Private Equity and Taxes*

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Abstract

We study companies' tax avoidance behavior after being acquired in a private equity transaction. Using firm-level data from Europe, we analyze target firms' tax payments after the acquisition compared to a carefully selected control group in a matched-sample difference-in-differences setting. We find that target companies' effective tax rate decreases by 16.14% relative to the unconditional mean. This finding is in line with the hypothesis that private equity investors create shareholder value by extracting money from the government. While our evidence suggests that target firms engage more heavily in profit shifting, we do not find direct evidence in support of a tax-motivated leverage channel. We further show that those target firms that become more tax efficient experience significantly lower asset and employment growth than target firms with no or moderate tax savings after the buyout. This finding indicates that tax savings are not used to finance investment but are directly transferred to shareholders.

Keywords: Private Equity, Leveraged Buyouts, Leverage, Profit-Shifting, Corporate Taxation, Taxes, Investments

JEL classifications: G31, G34, H26

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1 Introduction

With more than USD 3 trillion assets under management as of 2017 and growing, private equity will soon be the largest alternative asset class (Financial Times, 2018). This growing importance leads regulators to ask how private equity firms create shareholder value. The bright side view argues that targeted companies increase in value through operating efficiencies and better aligned incentive contracts. The dark side view points towards value extraction from other stakeholders, such as employees or the government. While there are studies on the effect of private equity transactions on employees (e.g., Davis et al., 2014; Antoni et al., forthcoming), there is little evidence on value extraction from the government. Our analysis supports the claim that private equity firms transfer money from the government to shareholders by significantly reducing the target firms' effective tax rate (ETR).

Through tax claims, national and local governments are a significant stakeholder in private firms. Reducing the overall tax bill provides one important way of transferring money from the government to shareholders. We identify three major channels by help of which private equity target firms can engage in tax avoidance. First, general tax efficiency. This category subsumes, for example, generating additional tax deductions, making use of tax consolidation at the business group level, and general tax aggressiveness. A second potential channel is profit shifting. Firms can engage in internal trade with other subsidiaries and thereby shift profits into low-tax countries. Third, target firms can benefit more from the interest tax shield that allows firms to deduct their interest payments from the taxable income. Private

equity firms are notorious for the extensive use of debt financing, which increases the value of these tax shields. We document a substantial increase in target firms' general tax efficiency after being acquired by a private equity firm. We further find supportive evidence for profit shifting, while financial leverage seems to play a secondary role for target firms' tax avoidance. In a last step, we look at the cross-section of private equity deals to investigate how target firms use their tax savings. We find that investments in assets and human capital are significantly lower for high tax avoidance deals.

We conduct our analysis evaluating 11,305 European private equity transactions between 2001 and 2016 from the Zephyr database. These data are matched to the companies' financial and ownership data from Orbis as well as additional country-level data from the OECD, the ZEW, and the IBFD European Tax Handbooks. To address concerns that private equity ownership is endogeneous, we perform a matched sample difference-in-differences estimation with the acquisition as treatment. This approach is similar to the one in Boucly et al. (2011). In addition to an exact matching on five different discrete variables, including firms' country, year, and industry, we perform a nearest-neighbor matching on six continuous variables. These variables are carefully selected in accordance with the private equity and tax literature. They comprise the effective tax rate, ROA, cash ratio, growth, size, and financial leverage. The large pool of more than 50 million potential control observations assures a good matching quality. In the first part, we analyze how the target's effective tax rate and overall tax payments develop after an acquisition. We then use triple-differences estimation to investigate additional channels. Last, we conduct a sample split to look at firms' investment

outcome depending on their level of tax avoidance.

First, we investigate companies' tax avoidance by analyzing the effective tax rate and total tax payments after the acquisition. We find an immediate drop in the effective tax rate of 1.62 percentage points directly following the acquisition. Three years after the deal, these firms report effective tax rates that are 3.01 percentage points lower than those of control firms, which represents a 16.14% decrease relative to the unconditional sample mean. This result is consistent with the hypothesis that private equity investors introduce a higher level of financial sophistication and have lower marginal costs of tax planning (Badertscher et al., 2013; Khan et al., 2017).[1] We also examine overall tax payments at the target firm following the acquisition. Interestingly, we find that the reduction of the effective tax rate is entirely driven by pre-tax earnings growth. Total tax payments do not differ between target and control firms. Thereby tax authorities do not lose money in absolute terms after private equity deals.

We then investigate whether target firms engage in profit shifting. Firms that belong to a multinational group can use transfer pricing to shift pre-tax income to low-tax countries (Huizinga and Laeven, 2008).[2] We hypothesize that target firms which have subsidiaries in tax haven or incentives stemming

[1] In particular, private equity firms benefit from expert knowledge centralized at internal tax departments. They can further introduce successful tax strategies already in use at other portfolio companies. For instance, the Swedish private equity firm EQT recently hired a new Global Head of Tax with *"deep and broad knowledge in all aspects of PE-driven transactions such as tax structuring and modeling, tax due diligence (...) and project management."*, see https://www.eqtpartners.com/Organization/Professionals/Specialist-Functions/Magnus-Pantzar/.

[2] See De Simone (2016) and De Simone et al. (2017) for recent evidence on firms in the European setting. Heckemeyer and Overesch (2017) provide a meta-study of the empirical profit shifting literature.

from tax rate differentials in the same business group are more susceptible to engage in such a behavior. Our findings show that target firms' pre-tax income growth is significantly lower if such profit shifting opportunities exist prior to the deal. We do not find strong effects when analyzing the acquirer firm's group structure, which suggests that target firms do not engage in intra-group trade with other portfolio companies of the same private equity firm. Our evidence is consistent with previous findings suggesting that acquirers anticipate tax planning opportunities at potential target firms of M&A activity (Erickson and Wang, 2007).

In our third set of tests, we analyze target firms' financial leverage after the acquisition. We find moderate increases in target firms' net leverage ratio. In the year of the acquisition, leverage decreases slightly and then increases until it is about 5 percentage points higher than the leverage of control firms. This finding contrasts the common notion of excessive debt financing during private equity buyouts (Kaplan and Strömberg, 2009). It is possible, however, that the increase in leverage is concentrated in intermediate holding companies and thereby does not show up in the target firms' financial accounts. Then, we test whether this leverage increase is related to tax considerations. We do not find heterogeneous treatment effects contingent on the target country's tax law, such as allowing for pre-tax income consolidation with other group firms or restricting the tax deductibility of interest payments. Our findings, therefore, do not support the notion that private equity leverage is driven by tax considerations.

Our last set of results presents target firms' investment outcome with respect to their tax savings. We find that target firms with above median

tax savings invest 2.64 and 2.32 percentage points per year less in assets and human capital than target firms with below median tax savings. When splitting the data with respect to quartiles in the tax savings distribution, the effects are exacerbated to an annual 4.03 and 4.06 percentage points decline in assets and employment growth, respectively. These findings show that private equity transactions after which target firms engage in substantial tax avoidance also have adverse effects on stakeholders other than the government through lower investments and less employment.

In our analyses, we conduct several robustness tests. We look at pre-trends, different sub-samples, different sets of control variables, alternative outcome measures, and a placebo event. One crucial prerequisite for a difference-in-differences approach is the common trend assumption. Both our graphical and numerical analyses support a common pre-trend for the treated and control group. Next, we make sure that our results are not driven by a survivorship bias. To that end, we test two different samples. In both the balanced and the unbalanced samples, we find the same effects. Then, if the acquisition is (plausibly) exogeneous after the matching, we should not find that the inclusion of additional covariates alters our results. Our findings are robust to the inclusion of additional covariates. In accordance with the tax literature, we further test two long-run effective tax rates. Results are consistent and show that private equity investors introduce sustainable tax planning strategies. Last, in a valid difference-in-differences design, the outcome of interest should only be affected by the actual event. Setting the event year four years prior to the actual event should not result in any effect. In line with this assumption, we do not find any treatment effect prior to the

actual acquisition.

Our paper contributes to two strands of the literature. First, it adds to previous research in finance on the real effects of private equity investments.[3] Some studies on the bright side view of private equity, such as Boucly et al. (2011) and Guo et al. (2011), find positive effects of acquisitions on growth and profitability. Value extraction from employees, as theorized by Shleifer and Summers (1988), is not supported by empirical evidence (e.g., Davis et al., 2014; Antoni et al., forthcoming). Evidence on value extraction from the government is scarce. Kaplan (1989) analyzes the tax benefits of interest tax shields from 76 public-to-private management buyouts. Cohn et al. (2014) and Guo et al. (2011) both find increases in target firms' financial leverage but are not able to directly relate these increases to tax considerations. Our study is therefore the first to fully explore the tax effects of private equity acquisitions on a representative and large scale sample. We further provide evidence that some private equity investment strategies focus on value extraction from other stakeholders, while others seem to create value.

Our paper further contributes to the accounting literature on firm ownership and tax avoidance.[4] Recent studies find that institutional ownership (Khan et al., 2017) and hedge fund participation in particular (Cheng et al., 2012) are associated with higher levels of tax avoidance of publicly traded US firms. Chen et al. (2010) and Badertscher et al. (2013) find US firms

[3]For an excellent overview on the private equity literature, consult Kaplan and Strömberg (2009).

