are even more able to reduce their *GAAP_ETR* probably because an increase in profitability means an increase in the profit companies and also in the total tax income not lowered enough by tax avoidance strategies.

wcash_flow coefficient has a negative and highly significant impact on tax avoidance measures, establishing that firms with more cash flow are more prone to be tax avoidant. The negative impact of cash holdings on tax avoidance level of the firm is consistent with the prediction of Dhaliwal, Huang, Moser and Pereirea (2011) where they explain in their research that more tax avoidant firms hold more cash in order to enable a greater rent extraction with also a negative effect of shareholder valuation of the firm.

winvest has only a positive and significant effect on *Cash_ETR*, whereas not affecting *GAAP_ETR*. The sign of the coefficient is unexpectedly positive, not confirming predictions in the literature where greater capital expenditures and R&D expenses are great tools to generate potential deductible expenses and tax credits (Cook et al., 2017).

wppe presents a negative coefficient in *Cash_ETR* regression, following the same reasoning of *winvest* where a firm increasing its PPE (a more capital-intensive firm) can exploit greater bonus depreciation for its tax avoidance strategy (Stickney and McGee, 1982). *wppe* coefficient found in *GAAP_ETR* doesn't support results found in literature since its significant and positive sign, signaling that more capital-intensive firms are less tax avoidant on average.

Concerning Hypothesis 1 and the effect on tax avoidance, data suggests company size has a positive and significant effect, fixed assets have a negative and significant effect (only for *GAAP_ETR*), leverage has a negative and significant effect (only for *GAAP_ETR*) and profitability has a mixed effect but still significant.

VARIABLES	(1) Cash_ETR	(2) GAAP_ETR
wln_TA	-0.009	-0.071***
	(0.011)	(0.008)
wlev1	0.051	0.059*
	(0.041)	(0.034)
wmtb	-0.001**	-0.000
	(0.000)	(0.000)
wpt_roa	-0.408***	0.404***
	(0.109)	(0.104)
wcash_flow	-0.223*	-0.523***
	(0.123)	(0.109)
winvest	0.457**	0.181
	(0.186)	(0.219)
wppe	-0.025	0.025*
	(0.025)	(0.014)
Constant	0.426***	1.246***
	(0.155)	(0.117)
Observations	7,133	7,777
R-squared	0.492	0.488
Firm FE	Yes	Yes
Year FE	Yes	Yes
Industry-Year FE	No	No

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.6: OLS regressions of firm specific factors on (1) Cash ETR and (2) GAAP ETR. Source: personal processing

4.4.3 The effects of TCJA on US GAAP ETR and ETR differential with unbalanced data

In Table 4.7 I present an OLS DiD estimation adopting unmatched data to show the case where the distribution of the covariates is not balanced between the treated and control groups. The number of observations considered in the model is 5.683. The dummy *treat_post* equals 1 if the firm is US and the observations belong to the period after the enactment of TCJA (years 2018 and 2019). *treatment* is a dummy that takes the value of 1 if the firm is US and 0 if it's Canadian, Stata omits it for a likely collinearity issue with the fixed effects. *post_reform* is the third dummy variable that splits firm-observations belonging to the years after TCJA (*post_reform*=1) to the firm-observations belonging before TCJA (*post_reform*=0).

The coefficient of main interest is the *treat_post* coefficient. In this model the coefficient is -0,058 and is highly significant (p-value=0.000), meaning that a firm belonging to US country in the period after the implementation of TCJA brings on average to reduce the *GAAP_ETR* by

5,8%. *post_reform* is positive but not significant (p-value>>>0,1). As discussed previously, this drop in *GAAP_ETR* can't be interpreted as a straightforward increase in tax avoidance behavior of US firms due to TCJA, but a mere adjustment to the new Statutory Tax Rate of 21%. Further analysis is needed to shed a light on this issue.
If we analyze firm-specific characteristics, *wln_TA* displays a negative and significant coefficient of -0,022 (p-value<0,1) and *wcash_flow* exhibits a negative and significant coefficient of -0,236 (p-value<0.01), leading to hypothesize that bigger firms that hold more cash flow are more inclined to reduce their GAAP ETRs and being more tax avoidant.

