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Private Equity and Local Public Finances

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ABSTRACT

We study the economic impact of private equity (PE) investments on local governments, which are important corporate stakeholders. Examining over 11,000 deals and private firm data in Europe, we document that target firms' effective tax rates and total tax expenses decrease by 15% and 13% after PE deals. At the same time, target firms expand their capital expenditures and firm boundaries, but do not increase employment. Using administrative data on the public finances of German municipalities and exploiting the geographical and time-series variation in PE deals, we document that PE activity is negatively associated with local governments' tax revenues and spending. This result is likely driven by reduced tax payments of PE portfolio firms, accompanied by only modest positive spillovers of PE investments on regional economic growth. Collectively, our findings suggest that corporate tax efficiency serves as a cost-cutting channel in the PE sector and constrains the finances of local governments.

JEL codes: G31, G34, H25, H26, H70

Keywords: PE; leveraged buyouts; investments; tax avoidance; public finances

1. Introduction

As of 2022, Private equity (PE) was the largest alternative asset class with over 4.5 trillion USD in assets under management, which are projected to exceed 11 trillion USD by 2026 (Economist [2022], Preqin [2022]). This growing importance begs the question of how PE firms create value. A particular concern relates to the PE industry's contribution to tax revenues, which impacts the public finances of the government. For example, during the crisis around Covid-19, critics lamented that PE-backed firms pay low taxes in good times but are financially fragile and demand government support during downturns (Financial Times [2020]). Further, recent media coverage has revealed that PE firms exploit favorable corporate tax rulings in Luxembourg and dodge taxes at the executive partner level (The Guardian [2014], New York Times [2021b]). We examine how PE buyouts are associated with target firms' corporate tax payments and economic activity as well as the corresponding changes in local governments' public finances.

Understanding the impact of PE activity on local public finances is important because sound fiscal budgets and local government spending are crucial for economic development and community well-being (Gyourko and Tracy [1991], Busso, Gregory, and Kline [2013], Glaeser [2013], Corbi, Papaioannou, and Surico [2019], Antolin-Diaz and Surico [2022]). Regulators are often skeptical of the value contribution of PE firms in light of the imposition of debt and cost-cutting on portfolio firms (Kaplan and Strömberg [2009], Davis et al. [2020]). PE investors likely lower their portfolio firms' tax payments to increase shareholder value, potentially resulting in monetary transfers away from governments. Practitioners, in contrast,

argue that the PE industry contributes significantly to aggregate investment, employment, and tax revenue in the United States (Frontier Economics [2013], EY and AIC [2019]), and academic studies document that portfolio firms' profits and investments generally increase after PE buyouts (e.g., Boucly, Sraer, and Thesmar [2011], Cohn, Mills, and Towery [2014], Cohn, Hotchkiss, and Towery [2022], Guo, Hotchkiss, and Song [2011]). Thus, economic benefits might counterbalance lower corporate taxes such that governments may not need to worry about PE portfolio firms' tax strategies.

To comprehensively assess the impact of PE on local governments, we examine economic outcomes at three levels.[1] First, we study target firm outcomes after PE buyouts. The main tests focus on effective tax rates (ETRs) as a common measure of tax-related performance. As lower ETRs reflect a relatively lower amount of taxes paid for the same amount of pre-tax income generated, the ETR outcome directly relates to the concept of cost efficiency critical to PE firms' value creation focus (Gompers, Kaplan, and Mukharlyamov [2016], Sorensen and Yasuda [2023]).[2] Building on Badertscher, Katz, and Rego [2013], we expect that target firms report lower ETRs after a PE buyout. This reduction in ETRs may stem from more focused tax management, more aggressive tax strategies, or also operational changes that are not necessarily driven by tax considerations. Additional tests explore these possibilities to pin down the specific mechanisms of firms' tax planning. As PE buyouts may increase firms' pre-tax earnings and investment, the impact of PE activity on total corporate tax payments is unclear, even if ETRs decline. To address this issue, we also decompose the ETR into tax payments and pre-tax earnings and further study associated changes in economic activity.

Second, we study corporate tax and investment outcomes at the aggregated level to account for the direct changes in target firms' economic activity and potential spillovers on nonacquired firms due to competitive interactions or supply chain relationships (Bernstein et al. [2017], Breuer [2021], Berg, Reisinger, and Streitz [2021]). By accounting for spillovers on other firms located in the same region, we can assess the aggregate consequences of PE on local governments' public finances. Spillover

[1] Appendix B illustrates our conceptual framework. We acknowledge that PE investments can have effects on the broader economy, and that some of these effects are outside the scope of our study. Examples include technological transformations of industries and consequences of PE activity for other stakeholders such as customers and suppliers. However, our analyses should indirectly account for these factors, as we capture the net outcomes regarding local governments' finances.

[2] When interpreting our results, we use the term "tax efficiency" instead of only referring to the term "tax avoidance," which is not unambiguously defined in the academic literature and can relate to a continuum of firms' tax strategies ranging from mild forms of tax planning such as investing in tax-exempt bonds to aggressive sheltering activities without much economic substance (Blouin [2014]). We use the term "aggressive tax avoidance" when we study specific measures of aggressive forms of tax planning such as the use of tax havens.

effects can be positive in the case of agglomeration economies when large investments of one firm benefit local peers due to input sharing or knowledge externalities (Kline and Moretti [2014], Giroud et al. [2022]). The spillovers can also be negative if PE-backed firms steal business from local peers and toughen negotiations with suppliers, or if peer firms mimic tax planning strategies, which can lower overall tax collections (Bird, Edwards, and Ruchti [2018], Armstrong, Glaeser, and Kepler [2019]).

Third, we exploit administrative data on tax revenues, public spending, and debt to estimate the net impact of PE activity on local governments. In Germany, more than 50% of taxes on business profits are collected at the municipality level and high-quality administrative data on local public finances and economic activity are available (Fuest, Peichl, and Siegloch [2018]). Exploiting this setting, we capture how PE portfolio firms' and local peer firms' tax payments and operations translate into the overall fiscal budgets of local governments. We thereby show how PE activity relates to governments' public finances.

We combine several data sources for our analyses. We start by creating a new data set of over 11,000 PE acquisitions of European target firms from 2001 to 2018, mostly private-to-private deals representative of the overall buyout activity. We merge deal data from Zephyr with financial and global ownership panel data from Orbis and use the target firms' addresses to determine their location in a given municipality. We then use administrative panel data from Germany on tax revenues of over 13,000 municipalities and on public spending and debt in over 400 counties.

Our baseline tests show that target firms' GAAP ETRs decrease by about three percentage points more three years after a buyout, compared to control firms matched on profitability, leverage, size, and growth in the same year, country, and industry. This effect size is comparable to those found in studies by Khan, Srinivasan, and Tan [2017] and Chen et al. [2019] on institutional ownership of large U.S. firms. Our estimate represents a 14.5% ETR decrease relative to the unconditional sample mean, suggesting that PE investors benefit from economies of scale and lower marginal costs of implementing tax planning strategies across their portfolio firms. Using an alternative control sample of M&A targets, we document a 1.5-percentage-point stronger decrease in ETRs for PE targets. This empirical design varies the acquirer type but not the decision to acquire that could also reduce target firms' ETRs (Belz et al. [2016]). Thus, these results suggest that increasing tax efficiency is part of PE investors' optimization strategies and not a mere result of reorganizations.

Additional tests provide insights into the mechanisms behind this increase in tax efficiency. We document that both lower absolute tax expenses and higher pre-tax earnings drive the decrease in ETRs. Further, target firms increase their subsidiary presence in tax havens and other low-tax jurisdictions, suggesting that PE investors emphasize target firms' international tax avoidance strategies. Target firms also spend more on external tax advice after a PE buyout, suggesting that PE investors enhance the

quality and focus of their target firms' tax strategies. Cross-sectional tests further corroborate the inference that tax-focused strategies plausibly explain our main findings. We document the most pronounced ETR decreases when target firms have not fully utilized their tax savings potential, when tax consolidation rules allow for tax-efficient group structures, in first-time PE ownership deals, and when the largest global PE firms acquire target firms.

Regarding target firms' economic activity, we document a significant increase in corporate investment after the PE deals, compared to the matched control firms with similar growth trajectories before the buyouts. Specifically, we observe an immediate increase in capital expenditures (CAPEX) of approximately 35%, which is largely due to investments in tangible assets. This result is somewhat larger than those reported in previous work using more specific samples (e.g., Boucly, Sraer, and Thesmar [2011]). Moreover, we find that target firms are much more likely to engage in M&A activity after a PE buyout. Notably, the target firms are likely to acquire other firms in the same municipality. We fail to find a significant increase in employment. However, average salaries in target firms increase. These findings align with related work documenting that PE investors make human resource changes that improve labor productivity and benefit higher paid employees (Olsson and Tåg [2017], Antoni, Maug, and Obernberger [2019], Davis et al. [2020]).

Although operational changes may contribute to lower taxes after PE buyouts, our comprehensive tests using various outcomes and sample splits suggest that target firms focus more on tax management and aggressive tax planning strategies after the PE buyout. This systematic evidence is consistent with anecdotes from hand-collected disclosures, leaked tax rulings, interviews, and media reports that suggest that PE ownership drives target firm-level tax savings at least to some extent.[3] In line with this interpretation, we document evidence suggesting that managers decrease target firm taxes by claiming tax credits and preferential tax rates when

[3] Several pieces of anecdotal evidence support our interpretation of the observed patterns in the large sample analyses. For example, John Samuels, former head of General Electric (GE)'s tax department and current chairman of global tax at Blackstone, exemplifies how PE firms leverage tax expertise to implement tax strategies across their portfolio companies. While at GE, he was covered on The New York Times [2011] front page: "[GE's] extraordinary success is based on an aggressive strategy that mixes fierce lobbying for tax breaks and innovative accounting that enables it to concentrate its profits offshore. G.E.'s giant tax department, led by a bow-tied former Treasury official named John Samuels, is often referred to as the world's best tax law firm." (NYU Law Magazine [2013]) later labeled him as "the most influential person in the tax world." Original documents from the Lux Leaks database further reveal that PE firms regularly negotiate favorable rulings with Luxembourg tax authorities on behalf of the PE firms' portfolio companies (The Guardian [2014]), resulting in substantial corporate tax reductions in the portfolio companies' countries through the favorable treatment of income from intellectual property and hybrid financing structures. Section A of the online appendix provides specific examples of these tax rulings and further anecdotal evidence on PE firms' specific tax strategies.

investing in tangible and intangible assets and that firms' M&A strategies also increase the number of subsidiaries owned in tax havens. Thus, our results are consistent with PE managers improving tax efficiency alongside operational changes. Collectively, the target firm-level results indicate that overall tax revenues of local governments could decrease, despite the target firms' growth in profits and investment. However, it is unclear whether firm-level tax reductions constrain local public finances due to the possibility of positive spillovers within the local economies.

Therefore, we next analyze aggregate outcomes at the local level. We document lower aggregate ETRs after a PE firm acquires a target firm in a given municipality, compared to other municipalities without a PE deal in the same country-year and experiencing similar industry trends, while holding constant M&A activity at the local level. Spillover effects on local peer firms' CAPEX are positive but modest, resulting in an increase in aggregate municipality-wide CAPEX after a PE buyout. We do not observe changes in aggregate employment growth after local PE buyouts, and the increases in salaries are driven by PE target firms alone. Despite the growth in aggregate CAPEX, these results suggest that aggregate corporate taxes are unlikely to increase when PE activity intensifies at the local level.

Our final analysis uses administrative data on local public finances and suggests a negative net impact of PE on local governments' finances. Exploiting the staggered nature of PE deals across German municipalities over time, we document an approximately 6% decrease in corporate tax revenues after local PE buyouts.[4] We also document a decline in income tax transfers from the federal government to local governments, suggesting that increases in other taxes do not compensate for the loss in local business tax revenues. These findings indicate that the tax efficiency implemented by PE firms leads to lower corporate tax revenues, without offsetting positive spillovers at the local level.

We further examine public spending and debt financing at the county level, where we can also access data on the spendings and debt of all municipalities within a given county. We document approximately 4% lower local government spendings after PE buyouts. Using granular data from the three largest German states, we find that local governments specifically cut spending on their administrative personnel, municipal streets, and sports promotion. We do not observe changes in spendings on federally mandated activities and new debt issuances, indicating that local governments compensate for lower tax revenues through discretionary spending

[4] The decrease in a municipality's tax revenues occurs over multiple years after PE investors acquire a local firm, relative to control municipalities in the same state and year, controlling for local M&A activity. Our identification strategy relies on the strong assumption that PE firms do not endogenously select target firms in geographies that follow specific economic trends. Insights from industry reports and a practitioner interview mitigate this concern. They suggest that PE managers mainly focus on industry trends, specific domestic markets, and target firm characteristics, rather than the location of target firms' incorporation in a given country.

cuts rather than additional borrowing. In sum, these results suggest that PE activity has broader consequences for the provision of local public goods.

We acknowledge three particular caveats to our study. First, we cannot establish a direct causal relationship between PE ownership on portfolio firms' taxes and governments' finances given the endogenous nature of PE target firm selection. We discuss this issue and results from tests that partially mitigate this concern in subsection 5.5. Second, we cannot account for all tax-related effects of PE buyouts, such as unobserved investor-level taxes. However, revenues from these taxes are unlikely to offset local corporate tax revenue losses because a substantial share of PE investment comes from foreign investors, often including tax-favored entities such as pension funds (Preqin [2021]). Third, we do not capture long-run effects outside our estimation window or on total domestic tax revenues, and it is possible that tax reductions eventually result in substantial growth due to long-run effects of innovation and technological transformations.[5]

Our study contributes to the literature on the impact of PE buyouts on different stakeholders in the economy. Several studies find positive effects of PE ownership on portfolio firms' growth and profitability, highlighting the benefits for investors (Boucly, Sraer, and Thesmar [2011], Guo, Hotchkiss, and Song [2011], Cohn, Mills, and Towery [2014], Bernstein, Lerner, and Mezzanotti [2019], Cohn, Hotchkiss, and Towery [2022]). Evidence on the effects on other stakeholders is scarce, apart from mixed results on value extraction from employees and customers (e.g., Davis et al. [2014], ,2020], Antoni, Maug, and Obernberger [2019], Eaton, Howell, and Yannelis [2020]). We show in detail how PE target firms achieve greater tax efficiency. We also establish novel evidence based on administrative data showing that PE-related investment growth unlikely counterbalances local tax revenue losses associated with target firm's tax reductions. This finding challenges the claim by lobby groups that PE could increase tax revenues through investment and job creation (Frontier Economics [2013], EY and AIC [2019]). Thus, our evidence informs the debate about the downside of PE in terms of value extraction from stakeholders (e.g., Shleifer and Summers [1988], Lerner, Sorensen, and Strömberg [2011]). Relatedly, our paper adds to the scant evidence on the broader economic impact of PE (Bernstein et al. [2017], Aldatmaz and Brown [2020]) and to the literature on the impact of structural changes within industries on the finances of local communities (e.g., Busso, Gregory, and Kline [2013], Bartik et al. [2019]). Our findings suggest that PE activity can constrain public finances and thus reduce the provision of public goods.