[4]See Hanlon and Heitzman (2010) and Wilde and Wilson (2018) for reviews of the corporate tax avoidance literature.

owned by family founders or managers to be less tax aggressive and explain this finding by reputation concerns and managers' incentives to not engage in risky tax avoidance. Our study extends this literature by showing how private equity owners with a specialized tax expertise affect firms' tax avoidance behavior. We also shed some light on the consequences of tax avoidance and reject the view that tax savings are an internal source of financing for private equity target firms.

This paper proceeds as follows. The data and the methodology are presented in Section 2. Section 3 presents the findings for the target firms' general tax avoidance. In Section 4, we further investigate the profit shifting and leverage channels. We study the real effects of tax avoidance in Section 5 and conduct robustness tests in Section 6. Section 7 concludes.

2 Data and Methodology

2.1 Sample Construction

To analyze the impact of private equity transactions on firm-level tax payments, we merge several datasets. We use private equity deals from Zephyr, which we merge with company financial and ownership data from Bureau van Dijk's Orbis database. Then, we add country-level data from the OECD, and tax regulation data from the ZEW as well as the IBFD European Tax Handbooks.

To construct our sample, we first retrieve all transactions marked as completed private equity acquisitions in Zephyr.[5] In addition to the 28 countries

[5]For a description of the Zephyr database and a comparison with Thomson One's SDC,

that are members of the European Union as of 2016, we also include deals from Iceland, Norway, Switzerland, and Turkey. Our sample covers transactions between 2001 and 2016. Before 2001, coverage in Zephyr is very limited. Since we require at least one year of financial data after the acquisition, our sample stops in 2016. At this point, our sample comprises 28,429 deal observations.

The deal data is then matched to the financial and ownership data from Bureau van Dijk's Orbis database. We use the flat files from July 2018 for the financial data to circumvent the limitations that were inherent to previous versions from Orbis.[6] These data are then merged to the BvD ownership data, which allow us to reconstruct the target as well as the acquirer's subsidiary structure.[7] Country-specific data on, for example, corporate tax rates and GDP are obtained from the OECD. We hand-collect further tax regulation data from the IBFD European Tax Handbooks and the ZEW's tax database. In total, 12,017 deals can be merged to Orbis firm data on the matching variables that are further specified in Section 2.2. Of these firms, we are able to match 11,305 to at least one suitable control firm. In order to account for a potential survivorship effect, each treated firm-year observation is only included if its matched control firm-year observation is also available in the data and vice versa. For further robustness, we also conduct

see Bollaert and Delanghe (2015).

[6]In addition to the data cleaning suggested by Kalemli-Ozcan et al. (2015), we interpolate the financial data linearly to obtain better balanced panel data.

[7]In particular, we access each annual update of the BvD database to create dynamic panel data that allows us to track ownership structures before each buyout happens. After downloading the universe of firms with available ownership data, we identify corporate global ultimate owners and then iteratively search for majority-owned subsidiaries to construct each business group with a maximum vertical depth of twelve ownership layers.

Table 1: Sample Construction

This table presents the construction of the private equity data set. Four steps are described. Of these steps, three lead to the base sample (3a) and the fourth only applies for the robustness sample (3b). The number of observations that remains after each step is provided and so is the relative loss when compared to the original sample. In addition, the number of observations with information on deal value and the respective average deal value is given for each of the sub-samples. These values are depicted to underline the representativeness of the final sample.

			Deal Value (m EUR)	
Description	Observations	Loss	N	Mean
(1) All private equity deals in Zephyr with the target in one of the 32 countries between 2001 and 2016	28,429		14,486	120.576
(2) All deals that can be matched to Orbis data on the matching variables	12,017	57.73%	6,133	131.532
(3a) All treated firms with at least one potential control firm	11,305	2.50%	5,659	125.243
(3b) All treated firms that have at least one control firm with the variable EBT / Taxes filled for the entire horizon	6,576	16.63%	3,407	133.406

our analysis on a balanced panel that comprises 6,576 treated and the same number of control firms that have data on the entire event horizon ($t = -3$ until $t = 3$).

Table 1 provides an overview of the sample construction. In addition to the number of observations of each sub-sample, it presents the relative loss of observations at each sample selection step. Most observations are lost due to the matching of Zephyr and Orbis financial data (57.73%). This loss is caused by the lack of available data on some of the matching variables

because reporting requirements for small- and medium-sized firms are not very stringent with respect to certain profit and loss (P&L) items in many countries. To show that our sample is nonetheless representative, we further provide the number of observations with a deal value and the average deal value at each step, which are provided by Zephyr. About 50% of the observations have the deal value filled throughout all steps. The average deal value barely changes and ranges from 120m EUR to 134m EUR. We thereby conclude that our final sample is representative of all deals listed in Zephyr.

2.2 Matching

To address concerns stemming from the non-random selection of target firms by private equity investors, we perform a nearest-neighbor matching on all the targeted companies one year prior to the acquisition. We aim to create a setting in which target and control firms are sufficiently similar that the ultimate choice of the investor to select one of the potential targets is plausibly exogenous. The dataset of potential control variables comprises as many as 52,295,322 firm-year observations, which reduces the potential bias from the within-pair estimation of the treatment effect in our regression analyses (Imbens, 2004). A description of the construction of the data set can be found in Table A-1 in the Appendix. We match our samples with replacement. Our choice of matching variables is based on the tax accounting literature and these variables are commonly described as determinants of tax planning opportunities. The matching algorithm is the following:

1.) All firm-year observations of companies that were targeted at one point

in time are removed from the set of potential control firms.

2.) We create cells for all company-year observations according to country, year, NACE industry section, and two dummies indicating whether the firm reports positive or negative EBT and tax expenses.[8] This creates 38,912 distinguished cells.

3.) We then compute the Euclidean distance from every treated company for all observations within the respective cells. The six matching variables used are the effective tax rate, ROA, cash ratio, three-years logarithmic asset growth, logarithmic total assets, and leverage ratio.

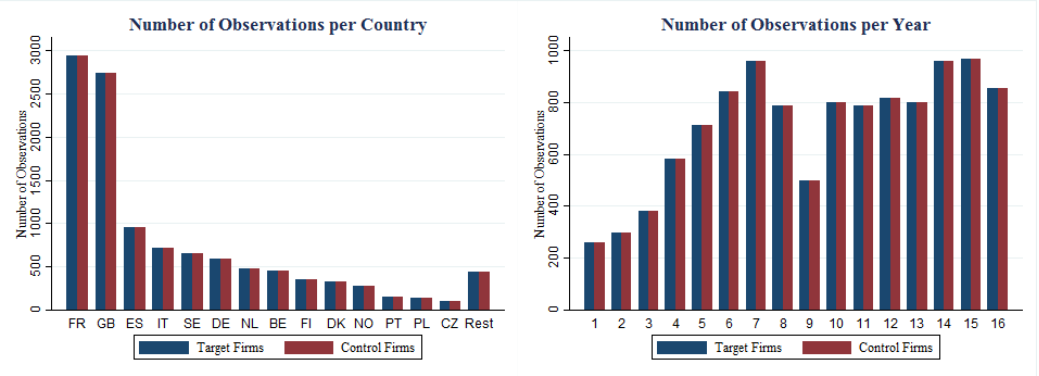
4.) Observations that are more than one standard deviation away from the target firm in any of the six variables are removed from the potential control sample. Standard deviations are computed within cells.

5.) The remaining control firms are ranked according to the Euclidean distance and the best control is selected for each treated firm.

The distribution of target and control firms is presented in Figure 1. In Figure 1a, the distribution with respect to countries is presented. The number of observations is shown for the 14 most active private equity markets in terms of target firm locations, while the other 18 countries are summarized under *Rest*. Less than 500 firms are acquired in these less active markets. The majority of transactions, almost 3,000, take place in France, directly followed

[8]The last two requirements make sure we compare each treated firm to a control firm with a similar tax status. Our main dependent variable is the effective tax rate measured as the tax expense scaled by EBT. Our matching requirements ensure that this ratio is positive or negative for the same reasons (same signs of the numerators and denominators).

Figure 1: Distribution of Target and Control Firms



(a) This figure shows the distribution of target and control firm observations one year prior to the acquisition with respect to their country of origin. All observations that are not based in one of the 14 most active private equity markets are subsumed under *Rest*.

(b) This figure shows the distribution of target and control firm observations with respect to the event year. All deals took place in the 21st century and the year values are abbreviated accordingly. Some of the more recent deals are missing due to data availability.

by the UK. This is mostly the result of data availability. For example, Orbis data coverage on balance sheet and profit and loss items is significantly better for France than for Germany.

Figure 1b shows the distribution over time. The private equity deals included in the sample range from 2001 until 2016. Their number increases steadily until the years of the financial and sovereign debt crisis in 2008 and 2009. After 2010, deal volume resumes to pre-crisis levels. Deal numbers from the more recent years 2015 and 2016 are downward biased because of the, on average, two years reporting lag of financial data in Orbis.

Table 2 presents the matching statistics for the Euclidean matching. Panels A, B, and C show descriptive statistics for the matched target firms, the control firms, and the unmatched target firms, respectively. The mean, median, and variance are computed for the six matching variables. In addition,

Table 2: Matching Statistics

This table presents the matching statistics for the final sample. It is divided into three panels for the sub-samples of the matched target firms, the matched control firms and the unmatched target firms. Summary statistics for the six matching variables effective tax rate (ETR), ROA, cash ratio, three-years asset growth, log total assets, and leverage ratio are provided. The mean, median, and variance are computed for each of the sub-samples. In addition, Panel B and Panel C provide the relative difference between their respective mean values and the mean value of the matched target firms in Panel A. The Imbens-Wooldridge test is calculated to underline the matching quality.