In order to better understand the effect of TCJA in the US sample, STR and GAAP ETR differential (*ETR_Diff*) is considered. The aim is to overcome the problem that the reduction of STR due to the Act would automatically decrease firms' GAAP ETRs, in this way a new proxy of tax avoidance metric is adopted. In the regression with unbalanced data, the coefficient of *treat_post* is negative (-0,082) and highly significant (p-value=0,000); this result demonstrates that the difference between STR and GAAP ETRs in US firms after the TCJA shrinks, displaying a decrease of tax avoidance behavior in the average US firm in 2018 and 2019. The coefficient of *wln_TA* is positive and significant (p-value<0,1) as the coefficient of *wcash_flow*.

VARIABLES	(1) GAAP_ETR	(2) ETR_Diff
treat_post	-0.058***	-0.082***
	(0.014)	(0.014)
o.treatment	-	-
post_reform	-0.007	0.007
	(0.013)	(0.013)
wln_TA	-0.022*	0.022*
	(0.013)	(0.013)
wlev1	0.029	-0.029
	(0.039)	(0.039)
wmtb	0.000	-0.000
	(0.001)	(0.001)
wpt_roa	0.025	-0.025
	(0.067)	(0.067)
wcash_flow	-0.226***	0.226***
	(0.081)	(0.081)
winvest	0.380	-0.380
	(0.271)	(0.271)
wppe	0.001	-0.001
	(0.017)	(0.017)
Constant	0.594***	-0.257
	(0.180)	(0.180)
Observations	5,683	5,683
R-squared	0.528	0.524
Firm FE	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.7: DiD model with unbalanced data that evaluates TCJA effects on tax avoidance measures (1) GAAP ETR and (2) ETR Differential in US firms. Source: personal processing

4.4.4 The effects of TCJA on US GAAP ETR and ETR differential with balanced data

After the improved balance due to the entropy balance procedure, the results of DiD estimates are shown in Table 4.8. As already explained, the balance obtained by entropy balance weights permits to reduce or free the problem of sample selection bias: the control group is chosen in a way that the distribution of the covariates between the control and treated group is more similar. In this way, the change in the dependent variable is fully attributed to the treatment effect rather than the pre-treatment factors that make the control and treated groups differ. The coefficient of the interest binary variable *treat_post* is still negative but with a greater and significant coefficient of -0,062 with respect to the -0,058 previously found in the unbalanced data OLS model. It means that adopting DiD with matched data, the magnitude of US firms after TCJA in tax avoidance strategy seems more powerful. Estimating the effect on *ETR_Diff* the coefficient of *treat_post* is -0,078 and highly significant (p-value=0,000). As for unbalanced data, it demonstrates that TCJA implementation brought US firms to decrease their tax avoidance activity with the effect of reducing the gap between STR and GAAP ETR. Differently from the unbalanced model, in the balanced model, we find a non-significant coefficient for *wcash_flow*.

Overall, Hypothesis 2 is validated since US firms reduce their tax avoidance activity and so TCJA influences tax avoidance strategies.

VARIABLES	(1) GAAP_ETR	(2) ETR_Diff
treat_post	-0.062***	-0.078***
	(0.014)	(0.014)
o.treatment	-	-
post_reform	0.004	-0.004
	(0.013)	(0.013)
wln_TA	-0.044**	0.044**
	(0.018)	(0.018)
wlev1	0.011	-0.011
	(0.067)	(0.067)
wmtb	-0.000	0.000
	(0.001)	(0.001)
wpt_roa	-0.021	0.021
	(0.162)	(0.162)
wcash_flow	-0.151	0.151
	(0.193)	(0.193)
winvest	0.306	-0.306
	(0.259)	(0.259)
wppe	-0.016	0.016
	(0.029)	(0.029)
Constant	0.907***	-0.600**
	(0.254)	(0.254)
Observations	5,144	5,144
R-squared	0.479	0.477
Firm FE	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.8: DiD model with balanced data that evaluates TCJA effects on tax avoidance measures (1) GAAP ETR and (2) ETR Differential in US firms. Source: personal processing

4.5 Conforming Tax Avoidance and US firms

Conforming tax avoidance is defined as a strategy of tax avoidance that obliges a firm willing to reduce its taxable income reported to tax authorities to reduce in a similar manner also book earnings reported in the Income Statement. In a conforming tax avoidance strategy, a firm can't reduce its taxable income without reducing its book income. Instead, nonconforming tax avoidance aim is to reduce taxable income with no reduction or effect on book income (Eichfelder et al., 2021).