[5] Nevertheless, our evidence is consistent with a constraint for local public finances around the typical holding period of PE investments of about five years. In untabulated tests, we document a steady and significant negative association between PE buyouts and municipality-level business tax revenues for up to 10 years (the maximum post-treatment window in our sample). Further, we document no significant changes in local GDP within the same period.

We also extend the literature on firm ownership and tax avoidance by offering evidence on largely unexplored consequences of tax avoidance. We go beyond establishing a link between PE ownership and portfolio firm tax avoidance: We show that firm-level tax reductions likely relate to local corporate tax revenue losses and a decline in public spending. This finding is meaningful because constraints in local public finances are typically seen as an impediment to local economic growth and well-being (Carroll and Wasylenko [1994], Glaeser [2013]). We thereby answer the call for research on the consequences of tax avoidance for shareholders and stakeholders (Hanlon and Heitzman [2010], Wilde and Wilson [2018], Bruehne and Jacob [2021]). Collectively, our insights should be of interest to policy makers who are increasingly concerned about PE-backed firms not contributing their fair share to economic growth and tax revenues.

2. Data

We construct a novel data set combining PE deals with information on firms' financials, ownership, and location of incorporation. We obtain PE deals with European target firms from Bureau van Dijk's (BvD) Zephyr database. For our firm-level tests, we use financial information from BvD's Orbis flatfile as of July 2020 and ownership information from annual historical Orbis updates (2005–2018). We create firm group ownership variables following Olbert [2023] and De Simone and Olbert [2022]. For firms in the United Kingdom, we collect additional data on tax advice and legal fees from BvD's FAME database. We then use information on target firms' location of incorporation to aggregate the firm data at the municipality level across European countries and identify municipalities that experience PE buyouts. Administrative data on public finances and macroeconomic characteristics for municipalities in Germany are from the German states' statistical offices (*Regionaldatenbank*). Macroeconomic and tax rate data are from the OECD and KPMG.

Table 1 explains the PE deal sample construction. We retrieve all PE deals with target firms in the 31 European Economic Area member countries as of 2019 and in Switzerland from BvD's Zephyr database. We analogously retrieve M&A deals to construct control samples and variables. Zephyr provides information on the acquirer and the target as well as the year of the buyout, the acquired ownership stake, and the deal value in some cases. The *acquirer* is typically the PE fund that finances the investment. The *target* is the acquired legal entity. Our sample covers transactions from 2001 to 2018. We only include completed or completed-assumed deals that cover a unique target firm in a given year. At this point, our sample comprises 29,344 PE deals.

In panel A of table 1, we present the number of observations after each step of constructing the firm-level sample, along with the loss of observations, as well as the number of observations with a deal value in Zephyr and the average deal value. We successfully merge 11,368 deals to firms with

TABLE 1
PE Deals Sample Construction

Panel A: Firm-level private equity deals	Private Equity Deals Obs	Private Equity Deals Loss	Deal Value (m EUR) Obs	Deal Value (m EUR) Mean
(1) Completed or completed-assumed deals in Zephyr with target firms in the 32 European countries in the period 2001–2018 and a nonmissing BvD ID	31,054		15,961	120.51
(2) Only unique target firm-year deals	29,344	5.51%	14,966	114.32
(3) Target firms with nonmissing information on the matching variables from Orbis	11,368	57.89%	5,813	143.41
(4) Target firms matched to a control firm	11,242	0.41%	5,742	141.90

Panel B: Private equity deals across municipalities in Europe	Acquired Firms Obs	All Firms Obs	Municipalities Obs	Acquired Firm Assets ($k = 0$) %
(1) Unique deals (step (2) in panel (A)) and municipalities	29,344	37,111,468	196,926	
(2) Target firms with nonmissing geographic location information in Orbis; municipalities with nonmissing firm information on taxes, EBT, employees, and fixed assets	11,393	8,693,927	116,250	11.12%
(3) Municipalities with at least one nonacquired firm and nonmissing outcome variables	11,315	2,485,747	109,629	10.27%

Panel C: Private equity deals across municipalities in Germany	Acquired Firms Obs	All Firms Obs	Municipalities Obs	Acquired Firm Assets ($k = 0$) %
(1) Unique German deals (step (2) in panel (A)) and municipalities	2,891	2,060,417	13,210	
(2) Target firms with nonmissing information in Orbis on financial variables and municipality	1,371	883,120	13,136	7.51%

(*Continued*)

TABLE 1—*(Continued)*

Panel C: Private equity deals across municipalities in Germany	Acquired Firms Obs	All Firms Obs	Municipalities Obs	Acquired Firm Assets ($k = 0$) %
(3) Municipalities with nonmissing data on public finances in the period 2008–2018	931	697,193	9,694	7.81%

Panel D: Private equity deals across counties in Germany	Acquired Firms Obs	All Firms Obs	Counties Obs	Acquired Firm Assets ($k = 0$) %
(1) Unique German deals (step (2) in panel (A)) and counties	2,891	2,384,851	431	
(2) Target firms with nonmissing information in Orbis on financial variables and county	1,616	605,314	361	1.40%
(3) Counties with nonmissing data on public finances in the period 2001–2018	1,613	600,547	361	1.41%

This table describes the construction of the four main data sets used in our analyses at different levels of aggregation. Panel A describes the construction of the firm-level buyout data set based on deal data from the Zehpyr database as of December 2020. We provide the number of observations after each sample construction step and the relative loss when compared to the original deal sample. In addition, we present the number of observations with available information on deal value and the respective average deal values at each construction step. Panel B describes how PE deals are aggregated by municipality in the 32 European countries. We show the number of acquired target firms and the average number of all firms throughout the sample period in a given municipality after each sample construction. In addition, we present the number of unique municipalities and the average share of firms' total assets acquired through PE buyouts after each sample construction step. Panel C describes how PE deals are aggregated by municipality in Germany. We show the number of acquired target firms and the average number of all firms throughout the sample period in a given municipality after each sample construction. In addition, we present the number of unique municipalities and the average share of firms' total assets acquired through PE buyouts after each sample construction step. Panel D describes how PE deals are aggregated by county in Germany. We show the number of acquired target firms and the average number of all firms throughout the sample period in a given county after each sample construction step. In addition, we present the number of unique counties and the average share of firms' total assets acquired through PE buyouts after each sample construction step.

information on the matching variables available in Orbis. We observe deal values for about 50% of the transactions, as the involved parties often agree not to disclose deal specifics. Average deal values barely change and range from 120 million to 143 million EUR when we impose sample restrictions. In terms of deal values, our final sample thus seems representative of the European PE market.

Panels B, C, and D of table 1 provide information on the procedure of aggregating the data to the different levels of analysis. Panel B shows that we exploit 11,315 PE deals for which we observe firms' addresses and nonmissing outcome variable information when studying municipalities across all European countries. Panels C and D show that Germany hosts 2,891 of the 29,344 PE deals. After we require the necessary geographic firm

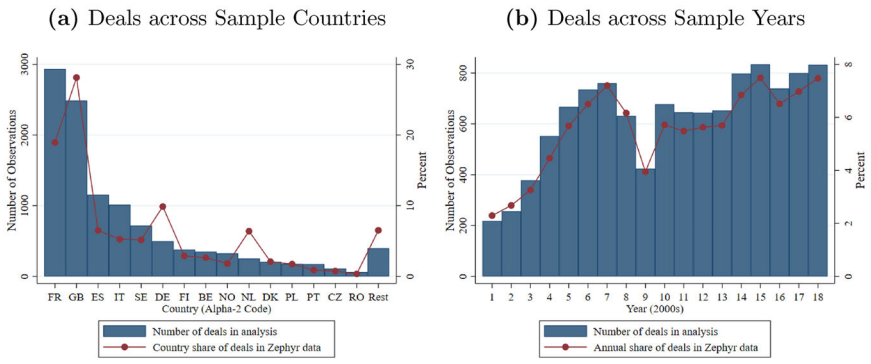


FIG 1.—PE deals across countries and over time. This figure shows the distribution of PE deal observations across target firm countries (panel (a)) and sample years (panel (b)). The blue columns illustrate the total number of successfully matched target firm observations used in the regression analysis with available data on target and control firms. The red dots in panel (a) illustrate each country's share of PE deals relative to the total PE activity in the 32 sample countries from Zephyr. All observations in countries other than the 15 most active PE markets are subsumed under "Rest". The red dots in panel (b) illustrate the share of PE deals in each year relative to the total PE activity from 2001 to 2018 from Zephyr.

information in Orbis and nonmissing administrative data, we use 931 deals from 2008 to 2018 in the municipal-level tests (panel C) and 1,613 deals from 2001 to 2018 in the county-level tests (panel D). Table 1 also shows the number of all firms located in a given municipality or county, the number of unique localities, and the share of total assets that PE investors acquire on average when a PE buyout happens in a given locality. We use these statistics to discuss our quantitative results in subsection 4.4 and section 5.

Figure 1 displays the final distribution of deal observations over countries and years. Panel (a) shows that the majority of transactions occur in the United Kingdom and France. Panel (b) shows that the number of deals increases steadily until the financial crisis in 2008 and 2009. After 2010, deal activity reverts to pre-crisis levels. Overall, the distribution of deals across countries and over time indicates that our sample is representative of PE activity in Europe.[6]

[6] Our sample is more representative of the actual PE activity than those in many previous studies, as we leverage the availability of financial data for private European firms. Compared to studies in the U.S. setting, our average deals are smaller because those studies examine small buyout samples with target firms listed on U.S. stock exchanges or filing U.S. tax returns and having total assets of above 10 million USD (e.g., Cohn, Mills, and Towery [2014], Cohn, Nestoriak, and Wardlaw [2021], Cohn, Hotchkiss, and Towery [2022]). In contrast, we observe many private-to-private transactions (more than 90% of our sample). This allows us to make inferences based on a comprehensive set of transactions, including smaller targets. To show that the sample is broadly representative despite heterogeneity in the availability of financial statement information across countries, panel (a) in figure 1 also depicts the number of deals per country, relative to all deals in Europe.

3. PE Deals and Target Firm Outcomes

3.1 EMPIRICAL STRATEGY

We begin our analysis by studying tax and other economic outcomes at the target firm level around PE deals. Empirically attributing changes in firm outcomes to PE buyouts is challenging because PE firms choose target firms purposefully. This strategic choice relates to target firm characteristics, most prominently growth opportunities, and deal timing (Sorensen and Yasuda [2023]). For a causal interpretation of results from comparing acquired target firms and nonacquired control firms, we would need to believe that the different units would have had the same trends, absent the PE firms buying the target firms. This assumption is very strong and unlikely to fully hold in our observational setting.

To provide comfort in our results, we perform a granular nearest-neighbor matching of PE target firms to comparable nonacquired control firms in our main tests. The goal is to create a sample in which target and control firms are sufficiently similar, such that we can reliably measure changes in firm-level outcomes associated with PE ownership, conditional on the observable matching variables. We match target firms to potential control firms in the year prior to the buyout within the same country, year, and industry. Thus, treated and control firms face the same country-level regulatory and macroeconomic circumstances. We then select matching variables and keep the nearest-neighbor control firm. As the matching variables include pre-buyout ETRs, growth, size, leverage, and profitability, they should proxy for determinants of PE acquisitions in general (e.g., Guo, Hotchkiss, and Song [2011]) as well as tax planning opportunities as identified by the tax literature. The sample statistics suggest that our approach produces a sample of treated and control firms that are comparable across several observable characteristics, in particular proxies for tax planning opportunities, mitigating the concern that our results are driven by PE investors selecting target firms with a higher likelihood of future ETR decreases. We provide details on the matching algorithm and sample statistics in section B of the online appendix. Panel A of table 2 presents summary statistics for the panel of matched treated and control firms.

We acknowledge that we cannot control for unobservable factors that could drive PE firms' target selection such as PE fund incentives or target firms' corporate governance. Such factors could cause differential changes in target firm outcomes, in particular if our observable matching variables are not sufficiently correlated with those factors. To further alleviate selection concerns related to the buyout decision, we compare PE target firms to target firms of M&A transactions. These additional tests vary the acquirer type but not the decision to acquire a firm. Thus to the extent M&A acquirers and PE firms select target firms based on similar unobservable characteristics that could reduce target firms' taxes and other outcomes, this strategy partially takes care of such unobservable factors.

TABLE 2
Summary Statistics

Panel A: Firm-level	Obs	Mean	Median	Min	Max	SD
ETR	122,881	19.73	22.79	−106.93	146.99	34.30
Log. Tax Expenses	97,841	11.66	12.59	0.00	18.30	4.03
Log. EBT	91,234	14.06	14.21	7.60	19.70	2.29
Tax Haven	122,881	14.44	0.00	0.00	100.00	35.15
Intl. Tax Differential (%)	75,470	1.08	0.00	0.00	3.54	1.29
Log. Tax Advice Fees	3,510	9.93	9.76	7.08	13.38	1.39
Log. Legal Fees	3,756	10.00	9.82	6.80	14.08	1.61
Log. Capex	96,462	13.03	13.46	1.61	16.94	2.51
Log. Tangible Capex	103,335	12.66	13.13	0.00	16.65	2.65
M&A Deal	122,881	5.85	0.00	0.00	100.00	23.48
Local M&A Deal	122,881	1.41	0.00	0.00	100.00	11.80
Employment Growth	87,567	4.91	2.14	−166.06	135.48	31.42
Log. Avg. Salaries	90,664	10.69	10.71	8.59	12.47	0.59
(2) Cross-sectional interaction variables						
Tax Savings Potential	122,881	34.59	0.00	0.00	100.00	47.57
Group Tax Consolidation	122,881	27.12	0.00	0.00	100.00	44.46
First PE Investor	122,881	75.58	100.00	0.00	100.00	42.96
Big PE Player	122,881	3.94	0.00	0.00	100.00	19.45
IP Box Access	86,975	11.20	0.00	0.00	100.00	31.54
Investment Tax Credits	122,719	6.41	0.00	0.00	100.00	24.50
(3) Control variables						
Log. Total Assets	122,881	16.58	16.60	10.76	22.26	2.18
EBIT over Assets (ROA)	122,881	4.21	5.73	−116.26	55.16	21.64
Leverage Ratio	122,881	65.19	64.80	3.20	219.34	30.01
Intangible Ratio (%)	122,881	8.85	0.96	0.00	72.99	15.97
Cash Ratio	122,881	13.55	7.03	0.01	78.76	16.62
Subsidiary Level	122,881	1.74	1.00	1.00	20.00	1.29
Log. Group Levels	122,881	2.01	1.61	0.00	8.33	2.22
GDP / Capita (th)	122,881	37.48	36.47	9.03	124.27	8.36
GDP (tn)	122,881	1.80	1.71	0.01	47.51	1.82
Long-t. Interest Rate (%)	122,881	3.19	3.41	−0.36	22.50	1.54
Short-t. Interest Rate (%)	122,881	1.77	1.23	−0.78	15.82	1.83

