

Link, Sebastian; Menkhoff, Manuel; Peichl, Andreas; Schüle, Paul

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Downward Revision of Investment Decisions after Corporate Tax Hikes

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Sebastian Link, Manuel Menkhoff, Andreas Peichl, Paul Schüle

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Poschingerstr. 5, 81679 Munich, Germany

Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email office@cesifo.de

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Downward Revision of Investment Decisions after Corporate Tax Hikes

Abstract

This paper estimates the causal effect of corporate tax hikes on firm investment based on more than 1,400 local tax changes. By observing planned and realized investment volumes in a representative sample of German manufacturing firms, we can study how tax hikes induce firms to revise their investment decisions. On average, the share of firms that invest less than previously planned increases by three percentage points after a tax hike. This effect is twice as large during recessions.

JEL-Codes: G110, H250, H320, H710, O160.

Keywords: investment, corporate taxation, state dependence, business cycle.

Sebastian Link

*ifo Institute – Leibniz Institute for Economic
Research at the University of Munich
Munich / Germany
link@ifo.de*

Manuel Menkhoff

*ifo Institute – Leibniz Institute for Economic
Research at the University of Munich
Munich / Germany
menkhoff@ifo.de*

*Andreas Peichl**

*ifo Institute – Leibniz Institute for Economic
Research at the University of Munich
Munich / Germany
peichl@econ.lmu.de*

Paul Schüle

*ifo Institute – Leibniz Institute for Economic
Research at the University of Munich
Munich / Germany
schuele@ifo.de*

*corresponding author

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1 INTRODUCTION

The effect of corporate taxes on firm investment is a central question in macroeconomics and public finance. Corporate tax reforms like the US Tax Cuts and Jobs Act (TCJA) are often motivated by the argument that high corporate tax rates inhibit firm investment and growth (CEA, 2017). Standard theories of corporate taxation indeed predict that firms cut on investment projects if their after-tax net present value is reduced by tax increases (Hall and Jorgenson, 1967). To what degree corporate taxation affects investment, however, is ultimately an empirical question. Credible evidence on it is still scarce, as estimating the causal effect of corporate taxes on investment is challenging.

On the one hand, attributing cross-country discrepancies in investment behavior to differences in corporate tax rates is difficult to justify, as the timing of tax reforms often correlates with other macroeconomic determinants of firm investment. On the other hand, studies exploiting within-country variation need a valid control group and face the problem that many national-level tax reforms such as the TCJA change several parameters of the tax system simultaneously. For these reasons, quasi-experimental evidence on the response of investment to changes in the corporate tax burden originates predominantly from targeted tax deductions, which provide exogenous variation in exposure to tax decreases across firms of different size or in different industries (e.g. Garrett et al., 2020; Ohn, 2018; Zwick and Mahon, 2017). However, to which extent the effects of such specific policies generalize to the statutory corporate tax rate remains unclear.

This paper addresses this gap by combining the specific system of business taxation in Germany with unique data on firm level investment plans and their realizations. Our identification strategy builds on two pillars. First, we exploit the decentralized design of the German local business tax (LBT): While tax base and liability criteria are set by the federal government, municipalities each year autonomously decide on the statutory tax rates.¹ We can therefore distinguish tax rate variation from potential changes in the tax base. Furthermore, municipalities adjust their taxes frequently. Restricting the analysis to tax increases, which are much more common than tax cuts, our identifying variation consists of 1,436 tax hikes between 1980 and 2018. The large number of tax changes allows us to control for potentially heterogeneous time trends across regions or industries.

Second, we estimate the investment response of corporate firms to these tax changes by leveraging panel data on both planned and realized investment volumes among a large, representative survey of on average 1,500 German manufacturing firms. The unique feature of our data is that each fall firms report the planned volume of investment for the subsequent year. Municipalities announce tax changes for the subsequent year typically

¹This variation has been used by Fuest et al. (2018) to study the wage incidence of corporate taxation and Isphording et al. (2021) to assess the effects on R&D spending.

in December, that is after firms have reported their investment plans. In consequence, the firms are surprised by the tax changes and have not included this information in their investment plans. At the same time, investment plans arguably incorporate all other pieces of firms' (partially unobserved) private and public information that determine investment in the subsequent year. Focusing on the revision of investment plans, i.e. the difference between the investment volume planned prior to the tax change and the investment volume ultimately realized, thus eliminates many potential confounding factors of firms' investment choices.² Moreover, considering revisions avoids problems with sensitivity in estimates due to the lumpy nature of investment, and hedges against potential bias in two-way fixed effects models (de Chaisemartin and D'Haultfœuille, 2022).