The authors explain that conforming tax avoidance planning incentives increase with the change in the statutory tax rate. Typical strategies include deferral and manipulation of pre-tax income especially when firms expect a lower statutory tax rate in the following period. Equation 10 represents tax benefit per unit of deferred income:

$$\Delta\tau_i = \tau_{i,t} - \frac{\tau_{i,t+x}}{(1+k_i)^x} \tag{10}$$

where τ_i is the statutory tax rate of firm i, τ_{i+x} is the future tax rate after x periods and k_i is the cost of capital, assumed constant for simplicity. If a firm foresees a tax reduction in the period $t+x$, τ_{i+x} will decrease leading the tax benefit per unit of deferred income ($\Delta\tau_i$) to increase. In practice, if a firm expects in the future a drop in the statutory tax rate it will postpone income to pay fewer taxes when the tax rate will be lower. Likewise, the higher the level of τ_I at time t, the greater the incentive to manipulate book income. Since conforming tax avoidance impacts negatively on pre-tax book income, an increase in the statutory tax rate has a negative effect on reported book income because the firm will have an incentive to shift income to a future period with a lower tax rate. Possible limitations and tensions of this theory arise for financial reporting cost with reporting lower performance in book income and the non-tax operational cost of conforming tax avoidance, as violation of debt covenant or compensation contract concerns.

In order to evaluate conforming tax avoidance in the US firms' sample, Table 4.9 displays the regression of the Logarithm of Pre-Tax Income (*Log_PTI*) on the Statutory Tax Rate (*str*) and on the other firm-specific characteristics. As stated by Eichfelder et al. (2021), a decrease in the tax rate leads firms to report higher pre-tax income resulting in a reduction of the conforming tax avoidance behavior. Consistent with the results found by Eichfelder et al., the coefficient of *str* is negative and highly significant (β = -0,49; p-value = 0.000), confirming Hypothesis 3A. The coefficient must be interpreted as a semi-elasticity: it represents the percentage change in the dependent variable resulting from a marginal change in the statutory tax rate. It means that a drop of 1% of the US Statutory Tax Rate, leads US Firms to increase Pre-Tax Income by 0,49%. Then, the authors specify that the logarithm transformation permits this relative effect

accounting also for non-linearity; in my case, if the Statutory Tax Rate lowers by 1% this corresponds to the US firms inflating Pre-Tax Income by 0,489%[11].

VARIABLES	(1) Log_PTI
str	-0.490***
	(0.139)
wln_TA	0.597***
	(0.052)
wlev1	-1.413***
	(0.147)
wmtb	0.004***
	(0.002)
wcash_flow	6.105***
	(0.366)
winvest	-1.037
	(0.910)
wppe	-0.676***
	(0.086)
Constant	2.883***
	(0.738)
Observations	7,719
R-squared	0.957
Firm FE	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.9: OLS regression of corporate statutory tax rate and firm specific factors on logarithm of pre-tax income in order to test conforming tax avoidance. Source: personal processing

4.5.1 The effects of TCJA on Conforming Tax Avoidance of US firms

Table 4.10 depicts the relation of US firms after TCJA in their conforming tax avoidance attitude. Making use of a DiD model, the usual coefficient of interest is the *treat_post* coefficient where in this model is negative and significant at a 5% level: US firms in the years after TCJA decreased their Pre-Tax Income rather than increased as suggested by the conforming tax avoidance theory where firms, after a decrease of the statutory tax rate, should increase their

[11] $100\times(e^{-0,531\times0,01}-1)=-0,489\%$

Pre-Tax Income. That said, Hypothesis 3A can't be confirmed and it seems that TCJA increases conforming tax avoidance in US firms after TCJA.

VARIABLES	(1) Log_PTI
treat_post	-0.203***
	(0.074)
o.treatment	-
post_reform	0.258***
	(0.088)
o.str	-
wln_TA	0.649***
	(0.077)
wlev1	-1.752***
	(0.305)
wmtb	0.003
	(0.003)
wcash_flow	6.723***
	(0.481)
winvest	-1.082*
	(0.596)
wppe	-0.760***
	(0.167)
Constant	2.474**
	(1.100)
Observations	5,085
R-squared	0.955
Firm FE	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.10: DiD model with balanced data that evaluates TCJA effects on conforming tax avoidance in US firms. Source: personal processing

5. Conclusions

Tax avoidance can be defined as a continuum of tax planning strategies that go from a less aggressive form as municipal bonds to the most aggressive side as evasion or tax sheltering (Hanlon and Heitzman, 2010). It's one of the main tools exploited by firms and managers for opportunistic goals and behaviors and can affect several operations and measures that define a firm. Managers face the trade-off of exploiting tax avoidance until the marginal benefit of the strategy equals the marginal cost, otherwise, penalties and sanctions are likely to arise affecting adversely capital structure and firm value.