Panel B: Aggregated firm-level	Obs	Mean	Median	Min	Max	SD
ETR (Mun.)	710,394	23.34	23.05	−223.78	274.65	52.80
Log. Capex (Mun.)	710,394	13.49	13.48	6.45	19.78	2.68
Employment Growth (Mun.)	710,394	16.09	7.50	−88.00	172.35	42.28
Log. Avg. Salaries (Mun.)	710,394	9.83	10.17	7.00	11.23	0.97
Treated PE (%)	710,394	3.23	0.00	0.00	100.00	17.68
Treated M&A (%)	710,394	9.10	0.00	0.00	100.00	28.77

Panel C: Municipality-level						
Log. Business Tax Revenue	93,200	6.07	6.05	−1.35	14.81	2.11
Log. Income Tax Transfer	93,200	6.67	6.60	0.69	14.01	1.57
Treated PE (%)	93,200	2.67	0.00	0.00	100.00	16.12
Treated M&A (%)	93,200	9.18	0.00	0.00	100.00	28.87
Log. GDP (t-1)	90,600	15.23	15.21	13.73	18.57	0.62

(*Continued*)

TABLE 2—*(Continued)*

Panel C: Municipality-level						
Log. Population (t-1)	90,600	11.99	11.96	10.44	14.19	0.49
Log. Workforce (t-1)	90,600	11.16	11.12	9.88	13.92	0.54
Panel D: County-level						
Log. Business Tax Revenue	6,450	17.80	17.73	14.82	21.72	0.95
Log. Spendings	4,354	19.08	19.03	17.07	22.38	0.74
New Debt (%)	4,186	−0.21	−0.32	−243.92	240.48	9.15
Treated PE (%)	6,450	42.23	0.00	0.00	100.00	49.40
Treated PE intense (%)	6,450	15.52	0.00	0.00	100.00	36.21
Treated PE very intense (%)	6,450	7.21	0.00	0.00	100.00	25.87

This table presents summary statistics for the variables of interest. The table provides the number of observations used in the regression analysis as well as the mean, median, minimum, maximum, and standard deviation of each variable. We provide variable definitions in appendix A. Ratios and indicator variables are multiplied by 100 and stated in percentage terms. Panels A–D categorize the variables into firm-, aggregated firm- (by municipality in Europe), municipality-, and county-level variables, according to the four samples used in the analysis. The firm-level sample in panel A covers three pre- and four post-buyout event years for each treated and control firm from 2001 to 2018. Approximately 50% of the firm-year observations relate to treated firms, given the one-to-one matching procedure used for constructing the control sample. Firm-level financial variables are winsorized at the 1% and 99% level. The aggregated firm-level sample in panel B covers European municipality-year observations from 2001 to 2018. The municipality-level sample in panel C covers German municipality-year observations from 2008 to 2018. The county-level sample in panel D covers German county-year observations from 2001 to 2018. Information on counties' government spending and debt are available from 2001 to 2014.

Our main tests estimate the following difference-in-differences model using OLS:

$$Y_{it} = \sum_{k=-3}^{K=3} \beta_k Treated_i * D_{ik} + \sum_{k=-3}^{K=3} \gamma_k D_{ik} + \eta^f Controls_{it}^f + \alpha_i + \delta_t + \epsilon_{it}, \quad (1)$$

where Y_{it} denotes the outcome of interest. We include firm (α_i) and year (δ_t) fixed effects. D_{ik} is an indicator variable equal to 1 for each event year k, and $Treated_i$ is an indicator variable equal to 1 for target firms. The event window runs from $k = -3$ to $k = 3$ years relative to the year of the buyout to capture the pre-trend and time delay until firms implement tax planning strategies and investment decisions. Most specifications include the control variables log. total assets, profitability (ROA), leverage, share of intangible assets, cash ratio, a firm's hierarchical position in its corporate group, the log. number of all hierarchical layers in a firm's corporate group, GDP per capita, total GDP, and long- as well as short-term government bond interest rates. Standard errors are clustered at the firm level. We winsorize financial variables at the 1% and 99% levels. We present most results graphically. For the baseline tests on ETRs, we tabulate results to emphasize the robustness of our main inferences across various alternative specifications and control samples. Appendix A provides variable definitions.

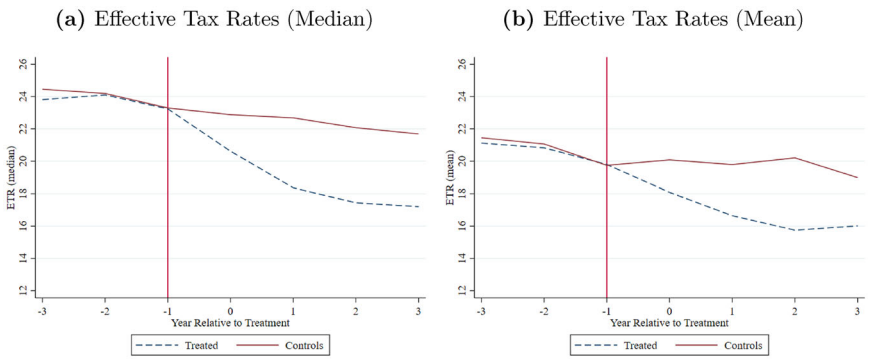


FIG 2.—Target and matched control firms' effective tax rates around PE deals. This figure shows the developments in median (panel (a)) and mean (panel (b)) effective tax rates (ETRs, in %) from event year $k = -3$ to event year $k = 3$ for both treated firms (blue dashed line) and control firms (red solid line) using raw data. The red vertical line at $k = -1$ indicates the time of the matching, which is one year prior to the deal.

3.2 RESULTS FOR TAX OUTCOMES

3.2.1. Baseline Result: ETRs. Our baseline tax outcome, the ETR, operationalizes the concept of tax efficiency and is commonly used as a measure of tax avoidance in the literature. We expect PE firms to improve tax planning and governance at target firms to increase shareholder value, leading to lower ETRs (Desai and Dharmapala [2006], ,2009], Badertscher, Katz, and Rego [2013]).

Figure 2 shows the median and mean ETR over the event period for the treated target and the matched control firms. The developments do not indicate any difference between the treated and control groups before the year of the acquisition ($k = 0$), supporting the common trends assumption. The median (mean) pre-deal ETR is approximately 23.5% (20%). After the buyout, target firms' ETRs decrease more than those of matched control firms. Both figures show an immediate and strong decline in treated firms' ETRs after PE buyouts. However, the decrease in treated firms' ETRs seems to take at least one additional year to stabilize. After stabilizing, the level for the treated group is about three percentage points below that of the control group. Although making use of, for example, tax deductions is possible retrospectively, it seems reasonable that the full implementation of efficient tax strategies takes some time.[7]

Table 3 presents regression results. We choose $k = -1$ as the base year and, therefore, omit the respective indicator. Columns 1–3 show the results

[7] We note a general decline in ETRs for both control and treated firms. Dyreng et al. [2017] also document this downward trend for public U.S. firms, likely due to a general downward trend in corporate income tax rates across the world and an increase in the use of domestic tax reduction opportunities. In untabulated tests, we document sustainable and long-lasting decreases in ETRs when using longer event windows.

TABLE 3
PE Deals and Target Firm Effective Tax Rates

	Effective Tax Rate (ETR)				
		Pre-ETR and EBT>0	Pre-ETR and EBT>0	M&A Control Sample	
	(1)	(2)	(3)	(4)	(5)
Event (k=−3) * Treated PE	−0.33	−0.51	−0.68	0.02	−0.12
	(−0.53)	(−0.93)	(−1.25)	(0.03)	(−0.26)
Event (k=−2) * Treated PE	−0.36	−0.11	−0.21	−0.06	−0.19
	(−0.61)	(−0.23)	(−0.42)	(−0.15)	(−0.43)
Event (k=−1) * Treated PE	.	.	.	.	.
Event (k=0) * Treated PE	−1.96***	−2.81***	−2.74***	−0.47	−0.31
	(−3.22)	(−4.94)	(−4.81)	(−1.05)	(−0.68)
Event (k=1) * Treated PE	−2.98***	−3.65***	−3.64***	−1.12**	−0.89*
	(−4.45)	(−5.54)	(−5.51)	(−2.24)	(−1.76)
Event (k=2) * Treated PE	−4.01***	−4.42***	−4.47***	−1.57***	−1.28**
	(−5.62)	(−6.16)	(−6.21)	(−2.93)	(−2.36)
Event (k=3) * Treated PE	−2.33***	−2.89***	−2.84***	−1.53***	−1.22**
	(−3.11)	(−3.78)	(−3.71)	(−2.70)	(−2.11)
Observations	122,881	75,550	75,550	511,321	489,487
Adj. R^2	0.157	0.175	0.169	0.153	0.156
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	
Country-year FE					Y
Industry-year FE					Y
Controls	Y	Y			

This table presents estimates from OLS regressions for five different models using a matched-sample difference-in-differences framework. The unit of observation is the individual target or control firm-year. Event-year variables (*Event*) indicate the year *k* relative to the year of the PE buyout. *Treated PE* is an indicator equal to 1 for PE target firms and 0 for control firms. The dependent variable is the *Effective Tax Rate (ETR)*, measured as tax expenses divided by GAAP earnings before taxes. Columns 1–3 use nearest-neighbor matched control firms. Columns 2 and 3 only include observations with positive pre-deal ETRs and EBT. Columns 4 and 5 use 92,399 target firms of M&A deals as control firms instead of the matched control firms. *Controls* refer to log. total assets, profitability (ROA), leverage, share of intangible assets, cash ratio, a firm's hierarchical position in its corporate group, log. number of all hierarchical layers in a firm's corporate group, GDP per capita, total GDP, and long- as well as short-term government bond interest rates. Standard errors are clustered at the firm level and *t*-statistics are presented in parentheses. $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

based on the matched sample. Column (1) is based on the full sample. Columns 2 and 3 use target firms with positive ETRs before the deal and positive EBT throughout, because negative ETRs can be difficult to interpret and to fully capture changes in tax avoidance of profitable firms. Consistent with figure 2, the estimates in the years leading up to the buyout are small and statistically insignificant, mitigating selection concerns. The post-period coefficients are statistically significant at conventional levels and point at ETR reductions in a range from −1.96 to −4.47 percentage points.

In columns 4 and 5 of table 3, we use an alternative control sample of European M&A target firms. Analogously to the PE sample construction, we collect M&A transactions from Zephyr and merge target firm financial information from Orbis. This approach leaves us with 92,399 M&A

transactions. These M&A controls might better mirror the growth prospects and other unobservable tax attributes of potential PE target firms. Further, this strategy enables us to hold constant the endogenous decision to acquire a firm and compare tax outcomes for different types of institutional investors. We run the same model as in column 3 and an extended model including country- and industry-year fixed effects. As a result, we are comparing within-firm changes relative to the year prior to the deal of PE versus M&A target firms, holding all common trends in each country-year and industry-year constant. Again, we document flat pre-trends and positive treatment coefficients in the post-buyout period. The coefficients are −1.53 and −1.22 for $k = 3$, both statistically significant at conventional levels.

These findings support our prediction that PE ownership is associated with greater tax efficiency at portfolio firms. Compared to the sample mean of 19.73% the average post-period coefficient of approximately -2.82 represents a relative ETR decrease of 14.5%.[8] Compared to M&A targets, which typically also exhibit lower ETRs after an ownership change (Belz et al. [2016]), we still find significant reductions in PE target firms' ETRs. Thus, our results suggest that tax authorities face a potential cost in terms of corporate tax revenue losses when PE firms make acquisitions in their constituency. We use a common holding period of five years (Braun, Jenkinson, and Stoff [2017], Bain [2019]), mean pre-tax earnings of 10.71 million EUR, and a reduction in the ETR of three percentage points to calculate a back-of-the-envelope estimate of the direct relative loss in corporate income tax revenues. This loss is approximately 1.61 million EUR per PE buyout, or 48.30 billion EUR for the more than 30,000 European deals from Zephyr in the sample period.

3.2.2. Mechanisms of Increases in Tax Efficiency. As PE buyouts are associated with a host of governance, operational, and strategic changes at the target firm level (for reviews, see Kaplan and Strömberg [2009], Sorensen and Yasuda [2023]), several mechanisms could explain our documented increase in tax efficiency. Two tax-related mechanisms are a greater focus on a firms' general tax management and the imposition of more aggressive tax strategies. Anecdotal evidence supports the view that PE firms use their economies of scale and lower marginal costs of tax planning to impose tax strategies at their target firms. For example, large PE firms such as the Swedish PE firm EQT or the U.S. firm Blackstone employ experienced

[8] We do not observe cash and deferred tax expenses separately for the private firms in our full sample. Our measure thus captures permanent tax savings realized through, for instance, the consolidation of profits and losses within a group, international profit shifting, or R&D incentives. In untabulated tests, we estimate stronger coefficients when using cash ETRs for firms in the United Kingdom for which information on cash ETRs is available, suggesting that PE buyouts create additional temporary tax savings at the level of target firms. We further find consistent results when re-weighting the sample to address the unequal distribution of deals across countries, addressing potential bias from firm survivorship, and using only treated firms in an event study approach.

senior tax directors to which portfolio firms gain access once acquired by the PE firm. Our interview with a leading PE tax practitioner confirmed that PE firms use established working models to increase tax efficiency that accompany the investment and strategic changes at portfolio firms. Further, documents from the Lux Leaks database show that PE firms applied for tax rulings that lead to significant corporate tax reductions for their portfolio firms. We provide a list of commonly applied strategies in section A in the online appendix. However, we acknowledge that operational changes could generate tax savings even absent any specific tax considerations of the management. Therefore, we conduct a number of additional tests to pin down the mechanisms specific to firms' tax planning and rule out that operational changes alone explain the changes in ETRs.

Tax Expenses and Tax Bases. So far, our results show a decline in target firms' ETRs. Although this suggests that there could be a loss in tax revenues for the government, previous research has shown that target firms' profits and, therefore, their income tax bases increase after buyouts (Boucly, Sraer, and Thesmar [2011], Cohn, Mills, and Towery [2014]). If profits increase substantially, ETRs could decline while total tax payments remain constant or even increase. Therefore, we analyze tax expenses and pre-tax profits separately.

Panels (a) and (b) in figure 3 present results based on equation (1) with log. tax expenses and EBT as the outcomes. Panel (a) suggests that tax expenses decrease by approximately 13% more for treated than for control firms after a PE buyout. Notably, the differences in tax expenses between treated and control firms are close to zero, stable, and statistically insignificant in the pre-buyout period. Although tax expenses decrease after PE buyouts, we also observe an increase in target firms' pre-tax income of approximately 7.5% immediately after the buyout and up to 15% three years after the buyout in panel (b). Although we observe no pre-trend for tax expenses (panel (a)), the trend in EBT (panel (b)) is consistent with PE managers selecting target firms based on firms' probabilities to increase future profits. This finding suggests that corporate income tax bases increase after PE buyouts. However, the negative coefficient for tax expenses indicates that the higher tax bases do not necessarily result in larger tax payments.[9] Thus, both an increase in profitability and a simultaneous decrease in tax expenses drive the decrease in ETRs in our setting, suggesting that PE investors increase the tax efficiency at their target firms.