Our results show economically large and statistically significant investment responses for firms experiencing a tax increase. On average, the share of firms that invest less than previously planned increases by 3 percentage points after a tax hike. In terms of magnitudes, a 1 percentage point increase in the LBT rate is associated with a decrease in the ratio of realized over planned investment by 2.8-3.5 percent, depending on the empirical specification. As firms on average invest approximately as much as previously planned, this maps into a semi-elasticity of investment with respect to the LBT rate of around 3. We verify our identification approach with an event study design, demonstrating that firms only deviate from the baseline probability for revising an investment decision in the year of the tax hike.

The magnitude of the investment response varies substantially over the business cycle. Compared to our baseline estimates, the share of firms that invest less than previously planned in response to a tax hike is twice as large if taxes are increased during a recession. We discuss three potential explanations for this state dependence of tax shocks, relating to uncertainty about expected returns to investments, cashflow sensitivity, and tax incidence.

Our findings contribute to several strands of the literature. First, we relate to studies investigating firm-level responses to the corporate income tax (e.g. Auerbach, 2006; Fuest et al., 2018; Garrett et al., 2020; Suárez Serrato and Zidar, 2016). We complement this literature by providing new evidence on the investment margin.³ Second, we contribute to a small but growing literature that uses quasi-experimental variation to quantify firm investment responses to specific tax policies. For example, several studies document that

²Comparing planned to realized quantities connects to the macro literature exploiting deviations from forecasts for identification (e.g. Romer and Romer, 2004).

³To the best of our knowledge, Harju et al. (2020) is the only other paper using firm-level data and quasi-experimental variation to study the investment responses to a change in the statutory corporate income tax rate. As the Finnish corporate tax cut also entailed an increase in dividend taxation, Harju et al. (2020) cannot consistently disentangle the corporate tax from the dividend tax channel. In the German context, Dobbins and Jacob (2016) compare the differential investment responses of domestically and foreign-owned firms after a cut in the federal corporate tax rate in 2008.

accelerated depreciation allowances can substantially stimulate investment (Curtis et al., 2021; Edgerton, 2010; Garrett et al., 2020; House and Shapiro, 2008; Maffini et al., 2019; Zwick and Mahon, 2017), and Ohrn (2018) finds similarly large effects for a tax provision in the US manufacturing sector. We add to this evidence by studying investment responses to changes in the statutory corporate tax rate, rather than to more targeted policies. Finally, our findings of higher investment responses during recessions relate to an ongoing debate about the state dependence of fiscal multipliers (Auerbach and Gorodnichenko, 2013; Ghassibe and Zanetti, 2021; Ramey and Zubairy, 2018) and the state dependence of investment effects in response to tax changes more specifically (Demirel, 2021; Hayo and Mierzwa, 2021; Jones et al., 2015; Ljungqvist and Smolyansky, 2018; Winberry, 2021). We complement this evidence by means of firm-level microdata and a distinct research design.