	ETR	ROA	Cash Ratio	Asset Growth	Total Assets	Leverage Ratio
Panel A: Matched target firms (N = 11305)						
Mean	18.68	4.232	13.8	43.89	16.72	65.3
Median	22.45	6.552	7.403	30.66	16.59	64.19
Variance	1,379	671.3	276.1	5,048	3.733	1,051
Panel B: Matched control firms (N = 11305)						
Mean	18.76	4.404	12.77	42.47	16.56	65.15
Median	23.19	5.689	5.929	28.22	16.45	64.69
Variance	1,319	547.4	273.2	4,711	3.761	957.5
Relative difference of means	0.43%	4.06%	7.46%	3.24%	0.96%	0.23%
Imbens-Wooldridge test	0.00	0.00	0.04	0.01	0.06	0.00
Panel C: Unmatched target firms (N = 712)						
Mean	14.04	-22.74	24.05	72.33	17.43	74.8
Median	3.598	-1.096	14.48	56.64	17.1	67.01
Variance	4,011	2,410	633.4	15,054	8.376	2,954
Relative difference of means	24.84%	637.33%	74.28%	64.80%	4.25%	14.55%
Imbens-Wooldridge test	0.06	0.49	0.34	0.20	0.20	0.15

Panels B and C present the relative differences and an Imbens-Wooldridge test of the respective sample means to the mean of the matched target firms in Panel A. The average target (control) firm has an effective tax rate of 18.68% (18.76), a ROA of 4.23% (4.40), a cash ratio of 13.80% (12.77), a three-years asset growth of 16.72% (16.56), and a leverage ratio of 65.30% (65.15). The relative differences of these averages never exceed 7.5% and the Imbens-Wooldridge statistics, which remain well below 0.25, indicate that the matching quality is good.

Of the 12,017 target firms, 712 cannot be matched to a control firm. In most cases this is due to the exclusion of potential control firms that are more than one standard deviation away from the target firm for any of the six matching variables. Accordingly, the relative differences of the variables for unmatched target firms and matched target firms are substantial ranging up to 637.33%. It is therefore warranted that these target firms are excluded from the sample, since no sufficiently similar control firm can be found in the respective cell in the universe of Orbis firms.

2.3 Summary Statistics

We present summary statistics for all relevant variables in Table 3.[9] They are categorized into firm-level and macro-level variables. Each category is then further grouped into dependent, interaction, and control variables. Descriptive statistics for the number of observations, mean, median, minimum, maximum, and standard deviation are shown. Where applicable, we present

[9]For the definition and source of the respective variables, consult Table A-2 in the Appendix.

values in percentage terms to improve readability.

The dependent firm-level variables used are the effective tax rate (ETR), log profits before taxes (EBT), log tax expenditures, net interest-bearing leverage, log asset growth, log employment growth, and the three- as well as five-years long-run ETRs. The effective tax rate is our main independent variable and is measured as the ratio of a firm's tax expense and EBT in a given year. The first six variables are winsorized at the 1 and 99% level to control for outliers, while the long-run ETRs are winsorized at the 5 and 95% level. It is noteworthy that the standard deviation of the effective tax rate is nonetheless inflated because the denominator (EBT) often approaches zero. Values for logarithmic profit and tax expenses are missing when the base value is negative. Since our sample mostly comprises high growth firms, asset and employment growth are large when compared to the average firm in the Orbis database. The average firm pays an effective tax rate of 18.65%, has earnings before profits of 14.21, log tax expenses of 11.57, an interest-bearing leverage of 9.80%, log asset growth of 9.14%, log employment growth of 4.40%, and a three- (five-)year long-run ETR of 18.95% (18.68%).

The firm-level interaction variables are computed from the Bureau van Dijk ownership panel data. They comprise an indicator variable for the presence of a subsidiary in a European tax haven (Ireland, Luxembourg, Malta, Netherlands)[10], the spread in corporate income tax rates measured as the difference between the lowest and the highest tax rate applicable to any subsidiary in its respective country of the same group of firm that the

[10]While these countries are not labeled as tax havens by the European Commission, they are typical locations of conduit entities for tax planning purposes. We refer to the blacklist of the Tax Justice Network, available at http://datafortaxjustice.net/paradiselost/.

Table 3: Summary Statistics

This table presents summary statistics for all variables included in the analysis. The mean, median, minimum, maximum, and standard deviation of each of these variables are computed. Ratios are stated in percentage terms. All variables can be categorized into firm- and macro-level variables. Within these categories, variables are futher grouped into dependent, interaction, and control variables. All firm-level dependent and control variables are winsorized at the 1 and 99% level.

	Obs	Mean	Median	Min	Max	SD
Firm-level Variables						
- Dependent Variables						
Effective Tax Rate (ETR)	128,361	18.62	22.07	-149.64	178.11	38.45
Log. Profit before Taxes	94,436	14.21	14.29	8.57	19.45	2.05
Log. Tax Expenses	101,233	11.57	12.58	0.00	17.89	4.05
Net Interest Leverage	116,249	9.75	5.26	-70.52	115.09	32.91
Log. Asset Growth	128,356	9.14	5.69	-107.05	139.93	35.79
Log. Employment Growth	110,778	4.40	1.88	-109.86	109.86	30.51
3-year long-run ETR	69,379	18.95	21.72	-28.88	67.67	22.17
5-year long-run ETR	35,529	18.68	21.29	-29.37	69.00	22.50
- Interaction Variables						
Target Sub in Tax Haven	71,738	0.32	0.00	0.00	1.00	0.47
Target Group Tax Spread	71,738	6.83	0.00	0.00	28.90	9.09
Target Firm Tax Spread	71,738	4.64	0.00	0.00	28.90	7.17
Acquiror Sub in Tax Haven	40,665	0.45	0.00	0.00	1.00	0.50
Acquiror Group Tax Spread	40,665	9.44	5.17	0.00	28.90	10.29
Acquiror Firm Tax Spread	40,665	6.89	0.15	0.00	28.00	8.76
- Control Variables						
Positive Earnings Dummy	128,361	0.74	1.00	0.00	1.00	0.44
Positive Taxes Dummy	128,361	0.79	1.00	0.00	1.00	0.41
Log. Total Assets	128,357	16.70	16.58	5.54	28.58	1.97
Log. Asset Growth	128,356	9.14	5.69	-107.05	139.93	35.79
EBIT over Assets (ROA)	128,220	4.36	5.35	-113.21	60.20	22.41
Tangible Fixed Assets Ratio	127,322	18.53	9.05	0.00	91.62	22.32
Intangible Fixed Assets Ratio	127,230	6.76	0.47	0.00	61.37	13.31
Cash Ratio	127,528	13.04	6.43	0.01	77.98	16.55
Long-Term Leverage Ratio	128,240	17.96	9.06	0.00	105.56	22.43
Short-Term Leverage Ratio	128,356	45.42	42.85	0.09	148.30	27.53

Table 3: Summary Statistics (continued)

Macro-level Variables						
- Interaction Variables						
Corporate Tax Rate	126,783	30.64	30.00	12.50	52.03	5.15
Domestic Group Taxation	128,083	0.80	1.00	0.00	1.00	0.40
Cross Country Taxation	128,083	0.27	0.00	0.00	1.00	0.44
Interest Deductibility Limit	128,097	0.35	0.00	0.00	1.00	0.48
- Control Variables						
GDP / Capita (th)	128,345	35.84	35.39	5.58	104.09	7.69
GDP (tn)	128,349	1.64	1.93	0.01	4.19	0.94
Long-Term Interest Rate	125,997	3.53	3.70	-0.36	22.50	1.38
Short-Term Interest	126,129	2.18	1.39	-0.78	19.91	1.87

firm belongs to, and the difference between the firm's corporate tax rate and the lowest corporate tax rate of any of its subsidiaries. All these variables are computed for the target as well as the acquirer's corporate ownership structure. Missing observations are the result of a firm not belonging to a corporate group or ownership data not being available. The average target firm has one subsidiary in a European tax haven with a probability of 32%, has a group tax spread of 6.38%, and a firm tax spread of 4.25%. It is acquired by a firm that has one subsidiary in a tax haven with a probability of 45%, a group tax spread of 8.72%, and a firm tax spread of 6.23%.

Firm-level matching and control variables comprise dummies for positive EBT and tax expenses, logarithmic total assets and asset growth, ROA, tangible and intangible fixed assets ratios, cash ratio, and long- and short-term leverage ratios. The average firm has positive earnings and tax expenditures in 74% and 79% of the observations, logarithmic total assets of 16.70, logarithmic asset growth of 9.21%, ROA of 4.25%, tangible and intangible fixed assets ratios of 18.53 and 6.76%, a cash ratio of 13.06%, and a long- and short-term leverage of 18.00 and 45.53%.