[9] A simple numerical example reconciles these findings. Take a firm that reports the sample mean ETR of approximately 20% and EBT of 100. If tax expenses decrease by 13% and EBT increase by 7.5%, the ETR decreases by approximately 3.8 percentage points and becomes 16.2% ($17.4/107.5 = (20 * 0.87)/(100 * 1.075)$). Three years after the deal, when tax expenses seem to be approximately 5% below the pre-buyout year level and pre-tax profits are 15% higher, the ETR will still be significantly lower at 16.5% (19/115). This example is consistent with our main findings on ETRs from table 3.

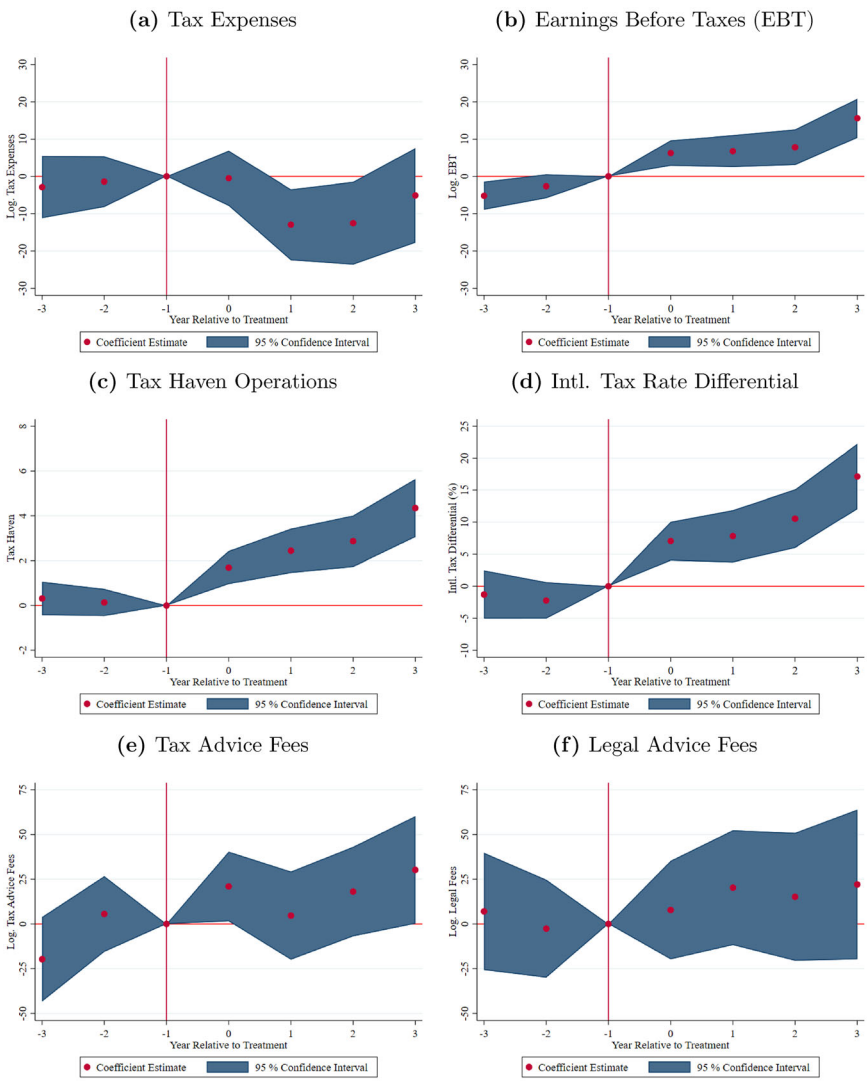


FIG 3.—PE deals and target firm tax efficiency. This figure shows estimates from OLS regressions for different firm-level outcomes using a matched-sample difference-in-differences framework based on equation (1). The unit of observation is the individual target or control firm-year. The y-axis depicts difference-in-differences estimates for the outcome variables *Log. Tax Expenses* (panel (a)), *Log. Earnings before Taxes (EBT)* (panel (b)), *Tax Haven* (panel (c)), *Intl. Tax Differential (%)* panel (d), *Log. Tax Advice Fees* (panel (e)), and *Log. Legal Fees* (panel (f)). We provide variable definitions in appendix A. The x-axis shows the year relative to the treatment. The red dots represent the coefficient estimate for the difference between treated and control firms for the event years $k = -3$ to $k = 3$. The shaded area represents the 5% and 95% confidence interval. The red vertical line at $k = -1$ indicates the baseline year before the treatment. We multiply logged outcome variables by 100 to facilitate the interpretation of coefficients in percentage terms. The specifications include firm and year fixed effects. Standard errors are clustered at the firm level.

International Tax Avoidance Strategies. To explore whether target firms' tax aggressiveness contributes to the ETR decreases, we examine specific outcomes that proxy for the use of international tax avoidance strategies. Academics and the media have speculated that PE firms' focus on profit-maximization leads to more tax aggressive profit shifting of their portfolio firms (Ault, Schoen, and Shay [2014]). Consistent with this allegation, practitioners argue that the recent international agreement on a global corporate minimum tax will increase the tax burdens of PE-owned firms as suggested by a decrease in market values of publicly listed PE and multinational firms after the OECD's reform announcement (Garnry [2022], Gomez Cram and Olbert [2023]).

As the use of tax havens is a prime example of aggressive tax sheltering activities (Lisowsky [2010], Blouin [2014]), we first examine target firms' tax haven subsidiary ownership. We then study the development of tax rate differentials across target firms' subsidiaries as a proxy for international profit shifting opportunities. We expect the use of such aggressive international tax strategies to increases under PE ownership as theory shows that lower reputational concerns and better governance under PE ownership allow firms to create more value through tax avoidance (Desai and Dharmapala [2006], Badertscher, Katz, and Rego [2013]).

Panel (c) of figure 3 shows that the likelihood of owning a tax haven subsidiary is nearly identical for treated and control firms before the PE buyout and then sharply increases for treated firms. Three years after the PE buyout, target firms have an approximately 4.5 percentage points higher likelihood of being affiliated with a tax haven subsidiary relative to control firms, representing a 31% increase relative to the unconditional sample mean. This regression result aligns with exemplary evidence in our raw data on the tax haven activities of portfolio firms owned by large PE firms (see section A in the online appendix for details). An additional test shows that firms are twice as likely to acquire tax haven entities after a PE buyout, suggesting that target firms add some of the new tax haven entities through M&A activity with an apparent tax motivation (untabulated). The fact that PE firms are regularly advised by tax consulting teams based in tax haven countries further support these findings (e.g., KPMG [2022]).

Consistent with firms expanding their cross-border profit shifting activities under PE ownership, we also document that the differential between a target firm's domestic tax rate and the lowest tax rate of any affiliated subsidiary sharply increases after the buyout and exceeds pre-buyout levels by 15% to 20% in year $k = 3$ (panel (d) in figure 3). These large-sample results are consistent with patterns in hand-collected public disclosures and ownership data. One exemplary case is Permira's buyout of Hugo Boss in 2010 (see section A in the online appendix). Collectively, these findings support the notion that PE ownership is associated with more aggressive international tax strategies.

Investment in Tax Planning. To further validate the inference that target firms focus more on their tax management under PE ownership, we use data on external consulting fees for a subsample of U.K. firms. Panel (e) in figure 3 presents results based on equation (1) for log. tax advice fees. We document that target firms' spending on tax advice immediately increases after the buyout and is more than 25% higher than the pre-buyout level after three years, compared to control firms. This result is significant at conventional levels of significance, albeit weaker than our main results, likely due to the smaller sample size. Using the unconditional sample mean of 55 thousand EUR in tax advice fees, a coefficient of 25 represents an increase of 15.4 thousand EUR in annual fees paid to tax consultants. The positive, albeit weaker, result for nontax legal fees in panel (f) is consistent with target firms also investing in legal services likely related to general restructuring aspects. However, there seems to be a specific focus on optimizing tax positions by means of external advisors, consistent with the interview anecdote in Badertscher, Katz, and Rego [2013].

Heterogeneity in Ex-ante Tax Reduction Opportunities. Table 4 presents results of cross-sectional tests to support the inference that tax-focused strategies of PE firms relate to the documented decrease in target firms' ETRs. We expect stronger results when target firms have greater tax reduction opportunities before the buyout and when the new PE owners likely have a greater access to tax expertise and tax planning opportunities.

In columns 1 and 2 of panel A, we document that the largest reductions in ETRs are concentrated in target firms with ETRs above the statutory tax rate before the buyout, suggesting that PE firms generate the largest tax efficiency gains when the former tax management was relatively unfocussed. Further, results in columns 3 and 4 of panel A are stronger when target firms can use business group tax consolidations. This possibility provides tax advantages for firms with several affiliated legal entities, thus particularly contributing to PE-specific tax savings as PE managers regularly seek to optimize the target firms' legal structure to reduce the effective tax burden. Both of these findings comport with insights from an interview with a leading PE tax adviser (see section A in the online appendix for details).

Columns 1 and 2 of panel B show that ETR reductions are concentrated in buyouts of target firms receiving PE capital for the first time. This result is intuitive because tax efficiency gains should be stronger when ownership switches from less institutional investors to sophisticated PE investors, compared to secondary buyouts when PE owners likely have already utilized tax savings potentials. Columns 3 and 4 of panel B show that ETRs decrease more strongly after buyouts by the biggest PE players who are known for their aggressive tax strategies (e.g., The Guardian [2014], New York Times [2021a]).[10]

[10] In untabulated tests, we use data from Preqin, a leading provider of data on PE firm and fund characteristics, to observe strategic considerations at the PE fund level (Abraham,

TABLE 4
Mechanisms of PE Target Firm Tax Efficiency

	Effective Tax Rate (ETR)			
Panel A: Target firm characteristics	Tax Savings Potential		Group Tax Consolidation	
	No (1)	Yes (2)	No (3)	Yes (4)
Post * Treated PE	−1.44***	−4.41***	−1.79***	−4.20***
	(−3.01)	(−6.11)	(−3.93)	(−4.83)
Difference	−2.98***		−2.47**	
	(−3.44)		*(−2.54)*	
Observations	80,381	42,500	89,379	33,307
Adj. R^2	0.136	0.105	0.155	0.156
Panel B: PE firm characteristics	First PE Investor		Big PE Player	
	Low (1)	High (2)	No (3)	Yes (4)
Post * Treated PE	−0.89	−2.90***	−2.29***	−5.53**
	(−1.03)	(−6.30)	(−5.54)	(−2.45)
Difference	−2.01**		*−3.24*	
	(−2.05)		*(−1.42)*	
Observations	30,008	92,873	118,042	4,839
Adj. R^2	0.146	0.157	0.157	0.109
Panel C: Target firm access to special tax regimes	IP Box Access		Investment Tax Credits	
	No (1)	Yes (2)	No (3)	Yes (4)
Post * Treated PE	−1.92***	−4.71***	−2.23***	−5.25***
	(−3.64)	(−3.09)	(−5.27)	(−3.41)
Difference	*−2.79**		*−3.02**	
	(−1.73)		*(−1.90)*	
Observations	77,233	9,742	114,849	7,870
Adj. R^2	0.146	0.138	0.155	0.147
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y

This table presents estimates from OLS regressions using a matched-sample difference-in-differences and triple differences framework. The unit of observation is the individual target or control firm-year. To facilitate readability, the event years $k = 0$ to $k = 3$ from equation (1) are aggregated into a single *Post* and $Post * TreatedPE$ dummy. The dependent variable is the *Effective Tax Rate (ETR)*. Below the *Post * Treated PE* coefficients, triple difference estimates from auxiliary regressions present the statistical significance of the difference in coefficients across the subsamples. The table presents results for six sample splits. All cross-sectional variables are measured as of event year $k = -1$ for the matched target and control firm pair. In panel A, the sample splits are based on target firm information from Orbis and target firm country information from IBFD. *Tax Savings Potential* is equal to 1 if the target firm's effective tax rate is above the domestic statutory corporate income tax rate, and 0 otherwise. *Group Tax Consolidation* is equal to 1 if the target firm is part of a business group with at least two affiliated firms and is located in a country in which tax law allows for domestic and cross-border consolidation of pre-tax profits and losses within a business group, and 0 otherwise. In panel B, the sample splits are based on PE firm information from the

(*Continued*)

TABLE 4—*(Continued)*

Zephyr database. *First PE Investor* is equal to 1 if none of a target firm's vendors was a PE firm (i.e., the deal event was not a secondary PE buyout), and 0 otherwise. *Big PE Player* is equal to 1 if the target firm is one of the top 30 PE firms, according to the report by Preqin [2017], and 0 otherwise. In panel C, the sample splits are based on target firm country information from PwC, IBFD, the European Commission, and the OECD. *IP Box Access* is equal to 1 if a target firm is affiliated with another legal entity located in a country that offers a reduced corporate income tax rate for income derived from the use of intellectual property, and 0 otherwise. *Investment Tax Credits* is equal to 1 if a target firm is located in a country that offers superdeductions or tax credits for long-term tangible and intangible investments, and 0 otherwise. We provide variable definitions in appendix A. Standard errors are clustered at the firm level and *t*-statistics are presented in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Finally, we exploit firms' cross-country variation in the availability of reduced domestic tax rates for income related to the use of intellectual property (IP box tax rates) and tax credits for investment in physical capital. Results in panel C suggest that ETRs decrease particularly strongly after buyouts of firms in innovative industries with affiliated entities in countries offering favorable IP box tax rates and after buyouts of firms located in countries granting investment tax credits. Thus, these findings suggest that target firms actively claim tax benefits after making investments. This is consistent with the idea that PE firms prioritize both operational improvements and tax efficiency by structuring target firms' tax affairs to benefit from preferential tax regimes (see also the example of Carlyle Group's tax ruling in section A in the online appendix).

3.3 RESULTS FOR INVESTMENT OUTCOMES

Although our results on tax outcomes suggest that PE ownership is associated with corporate tax reductions at target firms, local governments might not be worse off if tax bases increase. Specifically, PE buyouts could induce firms to increase their physical and human capital investments, which could be associated with greater corporate income, payroll and potentially other taxes paid. Therefore, we study several fixed asset and human capital measures to assess the potential growth and operational changes that might accompany the documented ETR decreases.

Capital Expenditures. Panel (a) in figure 4 presents results based on equation (1) using CAPEX as a proxy for overall corporate investment. We observe that target and control firms do not exhibit discernible differences in investment patterns before the buyout, as the flat and statistically insignificant pre-trends suggest. After the buyout, CAPEX of target firms sharply increase and are, on average, 35% higher in the post-period than CAPEX of control firms. Panel (b) suggests that additions to tangible assets like plant, property, and equipment strongly, albeit not exclusively, drive this

Olbert, and Vasvari [2022]). Using a subsample for which we can merge these data, we confirm that larger PE players seem to focus more on tax strategies and that ETR reductions are more pronounced when PE funds do not state that they have an explicit ESG focus, which often means that firms commit to paying a fair share of taxes.