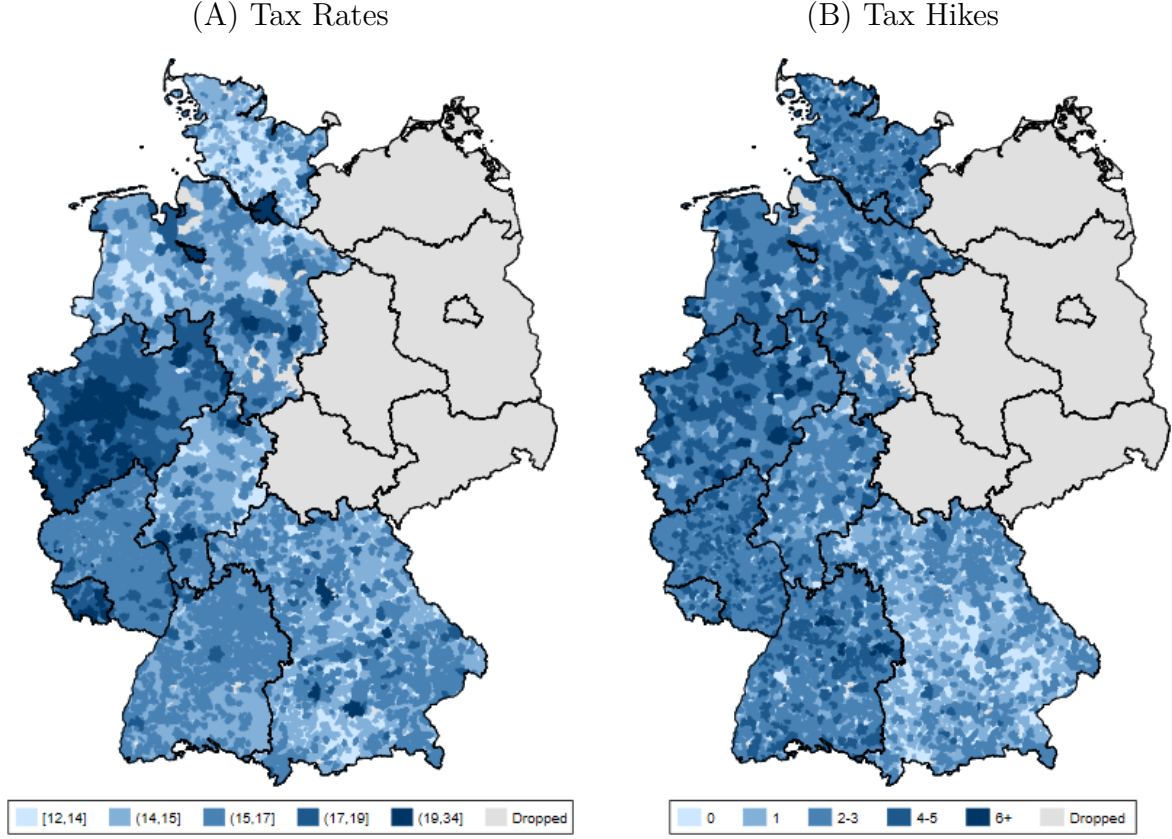
2 DATA AND RESEARCH DESIGN

The German Local Business Tax. The local business tax (LBT) is one of three types of taxes on business income in Germany. It is applied to the operating profits of both corporate and non-corporate firms. While tax base and liability criteria of the LBT are set at the federal level, municipalities decide autonomously on the tax rate. The tax rate consists of two components: a basic rate, which is determined by the federal government, and a local scaling factor, which is set at the municipal level. Each year, the municipal council has to vote on next year’s scaling factor, even if it remains unchanged. As it is common practice to decide on next year’s local scaling factor jointly with the adoption of the budget in the year’s last meeting of the municipal council, tax changes are typically announced in December.⁴ Municipalities in our sample are much more likely to increase rather than decrease their local scaling factor. As this leaves us with too little treatment variation to consistently estimate the effect of tax decreases on investment, we only rely on tax changes induced by municipalities increasing their local scaling factors, henceforth referred to as a tax hike. This implies that the tax reforms exploited in this paper affect investment exclusively via increases in the tax rate, and not via changes in the tax base. Taxable profits of firms with establishments in more than one municipality are divided between municipalities according to formula apportionment based on the payroll share. Appendix A provides additional details on the institutional setting.

Municipal Data and Tax Rate Variation. We use information on municipal tax scaling factors from the Statistical Offices of the German Federal States for the years

⁴Appendix Figure A.1 substantiates this empirically, showing that newspaper coverage of LBT hikes indeed peaks each year in December.

Figure 1 – Variation in Local Business Tax Rates (1980-2018)



Notes: This figure shows the cross-sectional and time variation in municipal scaling factors of the German local business tax (LBT). Panel (A) plots the average LBT rate (in percent) induced by different scaling factors for the period 1980-2018. Panel (B) indicates the number of tax hikes, defined as an increase of the scaling factor. Municipalities in light gray areas are dropped from the sample as they are either located in East Germany or underwent a change of boundaries due to a merger. Moreover, we exclude observations where a tax hike was followed or preceded by another tax hike in the next or last two years.