Interaction variables on the macro-level cover the corporate income tax rate, the existence of a domestic and cross-border group taxation legislation (effectively resulting in tax consolidation), and the presence of an interest deductibility limit for tax purposes (so-called thin capitalization rules). The average corporate tax rate of countries in which transactions take place amounts to 30.64%. Target and control firms operate in countries with a domestic (cross-border) group taxation in 80% (27%) of the cases. Restrictions on interest deductibility for tax purposes are effectively in place in jurisdictions where 35% of the firms operate.

Macro-level control variables comprise the GDP per capita, total GDP, long-term interest rate and the short-term interest rate. The average company is located in a country with an average GDP per capita of 35.84th EUR, a total GDP of 1.64tn EUR, a long-term government interest rate of 3.53%, and a short-term interest rate of 2.18%.

3 Buyouts and Tax Efficiency

In this section, we estimate various models in a difference-in-differences setting. Our approach is similar to the individual-level analysis in Antoni et al. (forthcoming). Our regression model takes the following form

$$Y_{it} = \alpha_i + \sum_{t=-3}^{T=3} \gamma_t D_{it} + Treated_i * \sum_{t=-3}^{T=3} \beta_t D_{it} + \epsilon_{it} \quad (1)$$

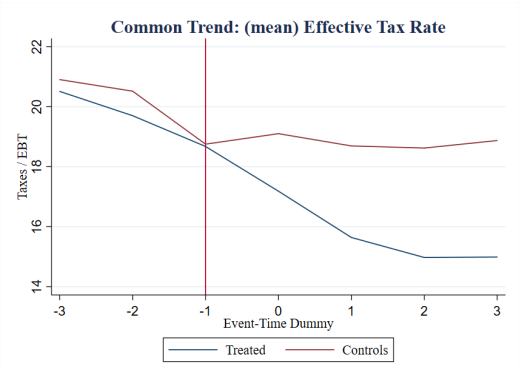
where Y_{it} denotes the outcome of interest. Company fixed effects are included in each specification and are specified as α_i. The event window runs

from t to T. D_{it} are dummy variables equaling 1 for each event year t and $Treated_i$ is an indicator variable equaling 1 for target firms. Subscripts i and t denote the company and event time, respectively. ϵ_{it} is an error term. In our setup, we are interested in the estimated coefficients on the interaction term β_t. Additional controls are included in some specifications to underline the robustness of our results.

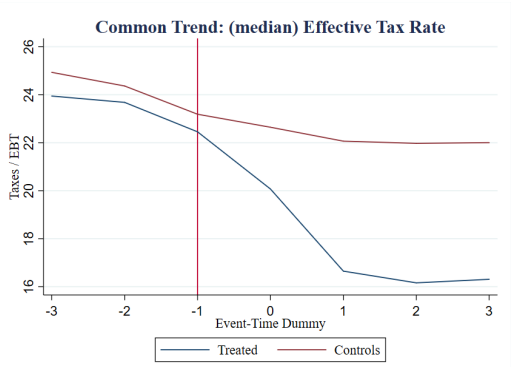
This section presents evidence on target firm's tax avoidance after being acquired in a private equity transaction. The event window for our analysis runs from $t = -3$ to $t = 3$ to fully capture the pre-trend and the time delay until the tax measures are implemented. The main dependent variable is the target firm's effective tax rate which is defined as the total tax expense divided by earnings before taxes in a given year. This measure is widely used in the tax accounting literature. In the way the ratio is computed, lower values indicate a higher level of tax avoidance that maps into higher accounting earnings and, thus, potential profit distributions to shareholders Hanlon and Heitzman, 2010. We present our findings in two different ways. First, we analyze our results graphically. Second, we show that the effects are also statistically significant in our analytical results as well as robust to the use of different samples and sets of control variables.

Figure 2 depicts our graphical analysis and contains two graphs. In both graphs, we show the average development of the effective tax rate over the event horizon for the treated as well as the control group. The red vertical line in $t = -1$ indicates the year in which the samples are matched one year prior to the acquisition. Figure 2a presents the development of the mean effective tax rate. Since the effective tax rate represents a ratio and is therefore

Figure 2: Effective Tax Rates around the Event



(a) This figure shows the development of the mean effective tax rate (%) from event year $t = -3$ to event year $t = 3$ for both the treated firms and the control group. The red line at $t = -1$ indicates the time of the matching, which is one year prior to the acquisition.



(b) This figure shows the development of the median effective tax rate (%) from event year $t = -3$ to event year $t = 3$ for both the treated firms and the control group. The red line at $t = -1$ indicates the time of the matching, which is one year prior to the acquisition.

susceptible to outliers, we also present our findings for the development of the median in Figure 2b.

Both graphs suggest that the common trend assumption likely holds. The pre-trend from $t = -3$ to $t = -1$, in which we should not see any effect, does not indicate any different development of the treated and the control group. Due to the outliers in the ETR, we see, unsurprisingly, that the median tax rate develops more smoothly over time than the mean. In both figures, we see that the event at $t = 0$ induces an immediate impact on the effective tax rate. However, the decrease of the effective tax rate for the treated firms seems to take at least one year to reach a stable level. This level for the treated group is about 3% below the one for the control group. Although making use of, e.g., tax deductions is possible retrospectively, we believe it is reasonable to assume that the full implementation of efficient tax strategies

takes some time. In summary, our graphical analysis suggests that treated and control firms have about the same effective tax burden prior to the acquisition, while target firms decrease their effective tax rate by about 3 percentage points after the transaction.

Table 4 shows our empirical results. The six models present the difference-in-differences coefficients for the years prior to and after the acquisition. $t = -1$ is chosen as the base year and the coefficients are therefore omitted due to multicollinearity. Models (1) to (4) show the results with the effective tax rate as the dependent variable, while Models (5) and (6) employ log EBT and log Taxes as the outcome variables. Different samples, degrees of winsorization, and control variables are used to underline the robustness of the results. *Firm controls 1* are selected in accordance with the tax accounting literature (e.g., Dyreng, Hanlon, Maydew, 2008 and Katz, Badertscher, Rego, 2013). They comprise firm size, long- and short-term leverage, the share of intangible and tangible assets, asset growth, cash holdings, and profitability. *Firm controls 2* are the same variables excluding firm size and asset growth to avoid the problem of including bad controls. As macro controls, we include GDP per capita, GDP, and long- as well as short-term interest rates. Standard errors are clustered at the firm level throughout all models.

In Models (1) to (4), we present our results for the effective tax rate as our dependent variable. Model (1) shows the results for the balanced sample without including additional controls. The number of observations is lower than in the other models because we require financial information to be available for the entire observation period from $t = -3$ until $t = 3$. Comparing the estimates and their statistical significance to the ones from

Table 4: Target Firm Tax Avoidance around Private Equity Transactions

This table presents estimation results for six different models using a matched-sample difference-in-differences framework. The dependent variables are the effective tax rate for Models (1) to (4) and the log EBT and log tax expenses for Models (5) and (6), respectively. Firm and macro controls refer to log total assets, long- and short-term leverage, the share of intangible and tangible assets, asset growth, cash holdings, profitability, GDP per capita, GDP, and long- as well as short-term interest rates. Firm controls in Models (5) and (6) exclude log total assets and asset growth to avoid the problem of bad controls. Standard errors are clustered at the firm level throughout.

	Effective Tax Rate				Log. EBT	Log. Taxes
	(1)	(2)	(3)	(4)	(5)	(6)
Event (t=-3) * Treated	-0.711	-0.335	-0.007	-0.108	-2.094	-3.051
	(-0.84)	(-0.49)	(-0.01)	(-0.30)	(-1.23)	(-0.69)
Event (t=-2) * Treated	-1.017	-0.710	-0.507	-0.328	0.466	1.401
	(-1.23)	(-1.09)	(-0.77)	(-1.00)	(0.32)	(0.38)
Event (t=-1) * Treated	.	.	.	.	.	.
Event (t=0) * Treated	-2.467***	-1.851***	-1.974***	-1.619***	8.928***	1.260
	(-2.88)	(-2.73)	(-2.85)	(-4.63)	(5.61)	(0.31)
Event (t=1) * Treated	-3.108***	-2.792***	-2.767***	-2.416***	11.650***	2.615
	(-3.55)	(-3.73)	(-3.62)	(-6.05)	(5.90)	(0.52)
Event (t=2) * Treated	-3.423***	-3.228***	-3.201***	-2.695***	15.057***	-2.948
	(-3.75)	(-3.92)	(-3.77)	(-6.07)	(6.68)	(-0.49)
Event (t=3) * Treated	-3.199***	-3.361***	-3.419***	-3.011***	22.427***	3.656
	(-3.52)	(-3.83)	(-3.81)	(-6.24)	(8.97)	(0.54)
Sample	Balanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Winsorization	1, 99	1, 99	1, 99	5, 95	1, 99	1, 99
Standard Errors	Cluster	Cluster	Cluster	Cluster	Cluster	Cluster
Firm Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects			Y	Y	Y	Y
Firm Controls 1 / 2			Y	Y	Y	Y
Macro Controls			Y	Y	Y	Y
adj. R2	0.003	0.003	0.007	0.023	0.251	0.076
Observations	92,064	128,361	123,716	123,716	91,173	97,346

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

the comparable Model (2), in which all observations are included, shows that results are not driven by a potential survivorship bias. Model (3) shows the same results for the unbalanced sample as Model (2) but includes several additional control variables and year fixed effects. Neither the estimated coefficients nor their statistical significance change, which lends support to the matching success. In Model (4), the dependent variable is winsorized at the 5 and 95% level. As outlined earlier, the effective tax ratio suffers from severe outliers. Winsorizing at higher cutoffs mitigates this issue. The estimated coefficients do not change when compared to the other models. However, they are estimated much more precisely with standard errors almost halved. This supports the notion that the outliers in the effective tax rate represent noise. We therefore select Model (4) for the presentation of our results. In Models (5) and (6), we run the same regression as in Model (3). However, the log. EBT and log. tax expenses are used as the dependent variables.