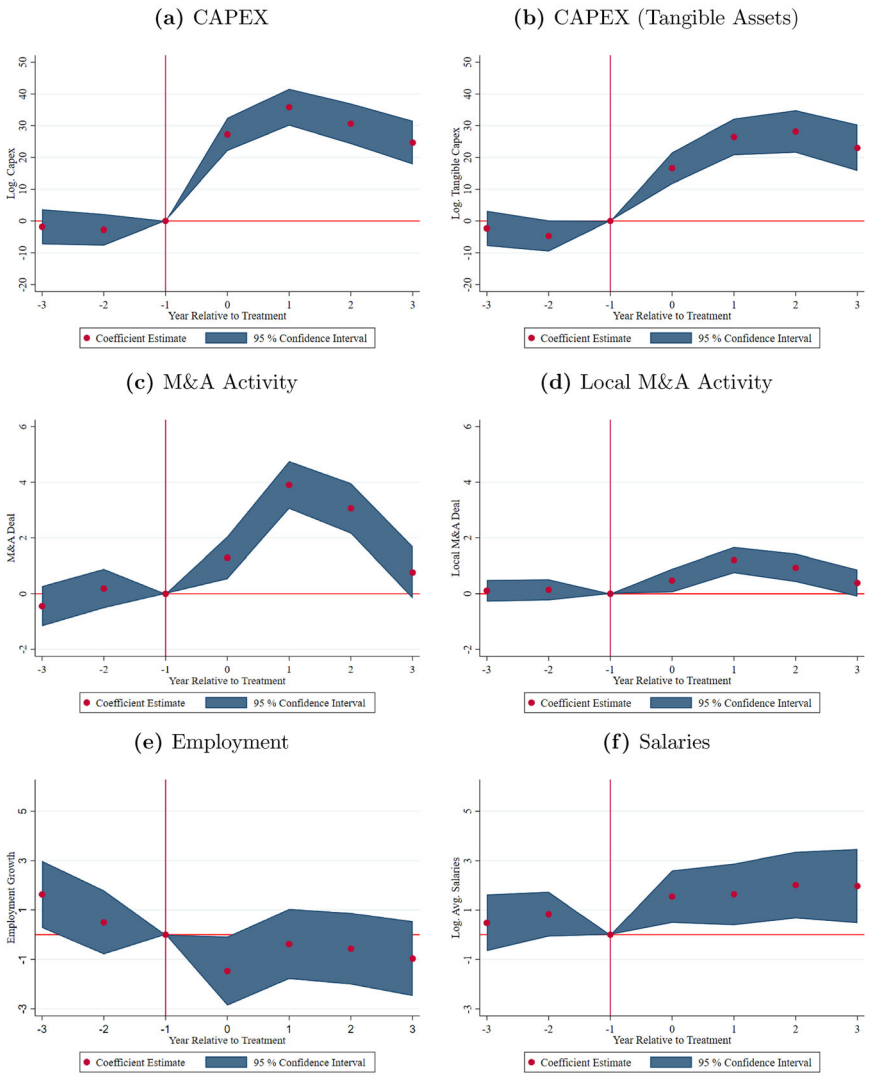


FIG 4.—PE deals and target firm investment. This figure shows estimates from OLS regressions for different firm-level outcomes using a matched-sample difference-in-differences framework based on equation (1). The unit of observation is the individual target or control firm-year. The y-axis depicts difference-in-differences estimates for the outcome variables *Log. Capex* (panel (a)), *Log. Tangible Capex* (panel (b)), *M&A Deal* (panel (c)), *Local M&A Deal* (panel (d)), *Employment Growth* (panel (e)), and *Log. Avg. Salaries* (panel (f)). We provide variable definitions in appendix A. The x-axis shows the year relative to the treatment. The red dots represent the coefficient estimate for the difference between treated and control firms for the event years $k = -3$ to $k = 3$. The shaded area represents the 5% and 95% confidence interval. The red vertical line at $k = -1$ indicates the baseline year before the treatment. We multiply logged outcome variables by 100 to facilitate the interpretation of coefficients in percentage terms. The specifications include firm and year fixed effects. Standard errors are clustered at the firm level.

growth. Given the average sample firm's annual CAPEX of approximately 1.5 million EUR, a 35% increase represents a total CAPEX of approximately 0.52 million EUR per year. The result that tangible CAPEX growth does not fully explain the overall CAPEX growth implies that target firms also invest in intangible assets, either via acquiring assets or entire businesses. Consistent with this conclusion, we document a statistically significant increase in firms' intangible assets ratio of 11%.[11]

Mergers & Acquisitions. As increases in intangibles and other noncurrent assets could reflect M&A activity, we also examine target firms' acquisitions around PE buyouts. Panel (c) in figure 4 shows that target firms' M&A activity increases, consistent with M&A being a form of investment supported by PE investors to generate growth (e.g., Bansraj, Smit, and Volosovych [2022], Cohn, Hotchkiss, and Towery [2022]). We document that a target firm's likelihood of acquiring other businesses immediately increases and is highest two years after the PE buyout. The three- to four-percentage-point increase in M&A likelihood represents an approximately 77% increase relative to the unconditional sample mean. Interestingly, we document that some of the M&A activity happens in the municipality of the PE target firm's incorporation. For these local deals, the unconditional M&A likelihood more than doubles (panel (d)). In both panels (c) and (d), we observe flat and insignificant pre-trends, supporting the inference that the M&A activity is a consequence of PE ownership and not a result of a general trend in the target firm's restructuring activities and growth. This finding indicates that PE buyouts likely have associated consequences for local governments beyond the economic changes that happen directly at the target firm.

We acknowledge that M&A activity can lead to decreases in target firm ETRs (e.g., Belz et al. [2016]), such that the increase in target firm tax efficiency might not be specific to PE ownership. However, our evidence collectively suggests that M&A activity alone cannot fully explain our ETR results absent a PE-specific focus on tax minimization. For example, directly benchmarked against M&A target firms, PE target firms' ETRs decrease by 1.5 percentage points more (table 3, column 4). Further, PE target firms' M&As are partly tilted toward tax havens and low-tax jurisdictions (figure 3, panels (c) and (d)). Finally, untabulated tests show that our estimates for ETRs are nearly identical when excluding PE target firms with M&A activity in the sample period.

Labor Outcomes. Panels (e) and (f) in figure 4 present results for employment growth and average salaries as proxies for target firms' investment in

[11] When studying intangible CAPEX, measured analogously to the tangible CAPEX measure, we document a growth of around 40% with flat-looking and statistically insignificant pre-trends. We do not tabulate these results because they rely on a smaller subset of firms for which the intangible CAPEX variable is available. Further, the data provided in Orbis do not allow researchers to learn about the specific nature of intangibles (i.e., goodwill, acquired intangibles, or capitalized development costs).

human capital. We note that PE target firms seem to exhibit a higher employment growth rate of almost two percentage points three years before the buyout. After the buyout, we fail to document systematic and statistically significant differences in employment growth between target and control firms. However, panel (f) suggests that average salaries of target firms increase by about 2% more than those of control firms. These findings suggest that the average PE deal is not associated with significant increases in local employment.

3.4 DISCUSSION OF TARGET FIRM-LEVEL RESULTS

We provide evidence on several firm-level outcomes associated with PE buyouts based on a matched-sample difference-in-differences design. Appendix B summarizes the key empirical findings. We acknowledge that, even after the granular matching approach, we observe some differences between target and control firms prior to the buyout. Specifically, target firms seem to exhibit a one- to two-percentage-point higher employment growth and have approximately 3%–5% lower pre-tax income in the pre-period. However, these differences are economically modest. Furthermore, across the multitude of event study graphs that we plot, we generally observe arguably flat trends in the pre-period. This suggests that our matching strategy allows us to meaningfully compare target firms to control firms that behave very similarly along a host of firm characteristics and operational actions. This is particularly the case for our main results on tax-related outcomes.

Our documented reductions in ETRs of around three percentage points, or 14.5% in relative terms, are comparable in magnitude with the findings on the impact of institutional ownership on U.S. public firms' ETRs in Khan, Srinivasan, and Tan [2017], Chen et al. [2019] and the difference in ETRs between large PE- and management-owned firms with public debt in the United States as documented in Badertscher, Katz, and Rego [2013].

Regarding other economic outcomes, our estimate of an average 11% increase in EBT for target firms after the buyouts is lower than the 18% increase in EBITDA documented by Boucly, Sraer, and Thesmar [2011]. Generally, our result is consistent with the positive association between PE ownership and operational performance documented in previous work on U.S. settings, which has examined return on sales and cash from operations (Guo, Hotchkiss, and Song [2011], Cohn, Mills, and Towery [2014], Cohn, Hotchkiss, and Towery [2022]) or labor productivity (Davis et al. [2014], ,2020]). Our CAPEX results are larger than the 24% CAPEX growth documented in Boucly, Sraer, and Thesmar [2011] who use a sample of French target firms and also document relatively large differences between treated and control firms' CAPEX before the buyouts. Although Boucly, Sraer, and Thesmar [2011] also document a 12% growth in employment, we do not find a statistically significant change in employment growth, measured as in Davis et al. [2014] and Antoni, Maug, and Obernberger [2019]. Our finding is in line with previous studies focusing on employment outcomes

and using similarly strict matching criteria to construct the control sample as in our study (Davis et al. [2014], Antoni, Maug, and Obernberger [2019], Davis et al. [2020]). Further consistent with the granular evidence on employment outcomes in Antoni, Maug, and Obernberger [2019], our results suggest that target firms' labor expenses increase while employment levels remain constant. This finding indicates that PE firms induce human resource-related restructurings toward higher skilled employees. Although Bansraj, Smit, and Volosovych [2022] and Cohn, Hotchkiss, and Towery [2022] discuss but do not systematically investigate that PE portfolio firms typically use M&A to grow their business, to the best of our knowledge, we provide the first large-sample evidence on the increase in M&A activity after PE buyouts.

A key feature of our study are the insights into specific mechanisms through which PE target firms increase their tax efficiency. Although we acknowledge and show that PE buyouts are associated with several operational changes and firm growth, our results collectively suggest that these changes do not fully explain our documented decreases in ETRs. Instead, our evidence using cross-sectional variation and tax-specific (M&A) outcomes is consistent with PE investors emphasizing target firms' tax efficiency when these operational changes occur and, specifically, increasing target firms' tax aggressiveness.

From the perspective of local governments, our results suggest that PE target firms would have likely contributed more to local tax revenues had they experienced similar growth without the PE-related focus on tax efficiency. Although target firms' CAPEX and higher wages might lead to larger tax bases in the future, it is unclear whether these effects outweigh the decrease in corporate tax payments. Further, PE target firms possibly interact with peer firms through competition or supply chain relationships, which can introduce spillover effects within local economies. Therefore, the overall impact on local governments is an empirical question we address in the following sections.

4. PE Deals and Aggregate Local Outcomes

4.1 CONCEPTUAL UNDERPINNINGS

In the previous section, we studied changes in ETRs and other economic variables in a tax context at the individual target firm-level after PE buyouts. Changes in individual firms' investment levels, operations, and even tax strategies can have spillover effects on other firms within the (local) economy (Kline and Moretti [2014], Armstrong, Glaeser, and Kepler [2019], Breuer [2021], Berg, Reisinger, and Streitz [2021], Giroud et al. [2022]). To get a more comprehensive picture of the relationship between PE buyouts and local public finances, we thus need to account for these spillovers. To do so, we examine aggregate economic outcomes of PE activity at the local geographic level in this section. This approach also allows us to test

whether changes in PE target firms' tax payments and investments are economically meaningful from a government's perspective.

As step (2) in appendix B illustrates, indirect effects of local PE buyouts can be positive or negative. The PE industry in the United States argues that PE contributes to aggregate growth in economic activity and tax revenues due to positive spillovers on suppliers, employees, and consumers (EY and AIC [2019]). Positive spillovers might occur in the presence of agglomeration economies and input–output linkages or when PE investments induce best practice knowledge spillovers (see Giroud et al. [2022] for evidence on the setting of large plant openings in U.S. municipalities). Knowledge spillovers can lead peer firms to mimic PE target firms' actions related to investment, corporate financing, and tax avoidance (Leary and Roberts [2014], Bird, Edwards, and Ruchti [2018], Armstrong, Glaeser, and Kepler [2019]). Knowledge spillovers around tax avoidance practices would constitute a negative spillover from a local government's perspective. Negative spillovers might also occur if PE-backed firms engage in predatory behavior vis-à-vis peer firms and tougher negotiations with other stakeholders, crowding out other local firms and potentially lowering local tax bases (Schmidt [1997], Bernard [2016], Glaeser, Olbert, and Werner [2023], Donohoe, Jang, and Lisowsky [2022]). Further, decreases in peer firms' profitability in response to the increased competition from PE-backed firms would typically result in lower average tax rates of these peer firms (e.g., Devereux and Griffith [2003], Drake, Hamilton, and Lusch [2020]). However, peers might also respond to greater competition by increasing investment (Schmidt [1997], Aghion et al. [2005], Kim, Nessa, and Wilson [2021]), leading to economic growth and larger tax bases. Therefore, the direction of the resulting spillover effects remains an empirical question.

4.2 EMPIRICAL STRATEGY

To capture spillovers and the broader economic relevance of target firm-level changes after PE buyouts, we sum up annual financial and PE deal information on firms incorporated in the same municipality from 2001 to 2018. By doing so, our tests should capture both direct and indirect effects on other local firms using the most representative sample possible. We create two separate samples, one including and one excluding PE-acquired firms' financial information. For the latter, we exclude the immediate target firm and all affiliated firms that are majority-owned by the target's parent firm. This approach allows us to test for the aggregate spillover effects of a PE buyout on all firms in a given municipality except for the firms that directly benefit from the PE capital injection. We then estimate the following staggered difference-in-differences model using OLS

$$Aggregate\ Local\ Outcome\ (Mun.)_{mt} = \beta Treated_{mt} + \alpha_m + \gamma_{ct} + \theta_{jt} + \epsilon_{mt}, \quad (2)$$

where $Aggregate\ Local\ Outcome\ (Mun.)_{mt}$ is the aggregate ETR, defined as the sum of tax expenses divided by the sum of earnings before taxes,

CAPEX, employment growth, or average salaries in municipality m in year t. We retain all observations with nonmissing information on these outcome variables, such that the final sample consists of European municipality-years if a given municipality hosts at least one nonacquired firm with financial information. Panel B in table 2 presents summary statistics for this aggregated European municipality-year sample. We define a municipality as treated ($Treated_{mt}$) as soon as one of the firms incorporated in the municipality m is acquired by a PE firm. We also include treated dummies for M&A acquisitions and their interaction with PE treatments to hold constant M&A activity and compare the PE versus M&A effects. Approximately 3.23% (9.10%) of all municipality-years have experienced at least one PE (M&A) deal in the current or previous years.