1980 to 2018. We enrich these data with information on municipality budgets and local economic conditions from several administrative data sources, leaving us with a balanced panel of all German municipalities with extensive information on taxes, revenues, and expenditures. To avoid capturing structural changes of the German reunification, and as data for East Germany are only available since 1990, we restrict our sample to West German municipalities. We furthermore exclude the few municipalities that underwent a municipal merger during the period of consideration, as we cannot determine their exact tax rates.

Figure 1 shows variation in LBT rates across municipalities and over time. As displayed in Panel (A), average tax rates vary substantially between municipalities, ranging from 12 to 34 percent. Panel (B) displays the identifying variation we rely on, i.e. the number of tax hikes between 1980 and 2018. Only few municipalities never increased

The hypothesis guiding our analysis is that firms surprised by the announcement of a tax hike in December of t_{-1} will on average invest less in year t_0 than previously planned. We therefore expect downward revisions of planned investments to be more frequent in municipalities that increased their local scaling factors. At the same time, firms’ investment plans elicited in the fall should incorporate all other, potentially unobserved, information influencing investment in the subsequent year.

Our identification strategy hinges on the assumption that there are no unobserved factors that are both (i) correlated with investment and local tax policy in year t_0 , and (ii) not in the information set of the firm when forming investment plans in the fall of t_{-1} . This assumption would be violated if, in response to a local shock that hits after firms have reported their investment plans, municipalities implemented a tax hike within a few weeks. However, given the municipal decision structures and the “speed” of German bureaucracy, such an immediate response is highly unlikely. Relatedly, Fuest et al. (2018) show that changes in the LBT are typically not triggered by shocks to economic variables, and Blesse et al. (2019) demonstrate that tax setting of the municipalities substantially deviates from theoretically optimal behavior. As in the US (Robinson and Tazhitdinova, 2022), regional variation in corporate tax rates seems to be to a large extent idiosyncratic and not readily explained by standard theories of tax setting. Overall, we are therefore confident that omitted variables do not threaten identification in our setting.

Instead, a potential limitation of our identification strategy is that some firms may have private information about tax hikes before investment plans are reported in the fall (Riedel and Simmler, 2021). If this was the case, firms would—at least partially—incorporate this information into their investment plans and hence revise their investment decisions less strongly on average.⁶ If anything, we hence tend to underestimate the investment response to a tax hike.⁷

Measurement and Estimation. We use two variables to measure investment revisions. The first is an indicator for revising investment decisions downwards, defined as:

$$\text{Downward Revision:} \quad \mathbb{1} \left(\frac{I_{i,t}}{E_{i,t-1}(I_{i,t})} < 1 \right)$$

⁶Private information about future tax hikes should be more prevalent in smaller municipalities. However, Appendix Table C.3 demonstrates that treatment effects are not significantly different between cities and rural municipalities. If anything, they are slightly larger among the latter.

⁷Moreover, the investment response might be underestimated as the IVS elicits firms’ investment volumes for all domestic plants and not exclusively for their headquarters. As firms pay the LBT according to the payroll share attributable to each municipality, firms with several plants in Germany are only partially affected by tax hikes in the municipality of their headquarters. Appendix Table C.3 demonstrates that treatment effects do not differ by firm size, a proxy for being a multi-plant company.

The downward revision indicator is attractive due to its robustness against outliers and non-linear investment responses. The second variable is the log revision ratio and takes into account the magnitude of each revision. It is defined as the natural logarithm of the ratio between realized and planned investment volumes:

$$\text{Log Revision Ratio:} \quad \ln \left(\frac{I_{i,t}}{E_{i,t-1}(I_{i,t})} \right)$$

We choose the logarithmic form due to the lumpy nature of investment, which implies that the distribution of investment volumes is skewed and the revision ratio can get very large for small denominators. Moreover, the resulting estimate directly translate into the semi-elasticity of investment with respect to the tax rate, as on average firms invest approximately as much as previously planned. This semi-elasticity can directly be compared to other estimates in the literature.