Similar to the graphical analysis, we do not find a statistically significant pre-trend, which supports the common trend assumption. In Model (4), we further find an immediate decline of the effective tax rate directly after the acquisition. This decline amounts to 1.62 percentage points, which translates to a 8.69% change relative to the unconditional mean of 18.65%. This effect is statistically significant at the 1% level. In the following years after the acquisition, the effective tax rate continues to decline for the treated firms relative to the control firms until reaching a level of -3.01 (-16.14%) in year $t = 3$. Again, this coefficient is statistically significant at the 1% level. We therefore conclude that private equity firms successfully reduce the effective

tax rate of their target firms by about 16.14%.

In Models (5) and (6), we again do not find a significant pre-trend prior to the acquisition. After the acquisition, the EBT grows steadily until reaching an increase of about 22.43% in year $t = 3$ relative to pre-acquisition levels. All individual year effects are statistically significant at the 1% level. The target firms' tax expenses do not develop in the same manner. After three years in $t = 3$, acquired firms pay about 3.66% more taxes than before the acquisition. This effect is not statistically significant at any level. Overall, it seems that target firms' profits grow strongly after the acquisition but that this growth is not accompanied by an increase in tax payments. Concluding, tax authorities do not lose revenues in absolute terms from firms that are acquired in a private equity transaction. Private equity firms rather seem to introduce a higher level of tax efficiency at their target companies accompanied by a strong pre-tax earnings growth.

4 Additional Channels

In this section, we investigate two additional channels through which target firms can engage in tax avoidance. We estimate various models in a triple-differences setting. Our approach is similar to the one in Antoni et al. (forthcoming). The regression model takes the following form

$$Y_{it} = \alpha_i + \sum_{t=-3}^{T=3} \gamma_t D_{it} + Treated_i * \sum_{t=-3}^{T=3} \beta_t D_{it} + Char_i * \sum_{t=-3}^{T=3} \delta_t D_{it} + Treated_i * Char_i * \sum_{t=-3}^{T=3} \theta_t D_{it} + \epsilon_{it} \quad (2)$$

with the same notation as in Equation (1). In addition to the previous model, this specification includes interaction terms with $Char_i$ denoting a firm-specific characteristic. In this setup, we are interested in the estimated coefficients on the last interaction term θ_t.

4.1 Profit Shifting

First, we look at a profit shifting channel. If target firms are part of a group of firms with subsidiaries in multiple countries, they can engage in intra-group trade. This trade can allow firms to shift profits into low-tax countries and thereby reduce the overall tax bill. Since international tax law grants firms some leeway in determining and documenting the internal prices for the respective goods and services, they can be set in a tax-efficient manner (Huizinga and Laeven, 2008). Such transfer pricing strategies do not necessarily show up in the effective tax rate because they reduce pre-tax profits in high-tax countries while the tax expense is still proportional in the applicable tax rate. Therefore, we analyze the pre-tax earnings development at target firms depending on their corporate structure and respective profit shifting opportunities one year prior to the buyout. These opportunities are proxied by i) a dummy for the existence of a subsidiary in a tax haven country within the target's or acquiror's group of firms (TH), ii) the group tax spread measured as the difference between the maximum and minimum corporate income tax rates that any subsidiary of the target's or acquiror's group of firms is liable to (GTS), and iii) the firm tax spread measured as the difference between the target or acquiror firm's tax rate and the minimum

tax rate that any subsidiary of the target's or acquiror's group of firms is liable to (FTS). The latter two measures are similar to the tax incentive variable developed by Huizinga and Laeven (2008) and are used in recent profit shifting studies (e.g., De Simone et al., 2017).[11] The intuition is that the financial benefit from shifting profits out of the firm's jurisdiction is greater if the group can make use of a large tax rate differential.

Table 5 presents the triple-interaction effects of different profit shifting opportunities (depending on the ownership structure) on the post-acquisition pre-tax earnings. The table is split into Panel A and Panel B. In Panel A, the triple interaction is dependent on the target's pre-treatment profit shifting opportunities. Panel B shows the triple interaction from the acquirer's pre-treatment profit shifting opportunities, respectively. Both panels show the coefficients for four different models. All these models include firm and year fixed effects as well as firm and macro level control variables. Standard errors are clustered at the firm level throughout all models. Similarly to the previous section, all difference-in-differences coefficients are included in the model, however, only the year $t = 3$ treatment and interaction terms are presented to improve readability. Model (1) is exactly the same as Model (5) in Table 4 and is only included for illustrative purposes. In Models (2) to (4) additional interaction terms are included.

Model (1) depicts the earnings growth of the average treated firm three years after the acquisition. The effect is about 22.43% and is statistically highly significant. When interacting this coefficient with the availability of a

[11] One difference is that we do not weigh the tax incentive by the size of a group's subsidiaries to avoid the loss of many observations due to data availability.

Table 5: Profit Shifting Channel

This table presents estimation results for four different models using a difference-in-differences and triple-differences setting. The dependent variable is log EBT throughout all models. T.TH (A.TH), T.GTS (A.GTS), and T.FTS (A.FTS) indicate the existence of a tax haven subsidiary, the corporate group tax spread, and the corporate firm tax spread for the target (acquirer). Firm and macro controls refer to long- and short-term leverage, the share of intangible and tangible assets, cash holdings, profitability, GDP per capita, GDP, and long- as well as short-term interest rates. Standard errors are clustered at the firm level.

	Log. EBT			
	(1)	(2)	(3)	(4)
Panel A: Target Group				
Event (t=3) * Tr.	22.427***	24.517***	24.635***	24.364***
	(8.97)	(9.15)	(8.99)	(9.07)
Event (t=3) * Tr. * T.TH		-14.475**		
		(-2.00)		
Event (t=3) * Tr. * T.GTS			-0.750**	
			(-2.14)	
Event (t=3) * Tr. * T.FTS				-0.927**
				(-2.06)
Standard Errors	Cluster	Cluster	Cluster	Cluster
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Firm Controls 2	Y	Y	Y	Y
Macro Controls	Y	Y	Y	Y
adj. R2	0.251	0.252	0.252	0.252
Observations	91,173	91,173	91,173	91,173
Panel B: Acquiror Group				
Event (t=3) * Tr.	22.427***	23.275***	22.787***	22.777***
	(8.97)	(8.70)	(8.52)	(8.60)
Event (t=3) * Tr. * A.TH		-6.779		
		(-0.91)		
Event (t=3) * Tr. * A.GTS			-0.143	
			(-0.40)	
Event (t=3) * Tr. * A.FTS				-0.181
				(-0.41)
Standard Errors	Cluster	Cluster	Cluster	Cluster
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Firm Controls 2	Y	Y	Y	Y
Macro Controls	Y	Y	Y	Y
adj. R2	0.251	0.251	0.251	0.251
Observations	91,173	91,173	91,173	91,173

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

subsidiary in a tax haven country in Model (2), we find that this growth rate is lower. In acquisitions where the target firm has a subsidiary in a tax haven country, the EBT growth rate is 14.48 percentage points lower than for firms that do not have such a subsidiary. This effect is statistically significant at the 5% level. For acquisitions in which the acquirer has such a subsidiary prior to the transaction, the earnings growth is 6.78 percentage points lower, albeit not statistically significant. The evidence therefore suggests that private equity firms use the presence of another subsidiary in a tax haven country within the target firm's group structure to implement more efficient profit shifting strategies at the target level.

In Model (3), we test the interaction of the corporate tax spread in a given group with the earnings growth three years after the acquisition. We find that EBT grows slower in target firms with a bigger group tax spread. The effect amounts to a reduction of growth by 0.75 percentage points for every percentage point difference in the target group's tax spread. This effect is again statistically significant at the 5% level. The acquirer group's tax spread is less relevant for the earnings growth. Every percentage point difference amounts to a reduction in growth by 0.14 percentage points, which is not statistically significant. Our findings thereby suggest that a corporate structure that allows for profit shifting (by exploiting international tax rate differentials) reduces the earnings growth in the target firm, which serves as an indication for profit shifting strategies exploited more extensively after a private equity acquisition.

Model (4) presents the results for an interaction with the firm tax spread. This is arguably the more relevant tax spread because it clearly depicts how

much a given target firm can gain from shifting profits into the subsidiary that faces the lowest corporate income tax rate. Earnings growth in targets is 0.93 percentage points lower for every firm tax spread percentage point that the target had prior to the acquisition. This effect is statistically significant at the 5% level. A German target (39% tax rate) with a Latvian subsidiary (15% tax rate) in 2006 would thereby experience an earnings growth that is 22.32 percentage points lower than the earnings growth of a German target without such a subsidiary. The acquirer's firm tax spread is with -0.18 percentage points also negative but again smaller and insignificant. Concluding, our evidence on the presence of a subsidiary in a tax haven as well as on two different group tax spreads suggests that acquired companies engage more extensively in profit shifting after being targeted by a private equity firm. While our research design, i.e., the buyout difference-in-differences model, differs from classical profit shifting regressions, the point estimate of around -1.00 is in the range of the baseline result in Huizinga and Laeven (2008) and the tax rate semi-elasticity of pre-tax profits computed in Heckemeyer and Overesch (2017).