Municipality fixed effects, α_m, control for all time-invariant characteristics of the local economies and governments as our unit of analysis. γ_{ct} denotes country-year fixed effects. θ_{jt} denotes separate year fixed effects for municipalities' industry composition types j, which are defined based on deciles of municipalities' number of firms in the industrial goods sector (manufacturing, utilities, construction). This empirical design compares the development of outcomes between a treated municipality and nontreated municipalities from the same country in the same year, controlling for industry trends that affect municipalities differentially and that might correlate with PE investments. Standard errors are clustered at the municipality level.

4.3 RESULTS FOR AGGREGATE ECONOMIC ACTIVITY

Table 5 presents regression results for the aggregate municipality-level outcomes. Results in panel A (B) are based on aggregate financial data including (excluding) PE target firms and their affiliates. We document a statistically significant negative association between PE buyouts and municipality-wide ETRs in column 1 of panel A, even after controlling for concurrent M&A activity. This result indicates that PE target-firm level tax reductions pervade aggregate corporate tax payments at the municipality level. Consistent with a single firm only partially contributing to aggregate tax payments, a local PE buyout is on average associated with a 0.97-percentage-point decrease in aggregate ETRs, which is smaller than the estimates of around three percentage points in the firm-level tests in table 3.[12] We continue to document a negative, albeit statistically insignificant, coefficient in panel B when excluding the PE-owned local firms.

[12] We derive the average estimate of 0.97 as follows. The baseline coefficient of 1.99 on *Treated PE* in column 1 of panel A captures the association between a local PE buyout and CAPEX when there is no concurrent M&A activity. Conditional on the municipality already experiencing M&A activity, the incremental PE treatment coefficient is -0.46 ($-1.99 + 1.53$; *Treated PE* + *Treated PE * Treated M&A*). As our summary statistics suggest that there is concurrent M&A activity in approximately two thirds of municipality-years with PE treatment, the average estimate is $-1.99 * 1/3 + -0.46 * 2/3 = -0.97$.

TABLE 5
PE Deals and Aggregate Local Outcomes

	ETR (Mun.)	Log. Capex (Mun.)	Employment Growth (Mun.)	Log. Avg. Salaries (Mun.)
Panel A:	Including PE targets			
	(1)	(2)	(3)	(4)
Treated PE (%)	−1.99**	14.87***	0.48	1.11**
	(−2.00)	(6.15)	(0.84)	(2.56)
Treated M&A	−0.75*	0.72	−0.54*	0.60**
	(−1.66)	(0.60)	(−1.93)	(2.51)
Treated PE * Treated M&A	1.53	−11.67***	−0.54	−0.30
	(1.37)	(−4.40)	(−0.91)	(−0.63)
Observations	710,394	710,394	710,394	710,394
Adj. R^2	0.05	0.79	0.14	0.95
Panel B:	Excluding PE targets and affiliated firms			
	(1)	(2)	(3)	(4)
Treated PE (%)	−1.19	6.41***	0.78	0.34
	(−1.29)	(2.64)	(1.33)	(0.79)
Treated M&A	−0.84*	0.24	−0.36	0.49**
	(−1.89)	(0.20)	(−1.26)	(2.06)
Treated PE * Treated M&A	0.10	−5.99**	−0.34	−0.00
	(0.10)	(−2.23)	(−0.55)	(−0.00)
Observations	710,394	710,394	710,394	710,394
Adj. R^2	0.06	0.79	0.14	0.95
Municipality FE	Y	Y	Y	Y
Country-year FE	Y	Y	Y	Y
Mun.-ind.-year FE	Y	Y	Y	Y

This table presents estimates from OLS regressions for different aggregate municipality-level outcomes using a staggered difference-in-differences framework based on equation (2). The unit of observation is the municipality-year in all European countries from 2001 to 2018. The estimations are based on firm-level financial information from Orbis aggregated at the municipality-year level. A municipality is considered as treated if at least one firm in its constituency is acquired by a PE firm. All models include municipality and country-year fixed effects as well as separate year fixed effects for different types of municipalities' industry composition. To define the latter, we create deciles of municipality groups based on the number of firms in the industrial goods sector (manufacturing, utilities, construction) in each country and interact these groups with the year fixed effects. In panel A, the dependent variables are the aggregate municipality-level ETR, defined as the sum of tax expenses of all firms located in the same municipality divided by the same firms' earnings before taxes (*ETR (Mun.)*), the natural logarithm of the sum of CAPEX of all firms located in the same municipality (*Log. Capex (Mun.)*), employment growth based on the number of employees of all firms located in the same municipality (*Employment Growth (Mun.)*), and the natural logarithm of municipality-wide average salaries, defined as the sum of labor expenses of all firms located in the same municipality divided by the same firms' number of employees (*Log. Avg. Salaries (Mun.)*). In panel B, the dependent variables are defined equivalently except for excluding PE target firms and firms that are affiliated with the target firm group through a majority-ownership by the same parent firm when aggregating the data at the municipality level. We multiply logged outcome variables by 100 to facilitate the interpretation of coefficients in percentage terms. Standard errors are clustered at the municipality level and *t*-statistics are presented in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

We observe similar patterns when studying aggregate CAPEX (column 2). The positive association between PE buyouts and target firm fixed asset investment persists at the aggregate municipality level, but the average result of a 7.09% aggregate CAPEX growth is much smaller than the

firm-level result of approximately 30% in figure 4(a).[13] When disregarding PE-owned firms at the aggregate level in column 2 in panel B, the aggregate CAPEX growth is 2.42%, suggesting that PE buyouts are associated with modest positive spillovers on local peer firms' CAPEX. Consistent with the firm-level results, we do not document any statistically significant changes in aggregate employment growth (column 3). However, aggregate average salaries increase, but these increases seem to be solely driven by the higher salaries paid by PE target firms (column 4).

These results suggest that PE buyouts have modest positive spillovers on CAPEX and, if anything, weak negative spillovers on aggregate taxes. When examining the dynamics of these effects, we document no evidence of a differential development of outcomes between treated and untreated municipalities, and we observe that the increases in aggregate CAPEX are concentrated in the first two years since the PE buyouts (figure OA.1 in the online appendix). A supplementary analysis, which explicitly models spillovers at the firm level following the approach in Berg, Reisinger, and Streitz [2021], confirms these findings (figure OA.2 in the online appendix with details in the notes below the figure).

4.4 DISCUSSION AND RECONCILIATION WITH FIRM-LEVEL FINDINGS

Our firm-level results from subsection 3.3 suggest a three percentage point lower ETRs and a 30-40% CAPEX growth at target firms after a PE buyout (figure 4(a)). The results based on aggregate outcomes in this section are internally consistent with these estimates. Specifically, PE target firms and their affiliates are responsible for approximately 4.67% aggregate CAPEX growth.[14] This contribution of PE-affiliated firms to aggregate local CAPEX growth seems plausible if an individual target firm's CAPEX growth is on average 30%–40% and target firms account for 10%–11% of corporate assets in the average municipality (see panel B in table 1). The same reasoning applies to the aggregate ETR results.

Panel B of column 2 in table 5 shows a modest positive association of approximately 2.3% between PE buyouts and local aggregate CAPEX of firms other than the PE target firms. This finding is also internally consistent with the firm-level findings as our supplementary examination of firm-level spillovers in figure OA.2 in online appendix suggests a modest positive CAPEX growth of nonacquired local peer firms once the ratio of PE-acquired target firms to all local firms exceeds 1%. Conceptually, this finding is consistent with the presence of agglomeration economies. That is, the increase in target firm investment likely triggers suppliers and peer

[13] We again derive this estimate by weighting the coefficient of 14.87 on *Treated PE* by one third and the sum of the coefficients on *Treated PE* and *Treated PE * Treated M&A* (14.87 − 11.67) by two thirds.

[14] We derive these numbers by subtracting average estimates for non-PE affiliated firms from panel B in table 5 from those based on the full sample of firms from panel A in table 5 (7.09% minus 2.42% CAPEX growth as described in the previous footnote).

firms to also invest due to input–output linkages (e.g., Giroud et al. [2022]) or with peer firms investing in their businesses to weather increased competition (e.g., Schmidt [1997]) and (). Greenstone, Hornbeck, and Moretti [2010] and Giroud et al. [2022] show opening large plants in U.S. counties leads to productivity and employment increases of 4%–5% in peer firms' plants located in the same counties. In light of these findings, our estimated spillovers of 2.42% seem plausible as a local PE buyout appears to come with significant expansions of the target firms' business activity but might not be as disruptive for the local economy as the opening of a new plant as in the setting of Greenstone, Hornbeck, and Moretti [2010] and Giroud et al. [2022]. However, given our findings on aggregate ETRs, it seems unlikely that municipalities collect more taxes through positive spillovers on other firms' corporate tax payments.

5. *PE Deals and Local Government Finances*

5.1 CONCEPTUAL UNDERPINNINGS AND INSTITUTIONAL SETTING

Our previous results have shown that the firm-level tax reductions and CAPEX growth persist at the aggregate level, which is partly due to spillovers. We now investigate whether these changes potentially impact local governments' public finances (step (3) in appendix B). Corporate tax payments matter for local governments because local governments mostly rely on tax revenues and debt to finance public goods provision, such as the local infrastructure, cultural events and facilities, and education. Sound public finances of local governments, in turn, are important because local public spending is a necessary condition for local economic growth and well-being (Glaeser [2013], Suárez Serrato and Wingender [2016], Corbi, Papaioannou, and Surico [2019], Antolin-Diaz and Surico [2022]). Thus, PE-backed firms' tax reductions and associated spillovers can have substantial implications for local communities to the extent these tax effects constrain local public finances.

We exploit the German setting where more than 13,000 local municipal governments have a significant claim on corporate tax revenues. Specifically, they have the right to set a local corporate tax rate and collect approximately half of the corporate income tax directly. The municipalities' local business taxes in Germany are comparable to state taxes on corporate profits in the U.S. setting. The local *corporate* income (or "business") tax amounts to more than 50% of the overall local tax revenues.[15] Local

[15] The average corporate income tax rate in Germany is approximately 30% as of 2019. It is composed of a 15% federal income tax, a 0.825% federal surcharge, and the local business tax, which averages 14% and ranges from 7% to 31.5%. In fact, the local business tax is economically more relevant than the corporate income tax because the latter is only levied on profits reported by incorporated firms. In 2019, the local business tax revenue amounted to 55.4 billion EUR and the federal corporate income tax to 32 billion EUR (Federal Statistical Office [2020]).

governments also receive transfers of tax revenues collected at the federal level.[16] The federal government transfers some of its revenues to local governments based on local economic factors, mostly the amount of personal, corporate, and capital gains taxes generated by corporations and individuals located in a given municipality. Thus, the federal transfer payments reward the municipalities for their contribution to the federal tax revenue pie. We examine these income tax revenue transfers to capture the PE activity's tax revenue effects on local governments outside the scope of locally collected corporate taxes. If the local economy experiences growth in wages and economic activity when PE activity increases, local governments will receive greater income tax transfers.

We then examine public spending and debt issuance to study whether potential tax revenue shortfalls are associated with other public financing decisions that can impact local communities. German municipal governments' finance departments autonomously allocate budgets to fund public services, with federal government mandates primarily in education and social security. Thus, if local tax revenues change, one might expect changes in public spending patterns and debt financing to outweigh tax revenue losses.

5.2 EMPIRICAL STRATEGY

The large number of small localities allows us to employ an empirical approach with the buyout of one firm representing a discontinuous shock to public finances because a significant portion of local governments' tax revenues comes from only a few firms within their borders. Our within-country setting also mitigates some concerns relating to PE firms' endogenous target firm selection. Industry reports and insights from our practitioner interview indicate that PE investors primarily focus on industry trends and firm-level financial characteristics, rather than the location of target firms' incorporation within a particular country. We estimate the following staggered difference-in-differences model using OLS

$$Local\ Public\ Finances_{mt} = \beta Treated_{mt} + \gamma_t + \alpha_m + \epsilon_{mt}, \tag{3}$$

where $Local\ Public\ Finances_{mt}$ is log. local business tax revenue, log. local public spending, or new public debt relative to total liabilities of municipality or county m in year t. We use data on municipalities' tax revenues from the local business tax and from income tax transfer payments by the federal government from 2008 to 2018. As data on public spending and debt at the municipality level are scarce, we exploit that the statistical offices provide

[16] These tax transfers include payroll, corporate income, and capital gains taxes from all domestic tax residents. The transfer mechanism is illustrated by the *Tax Revenue Transfer* box in appendix B. Local governments in Germany also receive consumption (i.e., value-added) tax transfers. However, they are of minor importance for the local government budget, and they are unlikely to be affected by PE activity.

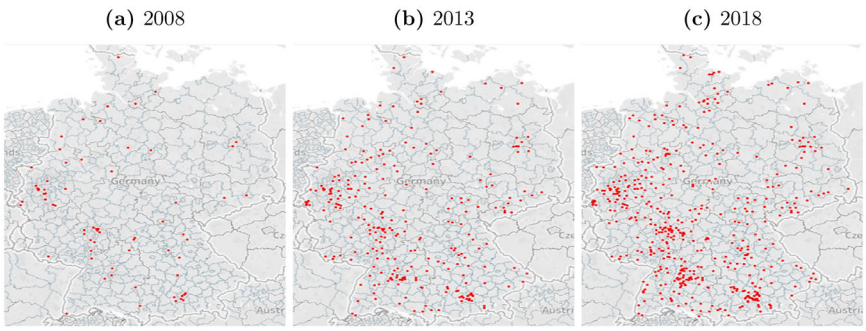
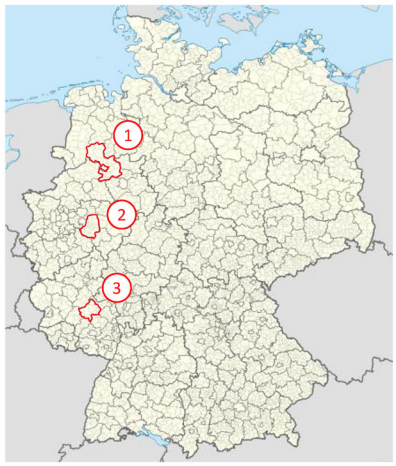


FIG 5.—PE deals across German municipalities. This figure shows three maps of Germany in 2008, 2013, and 2018 in panels (a), (b), and (c), respectively. Each map highlights municipalities that experienced at least one PE transaction in their constituency between 2008 and the respective year. In 2008, 68 municipalities experienced a PE transaction. By 2013, 261 municipalities experienced a PE transaction. By 2018, 461 municipalities experienced a PE transaction.

good coverage of municipalities' spending and debt data aggregated at the county level from 2001 to 2014.[17]