In our main analysis, we estimate the following linear model by OLS:

$$\text{InvestmentRevision}_{i,m,t} = \gamma \text{TaxHike}_{m,t} + \mu_i + \phi_{l,t} + \psi_{s,t} + \varepsilon_{i,t}, \quad (1)$$

which explains the investment revision of firm i in municipality m and year t by municipality level tax hikes $\text{TaxHike}_{m,t}$ that take one of the following two forms:

$$\begin{aligned} \text{Tax Hike Indicator:} & \quad \mathbb{1}(\Delta tax_{m,t} > 0) \\ \text{Tax Hike in Percentage Points:} & \quad \Delta tax_{m,t} \end{aligned}$$

The tax hike indicator equals one if at time t municipality m increased the LBT. In addition, $\Delta tax_{m,t}$ denotes the tax change in percentage points. As discussed above, the focus on deviations of realized investment from the planned value should by itself rule out omitted variable bias. To validate this, some specifications additionally include firm fixed effects (μ_i) and year fixed effects at the level of industries ($\psi_{s,t}$) and federal states ($\phi_{l,t}$) to flexibly control for any time-invariant heterogeneity or systematic time trends in the probability of investment revisions and the frequency of tax hikes. In these specifications, we obtain a Difference-in-Differences (DiD) estimate.⁸

Description of Final Sample. Our final sample consists of West German firms in the period between 1980 and 2018 that are spread across 1,190 municipalities (see Appendix B.4 for details). The median firm is a typical representative of the “German Mittelstand”

⁸Note that using investment revisions as the outcome of interest implies that treatment effects realize exclusively in the treatment period. Due to this lack of treatment effect dynamics, the recent concerns about bias in two-way fixed effects models (e.g. de Chaisemartin and D’Haultfœuille, 2022) do not apply in our setting, as discussed below in more detail.

that has 264 employees and generates annual revenues of 45 million Euro (CPI inflation-adjusted to 2015 values).

We are able to exploit many and fairly large tax reforms for identification. As documented in Appendix Table B.2, our estimations rely on 1,436 tax hikes in 797 municipalities that are distributed rather uniformly across time. We furthermore observe firms in treated municipalities within all states of West Germany, about three quarters in urban and one quarter in rural areas. Each year, approximately 8 percent of firms are exposed to a tax hike. The average tax hike amounts to 0.92 percentage points, corresponding to a 5 percent increase on average.

3 RESULTS

The baseline results presented in Table 1 reveal that firms affected by a tax hike strongly revise their investment decisions in the year this change is enacted. Panel (A) displays the estimates for the downward revision indicator. In Column (1), we compare the share of firms investing less than previously planned between municipalities where a tax hike is enacted and municipalities where the tax rate did not change, without including any controls. We find that the share of firms that revise their investment decisions downwards is 3.1 percentage points higher in affected municipalities (Panel A1). If we instead regress the downward revision dummy on the percentage point change in the tax rate in Panel A2, we find that a 1 percentage point increase in the tax rate is associated with an increase in the probability of a downward revision by around 2 percentage points. The estimates presented in the remaining columns demonstrate that the point estimates are barely affected by sequentially adding fixed effects at various dimensions. In Column (5), where we impose the most restrictive set of fixed effects, the effects of the tax hike indicator and the percentage change in the LBT on the probability of downward revising investment decisions are estimated at 3.4 and 2.6 percentage points.

Panel (B) repeats the analysis using the log revision ratio as the dependent variable. The negative coefficient in all specifications of Panel B1 again indicates that firms invest less than previously planned in response to a tax hike. While the effects are estimated less precisely, the point estimates are largely unaffected by the choice of the control vector. Again focusing on the most restrictive specification in Column (5), we find that the revision ratio decreases by 3.2 percent in response to a tax hike. Taking the magnitude of tax changes into account in Panel B2, the estimate in Column (5) implies that a 1 percentage point increase in the LBT rate is associated with a decrease in the ratio of realized over planned investment by 3.5 percent. Since in the absence of a tax hike firms invest approximately as much as they have planned, the ratio of realized over planned investment is close to one (and the log of the ratio is close to zero, as visible from the