4.2 Leverage

The finance literature so far has predominantly focused on the effect of buy-outs' leverage on tax payments. Higher corporate debt increases the value of a firm's tax shield (Miller, 1977). Heider and Ljungqvist (2015) show that stand-alone corporations indeed adjust their capital structure in accordance with the current corporate tax rate. In this sub-section, we therefore in-

vestigate the effect that private equity transactions have on the leverage of target companies and whether this change in leverage is in any relation to tax considerations. To that end, we interact the leverage effect on country specific variables that affect the tax deductibility of interest payments.

Table 6 shows the difference-in-differences and triple-differences estimates for the target firms' net financial leverage. All five models include the treatment effects on leverage. Models (2) to (5) further include six interaction terms each, of which only the one in $t = 3$ is presented to improve readability. All models include firm and year fixed effects as well as several firm and macro controls. *Firm controls 3* comprise the same control variables as *firm controls 1* excluding both long- and short-term leverage. Standard errors are clustered at the firm level throughout all models. The four interaction terms are variables depicting whether the target firm is located in a high-tax country (HT) and whether the target firm's country permits a domestic group taxation (DGT), cross-country group taxation (CGT), or whether the country has some form of interest deductibility limit (IL).

Model (1) presents the difference-in-differences estimates for net financial leverage. There is no significant pre-trend in the outcome variable, which supports the common trend assumption. In the year of the acquisition, the leverage decreases by 1.21 percentage points. This effect is significant at the 1% level. In later years, the target firms' leverage gradually increases until reaching 4.73 percentage points in year $t = 3$. All the coefficients are precisely estimated. The decline in the event year is driven by an increase in the cash position and by a decrease in the interest-bearing leverage. It seems thereby that private equity firms first induce cash and pay off outstanding

Table 6: Leverage Channel

This table presents estimation results for five different models using a difference-in-differences and triple-differences setting. The dependent variable is the net interest-bearing leverage throughout all models. HT, DGT, CGT, and IL indicate whether the target firm is located in a high-tax country, whether its home country allows domestic or cross-country group taxation, or whether its home country has an interest deductibility limit for tax purposes. Firm and macro controls refer to long- and short-term leverage, the share of intangible and tangible assets, cash holdings, profitability, GDP per capita, GDP, and long- as well as short-term interest rates. Standard errors are clustered at the firm level.

	Net Leverage				
	(1)	(2)	(3)	(4)	(5)
Event (t=-3) * Tr.	-0.008	0.007	-0.375	0.166	0.353
	(-0.02)	(0.01)	(-0.48)	(0.44)	(0.80)
Event (t=-2) * Tr.	0.131	-0.165	-0.323	0.264	0.325
	(0.49)	(-0.39)	(-0.51)	(0.86)	(0.91)
Event (t=-1) * Tr.	.	.	.	.	.
Event (t=0) * Tr.	-1.210***	-1.176**	-1.542**	-1.239***	-1.185***
	(-3.88)	(-2.40)	(-2.09)	(-3.50)	(-2.91)
Event (t=1) * Tr.	1.767***	1.748***	1.924**	1.915***	1.495***
	(4.41)	(2.72)	(2.16)	(4.30)	(2.87)
Event (t=2) * Tr.	3.716***	4.483***	4.078***	3.589***	3.962***
	(7.92)	(5.87)	(4.00)	(6.96)	(6.59)
Event (t=3) * Tr.	4.725***	5.039***	4.370***	4.784***	4.931***
	(8.97)	(5.88)	(4.04)	(8.27)	(7.43)
Event (t=3) * Tr. * HT		-0.560			
		(-0.53)			
Event (t=3) * Tr. * DGT			0.449		
			(0.37)		
Event (t=3) * Tr. * CGT				-0.262	
				(-0.20)	
Event (t=3) * Tr. * IL					-0.626
					(-0.59)
Standard Errors	Cluster	Cluster	Cluster	Cluster	Cluster
Firm Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y
Firm Controls 3	Y	Y	Y	Y	Y
Macro Controls	Y	Y	Y	Y	Y
adj. R2	0.071	0.071	0.071	0.071	0.071
Observations	113,407	113,174	113,395	113,395	113,395

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

debt before relevering the company. Interestingly, the increase in leverage of barely 5 percentage points is not in line with the expected capital structure of 60-90% debt financing (Kaplan, 2009). However, it is possible that acquiring firms do not lever up their target but rather an intermediate holding company involved in the deal, which would make the overall leverage effect partly unobservable since we observe the target company's financial accounts (see also Boucly et al. 2011).

In Models (2) to (5), we interact the leverage effect to determine whether the 4.73 percentage point increase is related to the target country's tax regulation. Model (2) tests the interaction for high-tax countries, in which the tax shield of interest is more valuable. If the leverage increase was related to tax considerations, the interest tax shield should be more pertinent in these countries. We find no significant results on the interaction term. In Models (3) and (4), we test the interaction of target firms located in a country that allows for a purely domestic and cross-border consolidation of pre-tax profits at the group level (group taxation), respectively. We expect a negative effect here, since a so-called debt-pushdown is only available to buyouts in countries, in which an intermediate financing company would take on the debt capital instead of the direct target firm. However, the estimated coefficients are not significant. Model (5) presents the same estimation with the interaction of a dummy for the existence of interest deductibility restrictions at the level of the acquired firm. Again, we expect a negative effect because this interest deductibility limit reduces the potential for firms to benefit from the tax shield. Like the previous coefficients, this one also turns out insignificant. Concluding, we find moderate increases in leverage in target firms relative to

the control group, but this leverage increase does not seem to be driven by tax considerations.

5 Real Effects

In this section, we use a two-step methodology to split target firms based on their predicted tax savings and then investigate the asset and employment growth of the resulting subsamples.[12] At first, we run a predictive Ordinary Least Squares regression to identify which transactions are likely to be tax deals (i.e., high tax avoidance deals). We use only ex ante firm level variables and make no causal claims about the relation of these variables to the outcome of interest. The regression model is similar to the collapsed version of Equation 2 and takes the following form

$$\begin{aligned} Y_{it} &= \alpha_i + \gamma * After_{it} + \beta * Treated_i * After_{it} \\ &+ \sum_f \delta^f * Char_i^f * Treated_i + \sum_f \theta^f * Char_i^f * Treated_i * After_{it} + \epsilon_{it} \end{aligned} \tag{3}$$

where Y_{it} denotes the effective tax rate and α_i the firm fixed effects. $After_{it}$ is a dummy variable equaling 1 if event time $t \geq 0$ and $Treated$ is a time-invariant indicator variable for target firms. Pre-deal firm characteristics are included via $Char_i^f$. Subscript i is unique for each firm. In total, f different characteristics are included in the regression.[13] We then calculate a score

[12] We will refer to private equity buyouts resulting in high levels of tax avoidance as *tax deals* and those deals associated with lower levels of tax avoidance as *no tax deals*.

[13] Since we only care about predictive power, we include many potential predictors amounting to a total of 28 firm-level and macroeconomic variables. These variables are

for each firm based on our previous prediction $S_i = \sum_f \hat{\theta}^f * Char_i^f$. This score summarizes the predicted level of tax avoidance based on the observable characteristics and later serves as our splitting variable for tax and no tax deals.

In the second step, we use the splitting variable S_i to analyze different subsamples. The regression model of Equation 3 simplifies to

$$Y_{it} = \alpha_i + \gamma * After_{it} + \beta * Treated_i * After_{it} + \epsilon_{it} \tag{4}$$

with Y_{it} now denoting the outcome measures effective tax rate, logarithmic asset growth, and logarithmic employment growth. The coefficient of interest is β. We analyze regression models with respect to the full sample and subsamples that are split according to the median as well as the lowest and highest quartiles of S_i.

Table 7 presents the results for three regression models each on five different samples. Panel A shows the estimated values for the treatment coefficients for the full sample and two samples that are split at the median value of S_i as defined above. It further provides the result of the test on the difference in coefficients across the subsamples, which is estimated in an auxiliary regression. Panel B presents the estimates for two samples defined by the lowest and highest quartile of the S_i distribution. Models (1) to (3), (4) to (6), and (7) to (9) employ the dependent variables effective tax rate, asset growth, and employment growth, respectively. While the effective tax

the effective tax rate, ROA, cash ratio, asset growth, log total assets, long- and short-term leverage, (in)tangible asset ratios, GDP per capita, total GDP, and long- and short-term interest rates as well as their squared term.

Table 7: Real Effects of Private Equity Transactions

This table presents estimation results for three different models using a difference-in-differences setting. Results for each model are shown for five samples. These samples comprise the full unbalanced sample, two samples split according to the median value of S_i, and two samples retrieved from the lowest and the highest quartiles of S_i's distribution. Results for the first three samples are presented in Panel A and results for the last two samples are presented in Panel B. The dependent variables are the *effective tax rate*, *log asset growth*, and *log employment growth*. In addition to the estimate of interest $Event(t = 0, 1, 2, 3) * Tr.$, we estimate the subsamples' coefficient differences as well as their statistical significance in auxiliary regressions. The effective tax rate is winsorized at the 5 and 95% levels and the two investment measures are winsorized at the 1 and 99% levels. Firm as well as year fixed effects are included in each regression. Standard errors are clustered at the firm level throughout.