We define a municipality (or county) as treated ($Treated_{mt}$) as soon as one of the firms within its borders is acquired in a PE buyout during the sample period. Figure 5 illustrates the staggered treatment of municipalities in Germany in 2008, 2013, and 2018. Municipalities in the west and south of Germany experience more PE buyouts than those from the north and east, consistent with Germany's distribution of population and economic activity. As counties are significantly larger than municipalities, we would not necessarily expect to document changes in public finances after a single firm becomes a target of a PE deal. Therefore, we define treatment intensity indicators that more plausibly could be associated with county-level economic outcomes. Specifically, we consider local PE activity with aggregate target firms' total assets of at least 100 million and 500 million EUR as intense and very intense treatments, respectively. This approach also allows us to test whether a larger PE buyout volume exhibits the expected stronger association with local public finances. Figure 6 depicts three examples of local PE activity in three counties. Panels C and D in table 2

[17] Germany's approximately 400 counties are the administrative divisions above municipalities. The counties in our sample host on average 41 municipalities. Although county-level tax revenue data are available until 2018, the spending and debt data stop in 2014. The German statistical office does not publish spending data at the municipality level because the format, the definition of distinct spending categories, and the availability of machine-readable entries differs across states, counties, and even municipalities. We thank Dr. Frank Streif and Martin Manhart for sharing these insights. For additional tests discussed in subsection 5.4, we use more granular data for the three largest German states to look into specific budget allocations in local public spending. We thank the statistical offices of the states of North Rhine-Westphalia, Bavaria, and Baden-Wuerttemberg, and in particular the central



1 County "Osnabrück"
- Treatment year: *2007*
- Acquired asset value: *214m EUR*
- Treated PE: 1
- Treated PE (intense): 1
- Treated PE (very intense): 0

2 County "Märkischer Kreis"
- Treatment year: *2004*
- Acquired asset value: *677m EUR*
- Treated PE: 1
- Treated PE (intense): 1
- Treated PE (very intense): 1

3 County "Bad Kreuznach"
- Treatment year: *2011*
- Acquired asset value: *98m EUR*
- Treated PE: 1
- Treated PE (intense): 0
- Treated PE (very intense): 0

FIG 6.—Exemplary PE deals in German counties. This figure shows three exemplary PE transactions from different counties in Germany. The treated counties are highlighted in red on the map. On the right, the respective deal characteristics are described with the parameter value for our three treatment variables.

present summary statistics for the German municipality-level and county-level samples. Approximately 2.67% (9.18%) of all municipality-years have experienced at least one PE (M&A) deal in the current or previous years. Unsurprisingly, more county-years have experienced at least one PE deal (42.23%) because we aggregate all deals of municipalities within the same county. 15.52% of county-years are intensely treated, and 7.21% are very intensely treated.

α_m denotes municipality or county fixed effects, absorbing all time-invariant local characteristics, such as a municipality's or county's industrial specialization, institutional quality, and demographic characteristics. We believe that these characteristics are relatively sticky within our sample period. γ_t denotes year fixed effects. In the municipality-level analysis, we include state-year fixed effects (γ_{jt}), which account for time-varying political or economic developments in the 16 German states. Thus, we compare the development of tax revenues of a treated municipality with that of another untreated municipality from the same state in the same year. In most specifications, we also include a treatment indicator for M&A acquisitions and its interaction with the PE treatment indicator to hold constant M&A activity and compare the roles of PE and M&A activity. Standard errors are clustered at the municipality or county level throughout the analyses.

We do not include local-level control variables in the main tests because our aim is to examine the net impact of PE on aggregate local public

coordination service of the statistical office of Baden-Wuerttemberg, for providing us with the data in a machine-readable format.

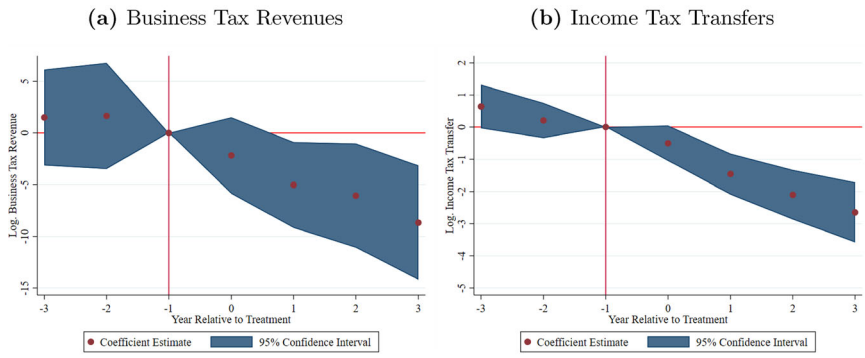


FIG 7.—Local business tax revenues around PE deals. This figure shows event-study estimates from OLS regressions for tax revenue outcomes of German municipalities using a staggered difference-in-differences framework. The unit of observation is the German municipality-year from 2008 to 2018. A municipality is considered as treated if at least one firm in its constituency is acquired by a PE firm. In panel (a), the y-axis depicts the difference-in-differences estimates for the outcome variable *Log. Business Tax Revenue*. In panel (b), the y-axis depicts the difference-in-differences estimates for the outcome variable *Log. Income Tax Transfer*. We provide variable definitions in appendix A. The x-axis shows the year relative to the treatment. We present coefficient estimates for three leads and four lags of the outcome variables relative to the treatment year. The red dots represent the coefficient estimate for the difference between treated and control municipalities for the event years $k = -3$ to $k = 3$. The shaded area represents the 5% and 95% confidence interval. The red vertical line at $k = -1$ indicates the baseline year before the treatment. We multiply logged outcome variables by 100 to facilitate the interpretation of coefficients in percentage terms. The specifications include municipality and year fixed effects. Standard errors are clustered at the municipality level.

finances, including any channels running through altered economic activity. Including controls for economic activity, such as local GDP or employment, could introduce a bad controls problem. Specifically, PE activity might impact local GDP, despite its negative direct effect on the taxes paid by the target firm. Including GDP as a control would then mask the overall effect.

5.3 RESULTS FOR LOCAL TAX REVENUES

Figure 7 shows dynamic treatment coefficients when studying business tax revenues (panel (a)) and income tax transfers (panel (b)), in an event study setup. We find that tax revenues develop similarly for treated and untreated municipalities before the treatment, as the very flat and insignificant pre-trends suggest. Income tax transfers appear to have been somewhat higher in treated municipalities relative to untreated control municipalities two years prior to treatment. However, the difference is not statistically significant at conventional levels. After a PE buyout of a firm in a municipality, the coefficients exhibit an immediate decline. On average, business tax revenues are approximately 5.0%–7.5% lower and income tax transfers received from the federal government are approximately 1.5%–2.5% lower after the treatment, compared to the base year in $k = -1$,

TABLE 6
PE Deals and Local Tax Revenues

	Log. Business Tax Revenue			Log. Income Tax Transfer		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated PE	−6.35***	−5.96***	−5.25***	−1.76***	−1.57***	−1.90***
	(−3.63)	(−3.32)	(−3.02)	(−6.57)	(−5.88)	(−7.22)
Treated M&A		−4.45***	−4.26***		−1.38***	−1.57***
		(−3.84)	(−3.72)		(−6.60)	(−8.12)
Treated PE * Treated M&A		3.92*	3.62*		0.37	0.29
		(1.91)	(1.80)		(1.34)	(1.07)
Log. GDP (t-1)			29.91***			1.93*
			(4.08)			(1.75)
Log. Population (t-1)			−41.17*			45.27***
			(−1.74)			(11.45)
Log. Workforce (t-1)			51.12***			18.90***
			(3.10)			(7.05)
Observations	93,200	93,200	90,579	94,533	94,533	91,843
Adj. R^2	0.947	0.947	0.947	0.998	0.998	0.998
Municipality FE	Y	Y	Y	Y	Y	Y
State-year FE	Y	Y	Y	Y	Y	Y
Controls			Y			Y

This table presents estimates from OLS regressions for tax revenue outcomes of German municipalities using a staggered difference-in-differences framework. The unit of observation is the German municipality-year from 2008 to 2018. A municipality is considered as treated if at least one firm in its constituency is acquired by a PE firm. Columns 1–3 use *Log. Business Tax Revenue* and Columns 4–6 use *Log. Income Tax Transfer* as the dependent variables. We provide variable definitions in appendix A. Column 1 presents regression estimates for *Treated PE* and includes municipality and state-year fixed effects. In column 2, an M&A treatment variable as well as its interaction with the PE treatment variable are included. Column 3 extends the model by including controls. These include lagged county-level macroeconomic characteristics (*Log. GDP (t-1)*, *Log. Population (t-1)*, and *Log. Workforce (t-1)*), the share of firms in the manufacturing, trade, and services sector, respectively, as well as the average municipality's firm's financial characteristics (financial variables used in table 3). We multiply logged outcome variables by 100 to facilitate the interpretation of coefficients in percentage terms. Standard errors are clustered at the municipality level and *t*-statistics are presented in parentheses. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.

suggesting that PE activity is associated with a decline in local corporate tax revenues. The graphs also show that business tax revenues in municipalities steadily decline after a PE buyout. This observation comports with our results from the firm-level tests, which show implementing tax strategies takes some time.

In table 6, we document regression coefficients on *Treated PE* from −6.35 to −5.25 for business tax revenues (columns 1–3). Columns 4–6 show coefficients between −1.90 and −1.57 for income tax transfers. These estimates are statistically significant at the 1% level. The coefficients are consistent when also controlling for lagged economic activity and local economic characteristics such as average firms' financial characteristics and the share of firms in the manufacturing, trade, and services sector, respectively, to address concerns regarding PE firms selecting based on industry trends. Columns 3 and 6 show that tax revenues vary predictably with determinants of the local business tax base like the size of the local workforce. Documenting stable coefficients supports our claim that PE

activity and the accompanying corporate tax reductions are not merely a by-product of local economic conditions.

These findings are consistent with corporate tax reductions after PE buyouts being economically meaningful and not offset by target firms' tax base growth or positive spillovers within the local economy. The negative association between PE activity and income tax transfer payments further supports this interpretation. Although PE investments may be linked to increased revenues from certain federal taxes, local governments will only fully benefit from these positive tax contributions. At the same time, local governments bear the full burden of lower local corporate tax revenues resulting from local PE buyouts. For instance, if capital gains or consumption tax revenues increase, these revenues will be collected at the federal level, and all municipalities in Germany will benefit partially depending on the tax revenue redistribution mechanism. Our results are economically meaningful, given that local taxes on business profits are a significant source of revenue for municipalities, along with direct transfers from federal tax revenue (Buettner and Holm-Hadulla [2008], Becker and Fuest [2010]). Multiplying the relative decrease in business tax revenue of 6% with the unconditional sample average in business tax revenues over a typical PE holding period of five years gives a sense of the economic magnitudes. This back-of-the-envelope calculation suggests a tax revenue loss of 1.31 million EUR for the average municipality experiencing a local PE buyout. The estimated size of this tax revenue loss broadly reflects our estimate of a 1.61 million EUR tax reduction at the target firm level in subsection 3.2.

5.4 RESULTS FOR LOCAL PUBLIC SPENDING AND DEBT

Main Results using County-Level Data. To assess whether lower tax revenues have a wider impact on a government's public finances through their effect on the available budget, we investigate public spending and debt financing after PE deals. Due to limited data availability, these analyses rely on county-level data. Table 7 presents the results from our county-level regressions. To show that our results are consistent with those using municipality-level data, we first examine business tax revenues at the county level. Consistent with a single PE deal unlikely materially impacting aggregate public finances at the (large) county level, we do not find a significant association between the baseline treatment variable *Treated PE* and business tax revenues. However, the coefficients on the *intense* and *very intense* treatment variables amount to −4.80 and −8.25 and are statistically significant at conventional levels (*t*-statistics of −2.49 and −2.64). These effect sizes seem plausible, as they support the conjecture that a larger PE buyout volume has a stronger association with county-level government budgets.

Results are similar for government spendings, with estimates of −0.40, −3.57, and −5.98. The latter two estimates are statistically significant at the 5% level. These results indicate that the decline in tax revenues is accompanied by less public spending. The estimated decline in spending is smaller than the estimated decline in business tax revenues. This is

TABLE 7

PE Deals and Local Public Finances

	Log. Business Tax Revenue			Log. Spendings			New Debt (%)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated PE	−0.17			−0.40			0.67		
	(−0.11)			(−0.37)			(0.82)		
Treated PE (intense)		−4.80**			−3.57**			2.20	
		(−2.49)			(−2.32)			(1.55)	
Treated PE (very intense)			−8.25***			−5.98**			1.72
			(−2.64)			(−2.31)			(1.22)
Observations	6,450	6,450	6,450	4,354	4,354	4,354	4,185	4,185	4,185
Adj. R^2	0.954	0.954	0.954	0.967	0.967	0.967	0.184	0.187	0.190
County FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
M&A treatments	Y	Y	Y	Y	Y	Y	Y	Y	Y

This table presents estimates from OLS regressions for tax public finance outcomes of German counties using a staggered difference-in-differences framework. The unit of observation is the German county-year. We consider three different treatment variable definitions. Specifically, *Treated PE* equals one if at least one PE deal took place in one of the past years in that county. *Treated PE (intense)* and *Treated PE (very intense)* equal to one if the total asset volume of all PE transactions in the respective county exceeded 100 million and 500 million EUR, respectively. Columns 1–3, 4–6, and 7–9, use *Log. Business Tax Revenue*, *Log. Spendings*, and *New Debt (%)* as the dependent variables, respectively. We provide variable definitions in appendix A. The models also include the M&A treatment indicator and its interaction with the PE treatment indicator. We multiply logged outcome variables by 100 to facilitate the interpretation of coefficients in percentage terms. Standard errors are clustered at the county level and *t*-statistics are presented in parentheses. $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

consistent with the institutional fact that local governments receive some of their revenues through means other than tax collection and that they cannot freely cut budgets on all government activities because the federal government mandates a certain level of local public goods provision. We fail to document an economically or statistically significant result for public debt in columns 7–9. Inferences do not change if we control for the share of firms in the specific industry sector and the average financial characteristics in the county-level tests (untabulated). Collectively, these results suggest that local governments seem to compensate for the lower tax revenues entirely with reduced spending and cannot fill the fiscal gap with additional debt in the short term.

Supplementary Results on Municipality-Level Spendings by Activity. To shed light on government activities experiencing the spending cuts, we obtained additional data for the three economically most important German states (North Rhine-Westphalia, Bavaria, and Baden-Wuerttemberg). These states represent more than 50% of German GDP. The data cover spending categories at the municipality level, including administrative personnel, municipal street investments and maintenance, sports promotion, primary schools, other schools, and social security transfer payments to the local population.

We regress spendings in the respective category on the PE treatment variable in line with the municipality-level tests reported in table 6. We present results from these supplementary tests in table OA.4 in the online appendix. We document a statistically significant negative association between PE activity and public spending on administrative personnel, the expansion and maintenance of municipal streets, and sports promotion as part of the local cultural activities. We document no statistically significant association between PE activity and spending on local government activities mandated by the federal government (specifically, providing education and social security). These findings are consistent with local governments cutting spending on activities over which they have relatively more budgeting authority. Activities that are mandated by the federal government, such as education or social security payments, are unrelated to local PE and the associated declines in local tax revenues, lending support to the credibility of our findings.