Table 1 – Difference-in-Differences: Investment Revisions after a Tax Hike

	(1)	(2)	(3)	(4)	(5)
<i>Panel (A): Downward Revision</i>					
A1: Tax Hike Indicator: $\mathbb{1}(\Delta tax_{m,t} > 0)$					
	0.031*** (0.011)	0.031*** (0.010)	0.029*** (0.011)	0.030*** (0.011)	0.034*** (0.011)
Constant	0.536*** (0.005)	0.536*** (0.005)	0.536*** (0.001)	0.536*** (0.001)	0.536*** (0.001)
A2: Tax Hike in Percentage Points: $\Delta tax_{m,t}$					
	0.018* (0.010)	0.022** (0.009)	0.021** (0.010)	0.023** (0.009)	0.026** (0.010)
Constant	0.537*** (0.005)	0.537*** (0.005)	0.537*** (0.001)	0.537*** (0.001)	0.537*** (0.001)
<i>N</i>	35228	35228	35228	35228	35228
<i>Panel (B): Log Revision Ratio</i>					
B1: Tax Hike Indicator: $\mathbb{1}(\Delta tax_{m,t} > 0)$					
	-0.033** (0.017)	-0.033** (0.016)	-0.025 (0.017)	-0.025 (0.016)	-0.032* (0.019)
Constant	-0.034*** (0.007)	-0.034*** (0.007)	-0.035*** (0.001)	-0.035*** (0.001)	-0.034*** (0.001)
B2: Tax Hike in Percentage Points: $\Delta tax_{m,t}$					
	-0.026* (0.015)	-0.029** (0.014)	-0.028* (0.015)	-0.029** (0.014)	-0.035** (0.017)
Constant	-0.035*** (0.006)	-0.035*** (0.006)	-0.035*** (0.001)	-0.035*** (0.001)	-0.034*** (0.001)
<i>N</i>	34552	34552	34552	34552	34552
Year FE	-	✓	-	✓	-
Firm FE	-	-	✓	✓	✓
Year × State FE	-	-	-	-	✓
Year × Industry FE	-	-	-	-	✓

Notes: This table reports estimates from linear regressions of Equation (1). “Downward Revision” is an indicator that is one if the fraction of realized investment over planned investment is below one. “Log Revision Ratio” is the natural logarithm of this ratio and excludes outliers below -3 and above $+3$. “Tax Hike Indicator” is an indicator that is one if the local corporate tax rate is higher than in the year before. “Tax Hike” is the change in the local corporate tax rate in percentage points compared to the previous year. Industry fixed effects refer to the ifo industry classification, comparable to two-digit NACE industries. Standard errors in parentheses are clustered at the municipality level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

constant). Hence, our estimates directly map into a semi-elasticity of investment with respect to the LBT of around 3.

Overall, we find a clear and statistically significant negative investment response of firms to increases in corporate tax rates in all estimated models.