	Effective Tax Rate			Asset Growth			Employment Growth		
	Full	No Tax	Tax	Full	No Tax	Tax	Full	No Tax	Tax
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Median Cutoff									
Event (t=0, 1, 2, 3) * Tr.	-2.061***	-0.178	-3.588***	6.193***	7.654***	5.012***	0.057	1.329**	-1.001*
	(-8.12)	(-0.47)	(-10.38)	(15.52)	(14.00)	(8.95)	(0.15)	(2.41)	(-1.93)
Difference		-3.417***			-2.638***			-2.324***	
		(-6.69)			(-3.37)			(-3.07)	
adj. R2	0.009	0.007	0.027	0.034	0.017	0.067	0.014	0.007	0.024
Observations	128,361	62,647	62,634	128,356	62,645	62,632	110,778	53,041	55,460

Table 7: Real Effects of Private Equity Transactions (continued)

Panel B: Quartile Cutoff									
Event (t=0, 1, 2, 3) * Tr.		0.550	-3.918***		9.260***	5.217***		2.460***	-1.584**
		(0.98)	(-7.50)		(10.88)	(6.09)		(2.82)	(-1.98)
Difference		-4.480***			-4.027***			-4.062***	
		(-5.85)			(-3.33)			(-3.43)	
adj. R2		0.017	0.038		0.021	0.094		0.008	0.035
Observations		31,323	31,315		31,323	31,314		25,548	27,552
Winsorization	5, 95	5, 95	5, 95	1, 99	1, 99	1, 99	1, 99	1, 99	1, 99
Firm Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y

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

rate is winsorized at the 5 and 95% level, the other two dependent variables are winsorized at the 1 and 99% level. All models include firm and year fixed effects. Standard errors are clustered at the firm level throughout.

Models (1) to (3) in Table 7 show the success of the sample splitting procedure. In Model (1), the average post-deal effective tax rate is estimated as 2.06 percentage points lower for target firms than for their controls after the transaction. Since this model pools all post deal observations, unsurprisingly, this effect is larger than the $t = 0$ effect of 1.62 and lower than the full effect of 3.01 in $t = 3$ that are estimated in Table 4. The coefficients for the subsample of no tax deals and tax deals are calculated as -0.18 and -3.59 percentage points. While the first coefficient is not significant, the second one is highly statistically significant. Their difference of -3.42 percentage points is significant at the 1% level. This difference is even larger when the sample is split into quartiles in Panel B. The estimated difference of coefficients amounts to -4.48 and is again significant at the 1% level. These results indicate that the sample split based on predicted tax savings was successful. The tax deal (i.e. high tax avoidance) subsample now comprises those deals with the highest post-deal tax avoidance.

Models (4) to (6) and (7) to (9) show results for two investment measures for these subsamples; total assets and employment growth. In Models (4) and (7) of Panel A, the post deal treatment effect is shown for the full sample. Target companies' assets increase on average 6.19% annually more than their controls after the acquisition. This effect is highly statistically significant. Employment at the target firms grows by an insignificant 0.06%.[14] Models (5)

[14]The strong baseline growth in total assets is in line with the findings in Boucly et al.

to (6) and (8) to (9) show the same regressions for no tax deals and tax deals. Asset and employment growth in *no tax deals* are 7.65% and 1.33% higher for target firms compared to control firms. These growth rates amount to 5.01% and -1.00% for *tax deals*. The differences in growth rate changes between these subsamples are -2.64% and -2.32% and are both highly statistically significant. Differences in growth rates from the quartile cutoffs are even more pronounced with values of -4.03% and -4.06% for assets and employment. Investments in assets and human capital for transactions with a high post-deal tax avoidance are thereby significantly lower than for transactions with no post-deal tax avoidance.

6 Robustness

The main concern regarding our analysis is that private equity target firms are not acquired at random. This selection endogeneity can lead to the estimation of biased coefficients. We try to address this issue by using a non-parametric matching approach with a huge set of potential controls. Our difference-in-differences estimator further accounts for all time-invariant heterogeneity. Nonetheless, we include additional tests to underline the robustness of our results. In our main analysis, we show the common pre-trend of treated and control firms, include various control variables, and use different samples. In this section, we further look at a *placebo event* and at *alternative outcome measures*.

(2011). Our findings for employment growth are similar to the one in Davis et al. (2014), who show a process of creative destruction in private equity deals but no significant reduction in overall employment.

It is conceivable that private equity targets are acquired because they follow a firm-specific trend. If this trend is related to the effective tax rate, we will find a spurious treatment effect. Therefore, we investigate a placebo event four years prior to the actual acquisition. According to our hypothesis, we should not find a significant treatment effect around this placebo event. Our results show that target firms do not exhibit a different trend than their control firms. The graphical depiction of this finding can be found in Figure A-1 in the Appendix.

We then look at long-run effective tax rates as the dependent variable. Long-run effective tax rates are calculated as the sum of tax expenses in a certain period over the sum of pre-tax income in the same period (Dyreng et al., 2008).[15] These rates are widely used in tax accounting research since they address two concerns that are also relevant to our analysis. First, long-run effective tax rates are less prone to measurement errors due to one-time affects in the tax expenses or pre-tax income that inflate annual effective tax rates such as large tax refunds or one-time deductions. Second, studying long-run effective tax rates allows to test whether tax planning strategies are sustainable in that firms succeed in persistently lowering tax payments. We confirm our main results and find that private equity investors are successful in implementing persistent tax strategies. Results can be found in Figure A-2 and Table A-3 in the Appendix.

[15] As opposed to the main tests in Dyreng et al. (2008)) that focus on cash taxes paid, we continue to use the total tax expenses as input variable for the denominator. This allows us to benchmark the results with our main findings. We further consider the total tax expenses to be the better measure in our analysis given that private equity investors are interested in accounting earnings after (total) taxes that can be distributed to shareholders.

7 Conclusion

In this paper, we study the effect of private equity buyouts on corporate tax avoidance. Lowering corporate tax payments at the target firm level creates shareholder value at the expense of the government. Our data comprises 11,305 European private equity transactions. To address the endogeneity of private equity acquisitions, we employ a matched sample difference-in-differences estimation. We analyze post-deal effective tax rates, earnings, and leverage to investigate different channels of tax avoidance. In addition, we compute heterogeneous treatment effects to look at asset and employment growth in high tax avoidance deals.

We find an immediate increase in tax avoidance at the level of the target firm after the acquisition. Target firms do not pay less in absolute taxes after being acquired by a private equity firm but their growth in profitability is accompanied by substantially higher tax efficiency. We examine specific tax planning channels and document that post-buyout growth in pre-tax profitability depends on tax planning considerations. In particular, private equity buyouts seem to intensify tax-motivated profit shifting behavior that results in tax base erosion in the countries of target firms. Interestingly, increases in debt financing at the target firm do not seem to be driven by tax considerations. We further show that those target firms that reduce their relative tax bill the most invest significantly less in assets and seem to reduce the workforce after the buyouts. These results suggest that tax-motivated private equity buyouts implement cost-cutting strategies in general while growth-oriented buyouts do not emphasize tax efficiency. Concluding, our results

indicate that some private equity firms create value for their shareholders by extracting value from the government through relatively lower tax payments and that buyout-related tax savings are not used to finance investments.

Appendix

Table A-1: Potential Controls Sample Construction

This table presents the construction of the potential control data set. Nine steps are described. The number of observations that remains after each step is provided and so is the relative loss when compared to the original sample.

Description	Observations	Loss
(1) All observations provided by the Bureau van Dijk July 2018 flat files on company financial data	216,868,946	
(2) Remove all duplicates with respect to the Bureau van Dijk Identifier and year	216,190,999	-0.31%
(3) Delete observations with missing values for turnover, number of employees, and total assets	212,670,813	-1.62%
(4) Exclude all firms with negative values for total assets, number of employees, sales, or tangible assets in any given firm-year	211,829,690	-0.39%
(5) Fill the time-series of firm-year observations and interpolate variables	219,685,539	3.62%
(6) Remove duplicates with respect to firm, year, and accounting practice (keep IFRS) and duplicates with respect to firm, year, and consolidation code (keep C2)	219,555,593	-0.06%
(7) Exclude all firms that were at least once targeted by a private equity firm	219,370,793	-0.09%
(8) Delete all firm-year observations outside of the years 2000 and 2016	179,827,339	-18.23%
(9) Keep observations with values filled for all the matching variables (ETR, ROA, cash ratio, asset growth, total assets, leverage ratio)	52,295,322	-58.81%

Table A-2: Variable Description

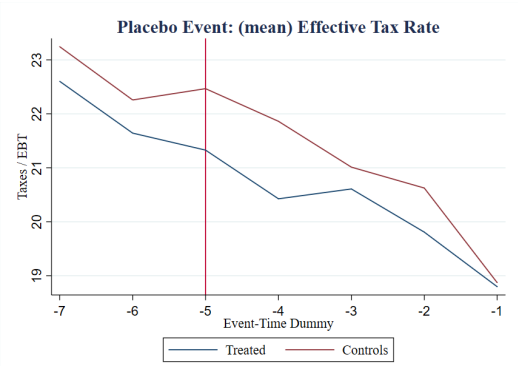
This table presents the description of all variables used throughout the analysis. Variables are grouped into firm-level and macro-level. The data source as well as the definition are provided for each variable. *Financials* and *Ownership* refer to data obtained from Bureau van Dijk's Orbis database.