5.5 ROBUSTNESS AND CAVEATS

A few remarks on the limitations of our analyses are in order when interpreting our findings on the association between PE activity and local public finances. First, we acknowledge that our empirical strategy cannot fully account for potentially correlated factors because the buyout of a target firm is a choice by PE firm managers. To mitigate concerns related to bias in our geography-based difference-in-differences estimates, we follow the recent recommendations in the econometrics literature. Specifically, we conduct additional tests to address the potential bias relating to variation

in treatment timing and potential violations of parallel trends (for reviews, see Barrios [2021], Baker, Larcker, and Wang [2022], Roth et al. [2022]). Further, untabulated robustness tests using placebo outcomes suggest that local economic trends or tax policies unlikely drive our results. Specifically, we employ a stacked cohort design based on the approach in Cengiz et al. [2019] and we estimate how strong the violation in pre-trends would need to be to invalidate our inferences based on the approach in Roth [2021]. The results lend credibility to our identifying assumptions and suggest that the differential trend between treated and control groups would need to change by more than 4% across consecutive periods to invalidate our inferences. See section D of the online appendix for details. Further, we fail to find a significant relationship between PE deals and future tax revenues from the local property tax or the local business tax rate multiplier, suggesting that we do not pick up spurious effects related to macroeconomic developments or tax policy changes.[18] Notwithstanding the results of these additional tests, the specific economic characteristics and trajectories of target firms and their local economic environments under which PE buyouts happen could still contribute to our findings.

Second, our evidence on local public finance outcomes relies on a relatively narrow single-country setting, such that our findings might not necessarily generalize to other settings. However, we believe our evidence is of interest to regulators and meaningful for several reasons. First, we did not find any indication that buyouts in Germany are unrepresentative of our European sample. Specifically, the firm-level results are similar when restricting the sample to only German firms and when excluding German firms (untabulated). Second, Germany is the largest European economy and has a developed PE market. Finally, as several other countries also collect corporate taxes at the state or municipal level (e.g., the United States or Spain), their local governments are likely to experience changes to their public finances after PE buyouts.

Finally, there may be long-run economic benefits of PE activity that are not captured by our focus on local public finances during the sample period. Two pieces of evidence, however, suggest that PE buyouts impose

[18] These results also corroborate the inference that PE firms engage in tax planning: Although firms can reduce business tax payments by implementing international or domestic tax planning strategies, firms cannot decrease property tax payments unless they divest real estate. The insignificant finding on business tax rate multipliers also suggests that our findings are not driven by PE investors negotiating tax rates with the local regulators after they have made local investments. We also considered a Bartik-instruments approach because our setting provides us with local units of observation that face heterogeneous exposure to overall trends in PE activity across industries due to differences in local industry compositions (Breuer [2022]). However, because the number of PE deals is small relative to the number of industry-municipality cells, a Bartik instrument would suffer from the overall trend's low predictive power of the actual trend in the local units of observation (Goldsmith-Pinkham, Sorkin, and Swift [2020]). Future research using settings with a higher frequency of PE or other firm ownership changes could benefit from such an approach.

a constraint on local public finances at least for the average holding period of approximately five years. First, we document consistent results when accounting for multiple PE buyouts over time. When regressing county-level public finance outcomes on a continuous treatment intensity variable based on the cumulative sum of local target firms' total assets acquired over time, we find that local business tax revenues are approximately 2.8% lower and government spendings are approximately 2.2% lower when PE investors own 10% more of local firms' total assets (table OA.5 in the online appendix). These economic magnitudes are broadly comparable to those in Becker and Fuest [2010], who document a 3% increase in German municipalities' tax revenues for a 10% higher international trade activity. Second, we document a steady and statistically significant decline in local business tax revenues for up to 10 years in the post-period, and we do not find any changes in local GDP for the same period (untabulated).

6. *Conclusion*

We study the relationship between PE activity and local governments' public finances. We find significant and persistent increases in firms' tax efficiency after PE buyouts, suggesting that local governments could miss out on tax revenue. We also document that target firms' CAPEX, but not necessarily their workforce, increase, potentially leading to larger tax bases. These effects persist at the aggregate local level, but we document only modest positive spillover effects on peer firms. Exploiting geographic PE deal and local public finance data in Germany, we find that local business tax revenues decrease after PE buyouts of local firms. Consistent with other economic consequences of PE buyouts not (fully) offsetting these revenue losses, overall public spending decreases, while public debt levels remain constant. Collectively, our evidence suggests that local governments endure fiscal costs when PE activity increases in their local economy.

We acknowledge that our study cannot cover all aspects of PE buyouts that affect the government as a corporate stakeholder. On the tax side in particular, our results do not speak to personal income taxes of PE investors. Further, our analyses do not fully capture long-run effects. However, we believe that our study provides novel evidence on the relationship between PE and local governments, in particular concerning public finances. We show that some PE firms create value for their shareholders by cutting tax expenses, and that this harms the fiscal budgets of local governments. We look forward to future research using alternative data and settings to pin down the mechanisms through which PE activity affect aggregate economic outcomes and shedding light on the contribution of PE to tax revenues at the country or even global level.

APPENDIX A: VARIABLE DEFINITIONS

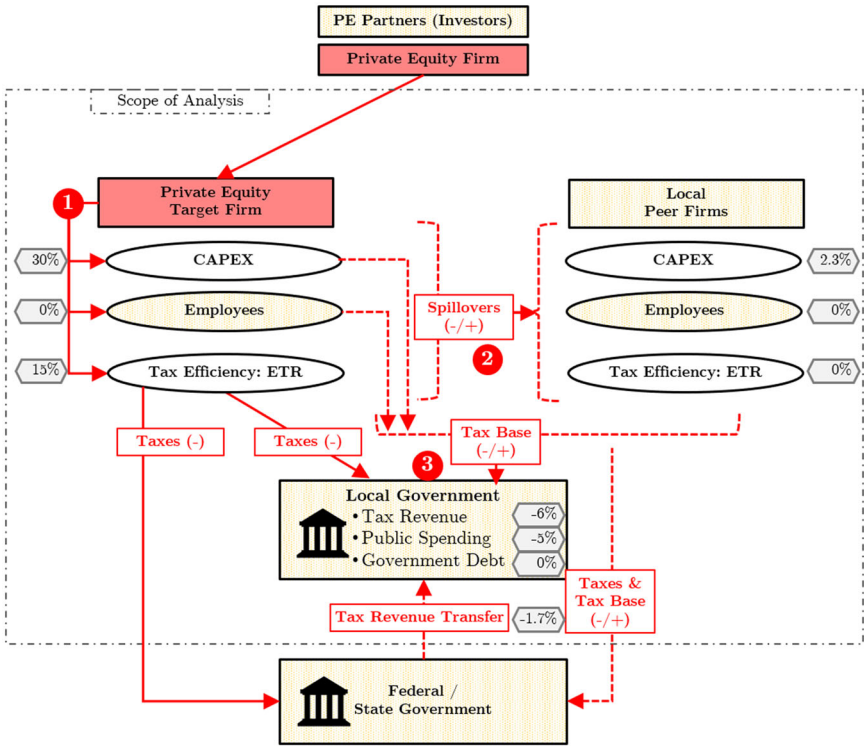
Panel A: Firm-level	
(1) Dependent variables	
ETR	GAAP tax expenses / earnings before taxes (EBT)
Log. Tax Expenses	ln(1 + tax expenses)
Log. EBT	ln(1 + earnings before taxes)
Tax Haven	Indicator equal to 1 if the firm is affiliated with at least one tax haven entity according to the tax haven lists in Bennedsen and Zeume (2018)
Intl. Tax Differential (%)	ln(1+ maximum absolute difference between the firm's country's corporate income tax rate and the lowest rate faced by any affiliated entity of the firm's business group)
Log. Tax Advice Fees	ln(1 + fees spent on tax advisory services)
Log. Legal Fees	ln(1 + legal fees spent on nontax advisory services)
Log. Capex	ln(1 + fixed assets - lagged fixed assets + depreciation)
Log. Tangible Capex	ln(1 + tangible fixed assets - lagged fixed assets + depreciation)
M&A Deal	Indicator equal to 1 if the firm acquired at least one other firm through an M&A deal in the given year
Local M&A Deal	Indicator equal to 1 if the firm acquired at least one other firm from the same municipality through an M&A deal in the given year
Employment Growth	(number of employees - lagged number of employees) / (0.5 * (number of employees + lagged number of employees)), following Davis et al. (2014) and Antoni et al. (2019)
Log. Avg. Salaries	ln(1 + labor expenses/number of employees)
(2) Cross-sectional interaction variables	
Tax Savings Potential	Indicator equal to 1 if the treated firm's effective tax rate is above the domestic statutory corporate income tax rate one year prior to the deal
Group Tax Consolidation	Indicator equal to 1 if the target firm is part of a business group with at least two affiliated firms and is located in a country in which tax law allows for domestic and cross-border consolidation of pre-tax profits and losses within a business group
First PE Investor	Indicator equal to 1 if none of a target firm's vendors was a PE firm (i.e., the deal event was not a secondary PE buyout)
Big PE Player	Indicator equal to 1 if the treated firm is acquired by one of the top 30 private equity firms according to the report by Preqin (2017)

Panel A: Firm-level	
IP Box Access	Indicator equal to 1 if a target firm is affiliated with another legal entity located in a country that offers a reduced corporate income tax rate for income derived from the use of intellectual property; indicator set to missing for firms with main activities not classified as belonging to innovative industries (NACE Sections J and M)
Investment Tax Credits	Indicator equal to 1 if a target firm is located in a country that offers superdeductions or tax credits for long-term tangible and intangible investments
(3) Control variables	
Log. Total Assets	ln(1 + total assets)
EBIT over Assets (ROA)	Earnings before interest and taxes (EBIT) / total assets
Leverage Ratio	Total liabilities / total assets
Intangible Ratio (%)	Intangible fixed assets / total assets
Cash Ratio	Cash and cash equivalents / total assets
Subsidiary Level	Firm's hierarchical position in its corporate group (1 if standalone firm or parent firm of a corporate group, >1 if subsidiary owned by other corporate parent entity)
Log. Group Levels	ln(number of all hierarchical layers in a firm's corporate group)
GDP / Capita (th)	GDP per capita of the firm's country (in thousand EUR)
GDP (tn)	Total GDP of the firm's country (in trillion EUR)
Long-t. Interest Rate (%)	Government bond interest rates with 10 years maturity in a firm's country
Short-t. Interest Rate (%)	Government bond interest rates with 3 months maturity in a firm's country
Panel B: Aggregated firm-level	
ETR (Mun.)	Sum of a GAAP tax expenses / sum of EBT of all firms incorporated in the municipality
Log. Capex (Mun.)	ln(1 + sum of fixed assets - sum of lagged fixed assets + sum of depreciation of all firms incorporated in the municipality)
Employment Growth (Mun.)	(number of employees - lagged number of employees) / (0.5 * (number of employees + lagged number of employees)), where the number of employees is the sum of the number of employees of all firms incorporated in the municipality
Log. Avg. Salaries (Mun.)	ln(1 + labor expenses of all firms incorporated in the municipality/number of employees of all firms incorporated in the municipality)
Treated PE (%)	Indicator equal to 1 if at least one private equity deal has occurred in the municipality
Treated M&A (%)	Indicator equal to 1 if at least one M&A A deal has occurred in the municipality

Panel C: Municipality-level	
Log. Business Tax Revenue	ln(municipality-level tax revenue from the local business tax)
Log. Income Tax Transfer	ln(a municipality's income tax revenue received as a transfer payment from the federal government)
Treated PE (%)	Indicator equal to 1 if at least one private equity deal has occurred in the municipality
Treated M&A (%)	Indicator equal to 1 if at least one M&A deal has occurred in the municipality
Log. GDP (t-1)	ln(lagged total GDP of a municipality's county)
Log. Population (t-1)	ln(lagged number of inhabitants of a municipality's county)
Log. Workforce (t-1)	ln(lagged number of inhabitants in the active workforce of a municipality's county)
Panel D: County-level	
Log. Business Tax Revenue	ln(sum of a county's municipalities tax revenues from the local business tax)
Log. Spendings	ln(sum of a county's municipalities public spendings)
New Debt (%)	(local government credit issuances - repayments) / local government credit liabilities
Treated PE (%)	Indicator equal to 1 if at least one private equity deal has occurred in the county
Treated PE intense (%)	Indicator equal to 1 if private equity deal(s) with at least 100 million EUR in total assets of acquired target firms has (have) happened in the county
Treated PE very intense (%)	Indicator equal to 1 if private equity deal(s) with at least 500 million EUR in total assets of acquired target firms has (have) happened in the county

This table presents definitions of the variables of interest. Panel A presents variable definitions for the firm-level sample. The data on PE and M&A deals are from Bureau van Dijk's (BvD) Zephyr database. Financial and ownership information are from the BvD Orbis flatfiles and Orbis annual historical updates. Data on tax and legal advice fees for firms in the United Kingdom are obtained from BvD's FAME database. Tax rates are from KMPG and the OECD. Macroeconomic data are from the OECD. Indicator variables for the firm-level cross-sectional tests are defined as of $k = -1$ and take on the same value for both the treated and the nearest-neighbor-matched control firm. Panel B presents variable definitions for the aggregated firm-level sample. These are based on firms' financial information from the BvD databases and aggregated at the European municipality-year level. Panels C and D present variable definitions for the municipality-county-level samples. Administrative data on public finances and macroeconomic characteristics for these samples are from the German states' statistical offices (*Regionaldatenbank*).

APPENDIX B: CONCEPTUAL AND INSTITUTIONAL FRAMEWORK



This figure presents the conceptual and institutional framework of our study and summarizes the main empirical findings. The scope of our analysis includes the economic outcomes of the target firm related to the changes in corporate decision-making after a PE buyout (1), potential spillovers on local peer firms (2), and local governments' public finances (3). Boxes represent legal entities or institutions and circles represent firms' resources. The key agents of interest are the PE buyout firm and the target firm (red shaded boxes). Nonacquired local peer firms and local governments are stakeholders potentially affected by the PE buyout and are also units in our analyses (yellow dotted boxes). Our analysis does not cover other stakeholders such as the PE firms' partners and external investors, the employees, suppliers, customers and other firms potentially transacting with the PE target firm outside the local economy, as well as the state or federal government. Red solid lines and arrows represent agents's actions that directly impact corporate behavior and certain stakeholders. Red dashed lines and arrows represent indirect consequences of these actions. The gray shaded hexagons with numerical values summarize our regression results. For instance, the hexagon with "30%" by the solid line with the arrow left

to the "Investment" outcome of the PE target firm indicates that our main result is an approximately 30% increase in CAPEX for target firms after the PE buyouts. The hexagon with "15%" by the solid line with the arrow left to the "Tax Efficiency: ETR" outcome of the PE target indicates that our main result is an approximately 15% increase in tax efficiency (here, a 15%, or three-percentage-point, decrease in the ETR).

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