Trump administration signed on 2017 Tax Cuts Jobs Act, one of the most important US corporate and tax reform since the Tax Reform of 1986. The main scope of the reform was to repatriate income sitting offshore and to penalize especially multinationals that are used to shift income and core operations in tax havens. Moreover, a significant drop of 14% in the statutory corporate tax rate aimed to make the corporate tax rate applied by US firms more competitive and aligned to the rates established in other advanced economies, discouraging even more movements of capital abroad but with the huge burden of loss borne by US Treasury.

That said, my dissertation tries to shed light on the effects that TCJA could have had on the tax avoidance strategies of US firms. First of all, data shows that the typical US tax avoidant firm is a firm with a bigger size, more able to conceal lower taxes declared and paid through complex transactions and operations guaranteed by the political influence performed by the entity; less levered because likely concerned by IRS scrutiny due to excessive debt and consequent risk and less incentivized for interest deduction cap; more profitable and able to generate cash flow as the perfect vehicle for managers rent extraction and diversion and, finally, less prone to invest in CAPEX, R&D and fixed assets.

In order to investigate the effect of TCJA on the tax avoidance strategies of US firms, a difference-in-differences model has been adopted. A Canadian sample of firms, then adjusted by the entropy balance method, permits to compare changes of US firms after the TCJA against firms with the same characteristics but not hit by the reform, extracting only the "clear" change due to the reform rather than change induced by different specific factors between US and Canadian firms existing before the Act

As shown by employing GAAP ETR as tax avoidance metric, it seems that TCJA enactment brings US firms to increase their tax avoidance behavior. Because of its design, GAAP ETR can't be considered a completely reliable metric of tax avoidance in evaluating TCJA consequences since the drop of the corporate tax rate would automatically lead to a mechanical reduction of the ETR. Indeed, adopting ETR Differential as tax avoidance measure the finding coming from GAAP ETR is reversed: US firms after TCJA reduce their tax avoidance strategies

as signaled by a greater convergence of GAAP ETR to the new statutory rate. The result coming from adopting ETR Differential demonstrates that TCJA enactment is effective in inducing US firms to resort less to tax avoidance activities.

Moreover, TCJA offers the opportunity to test conforming tax avoidance changes due to the statutory tax rate reduction. Considering the Eichfelder et. al (2021) research model, I tried to test if US firms alter their conforming tax avoidance level after the statutory tax rate drop. Conversely, results show that US firms diminish their pre-tax income and so increase relatively conforming tax avoidance. One hypothesis concerning the timing of TCJA implementation and consequent expectations about TCJA enactment effects could explain this finding. In 2017, in late summer, the legislative purpose about healthcare issue presented by the Trump administration failed, turning the attention to tax reform. In a few months – from late September to December – the bill was drafted, discussed and realized (Wagner et al., 2018). Since conforming tax avoidance can be considered as a tax planning strategy where firms, in response to the expectations about a reduction in the statutory tax rate, would "save" income now in order to report higher income in the future periods with a lower rate paying fewer taxes, TCJA moved through the legislative process impressively swiftly making US firms not as much able to plan tax and earnings manipulation strategies to declare "saved" previous incomes without heavily attracting government and audit scrutiny. In addition, TCJA provisions such as GILTI, FDII and BEAT obstruct movements of capital in other jurisdictions but also shift in future periods.

A second hypothesis lies in the increase of book-tax conformity, that is the convergence between the income reported in Income Statement (book income) and the income for taxes purpose (taxable income). Watrin et al. (2014) build a book-tax conformity indicator based on the permanent-book-tax difference equation: Permanent book-tax-differences = Pre-Tax Income – (Total Tax Expense / Tax Rate). Greater Permanent book-tax-differences (in absolute value) represents lower book-tax conformity. Since TCJA reduces corporate tax rate and US firms decrease their Pre-Tax Income after TCJA (as shown in Table 4.10), this can lead to a reduction in Permanent book-tax-differences based on Watrin et al. equation. Greater book-tax conformity may discourage US firms from planning nonconforming tax avoidance strategies, relying more on conforming tax avoidance as a substitute in order to maintain the same level of tax savings (Atwood et al., 2012; Eichfelder, 2021).

Future researches can examine more in-depth the consequences of tax avoidance behaviors in US firms, adopting other tax avoidance measures beyond ETRs. Moreover, a further step could be to test if US firms have really increased their book-tax conformity by exploiting Waitrin et al. (2014) indicator or other measures offered in the literature.

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