Variable	Source	Definition
Firm-level Variables		
Effective Tax Rate (ETR)	Financials	Tax Expenses / Earnings before Taxes (EBT)
3(5)-year long-run ETR	Financials	Sum of Tax Expenses of current and two (four) future periods over the sum of EBT of the same period
Log. EBT	Financials	ln(1 + EBT)
Log. Tax Expenses	Financials	ln(1 + Tax Expenses)
Net Interest Paying Leverage	Financials	(Loans + Long-term Debt) / Total Assets
Target Sub in Tax Haven (T.TH)	Ownership	A dummy variable equals 1 if the target firm has a subsidiary in a European tax haven country one year prior to the acquisition
Target Group Tax Spread (T.GTS)	Ownership / OECD	The difference between the highest and the lowest tax rate applicale to any of the target's subsidiaries
Target Firm Tax Spread (T.FTS)	Ownership / OECD	The difference between the targets's tax rate and the tax rate of its subsidiary with the lowest tax rate applicable
Acquiror Sub in Tax Haven (A.TH)	Ownership	A dummy variable equals 1 if the acquiror firm has a subsidiary in a European tax haven country one year prior to the acquisition
Acquiror Group Tax Spread (A.GTS)	Ownership / OECD	The difference between the highest and the lowest tax rate applicable to any of the acquiror's subsidiaries
Acquiror Firm Tax Spread (A.FTS)	Ownership / OECD	The difference between the acquiror's tax rate and the tax rate of its subsidiary with the lowest tax rate applicable
Log. Total Assets	Financials	ln(1 + Total Assets)
Log. Asset Growth	Financials	ln(Total Assets[t] / Total Assets[t-1])
ROA	Financials	Earnings before Interest and Taxes (EBIT) / Total Assets
Tangible Fixed Assets Ratio	Financials	Tangible Fixed Assets / Total Assets
Intangible Fixed Assets Ratio	Financials	Intangible Fixed Assets / Total Assets
Cash Ratio	Financials	Cash and Cash Equivalents / Total Assets
Long-Term Leverage Ratio	Financials	Long-Term Liabilities / Total Assets
Short-Term Leverage Ratio	Financials	Short-Term Liabilities / Total Assets

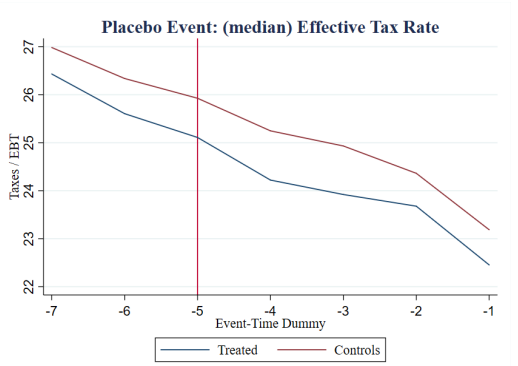
Table A-2: Variable Description (continued)

Variable	Source	Definition
Macro-level Variables		
Corporate Tax Rate	OECD	Average Corporate Tax Rate in a given Country for each year
High Tax (HT)	OECD	A dummy variable equals 1 if the firm's country of origin has an average corporate tax rate above the median of all firms
Domestic Group Taxation (DGT)	IBFD	A dummy variable equals 1 if the firm's country of origin allows for domestic group taxation
Cross Group Taxation (CGT)	IBFD	A dummy variable equals 1 if the firm's country of origin allows for cross-country group taxation
Interest Deductibility Limit (IL)	IBFD / ZEW	A dummy variable equals 1 if the firm's country of origin has some form of interest deductibility limit
GDP / Capita	OECD	GDP per Capita of a firm's country of origin
GDP	OECD	GDP of a firm's country of origin
Long-Term Interest Rate	OECD	Long-Term Interest Rate in a firm's country of origin measured by long-term government bond yields
Short-Term Interest Rate	OECD	Short-Term Interest Rate in a firm's country of origin measured by short-term government bond yields

Figure A-1: Effective Tax Rates around Placebo Event

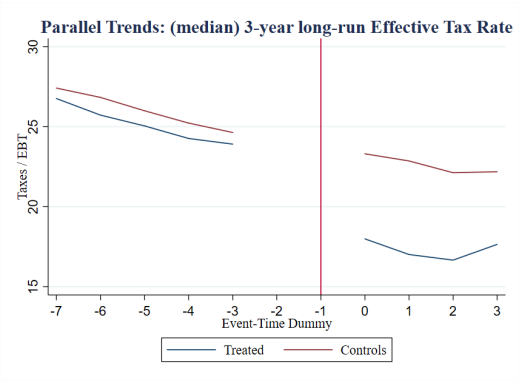


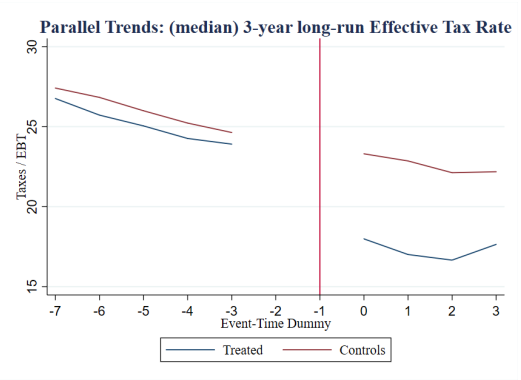
(a) This figure shows the development of the mean effective tax rate (%) from event year $t = -7$ to event year $t = -1$ for both the treated firms and the control group. The red line at $t = -5$ indicates the time of the placebo event, which is five years prior to the acquisition.

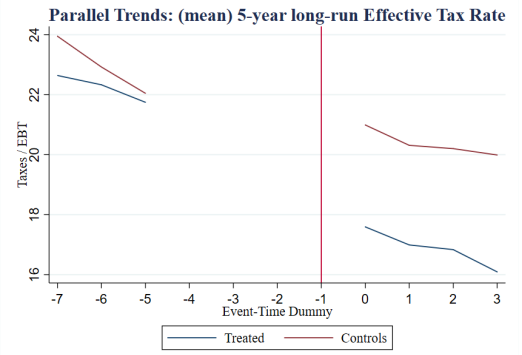


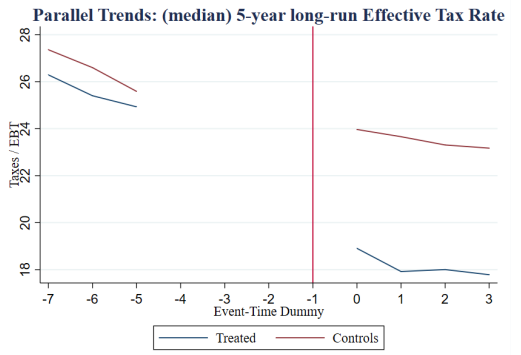
(b) This figure shows the development of the median effective tax rate (%) from event year $t = -7$ to event year $t = -1$ for both the treated firms and the control group. The red line at $t = -5$ indicates the time of the placebo event, which is five years prior to the acquisition.

Figure A-2: Long-Run Effective Tax Rates around the Event









(a) These two figures show the development of the long-run mean effective tax rates (%) from event year $t = -7$ to event year $t = 3$ for both the treated firms and the control group. The red line at $t = -1$ indicates the time prior to the event. Firm-year observations before the event are excluded if the calculation of the long-run effective tax rate is affected by the buyout.

(b) These two figures show the development of the long-run median effective tax rates (%) from event year $t = -7$ to event year $t = 3$ for both the treated firms and the control group. The red line at $t = -1$ indicates the time prior to the event. Firm-year observations before the event are excluded if the calculation of the long-run effective tax rate is affected by the buyout.

Table A-3: Long-run Target Firm Tax Avoidance around Private Equity Transactions

This table presents the long-run effective tax rate around the event. The dependent variable is the 3 and 5-years effective tax rate according to Dyreng et al. (2008). It is computed as the sum of taxes paid over a 3-year (5-year) horizon starting in year t divided by the sum of EBT over the same period. Firm and macro controls refer to log total assets, long- and short-term leverage, the share of intangible and tangible assets, asset growth, cash holdings, profitability, GDP per capita, GDP, and long- as well as short-term interest rates. Standard errors are clustered at the firm level throughout.

	3-year long-run ETR		5-year long-run ETR	
	(1)	(2)	(3)	(4)
Event (t=0, 1, 2, 3) * Tr.	-2.117***	-1.975***	-3.310***	-3.166***
	(-6.15)	(-5.60)	(-6.38)	(-5.78)
Sample	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Winsorization	5, 95	5, 95	5, 95	5, 95
Standard Errors	Cluster	Cluster	Cluster	Cluster
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects		Y		Y
Firm Controls 1 / 2		Y		Y
Macro Controls		Y		Y
adj. R2	0.013	0.020	0.014	0.020
Observations	120,282	113,904	62,301	59,273

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

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