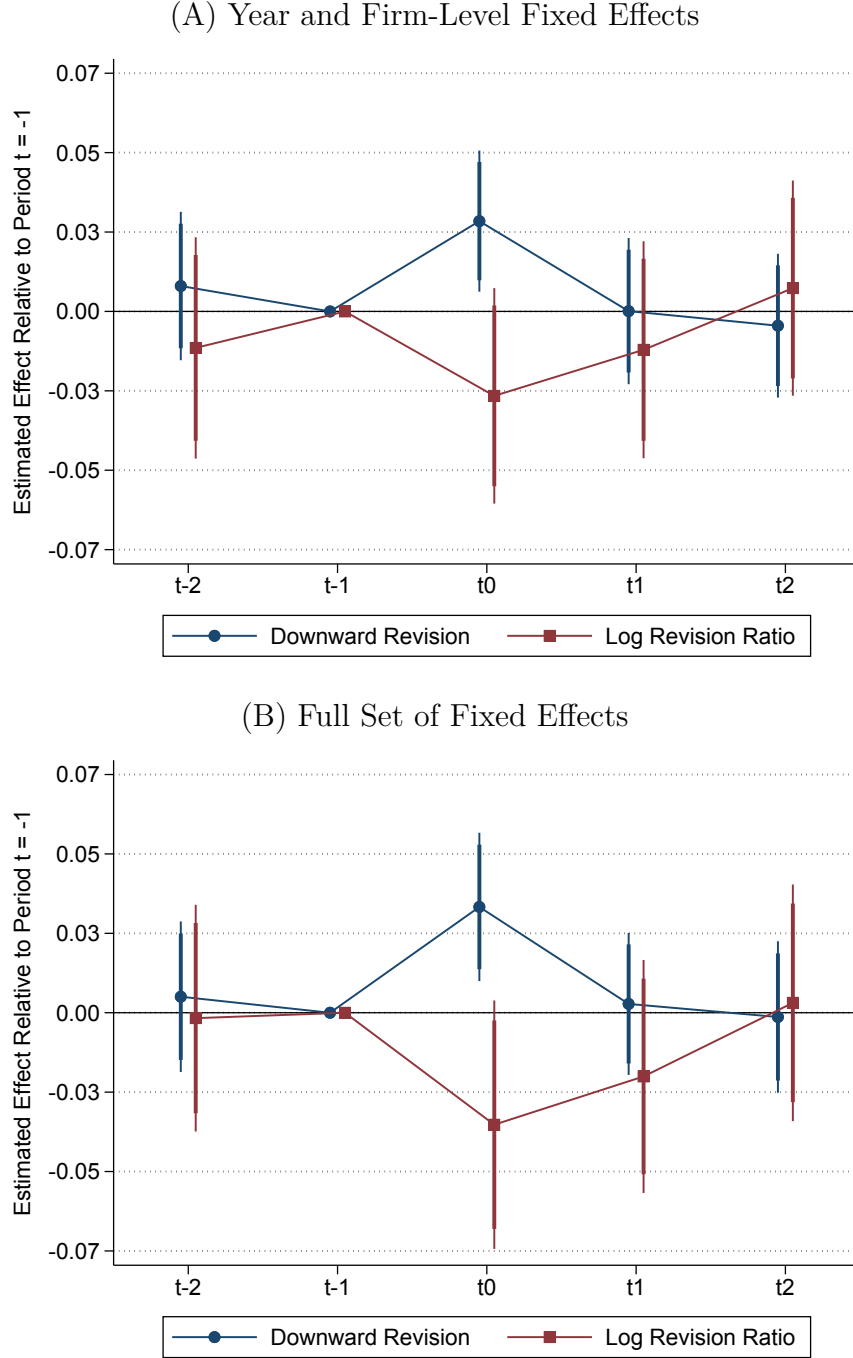
Robustness of Main Results. When moving across columns in Table 1, the stability of point estimates demonstrates that—as predicted under our identifying assumptions—the investment plans of the firms absorb close to all regional and industry-specific shocks that might simultaneously affect firm investment and the municipalities’ decisions to increase the LBT.

Nevertheless, attributing investment revisions to increases in the LBT could be problematic if tax hikes were accompanied by *immediate* changes in municipality expenditures. If—in the year of the tax hike—municipalities re-invested the additional tax revenue in local infrastructure, tax hikes would not only lead to higher tax payments on profits, but would also signal an increase of potentially valuable local amenities. If that were the case, we would underestimate the true investment response. While dependencies of this type are generally plausible, we do not find evidence for concurrent expenditure shocks in our data. In line with evidence from Fuest et al. (2018) and Isphording et al. (2021), Appendix Figure C.2 shows that on average, municipalities do not increase their expenditures jointly with the LBT.

The second assumption of our research design is that the effect on investment revisions occurs only in the year of the tax hike, whereas no effect should be visible in the years before (when the tax hike could not have been anticipated) and the years thereafter (when the information on the increased tax rate should already be incorporated into firms’ investment plans). To test this assumption in our data, we conduct an event study and plot the estimates in Figure 2. Indeed, investment revisions occur immediately in t_0 when the tax hike is enacted, while the point estimates are (close to) zero in all other years, further supporting the validity of our identifying assumptions.

Recent research in econometrics calls for caution when estimating two-way fixed effects models in settings with multiple treatment groups and periods (see, e.g., the survey by de Chaisemartin and D’Haultfœuille, 2022), as these estimators only provide an unbiased DiD estimate if the treatment effect is constant between groups and over time. This problem is less relevant in our setting given that the estimated treatment effects are not dynamic, i.e. do not evolve over time. To demonstrate that the recent critique does not apply here, we repeat the event study using the imputation estimator proposed by Borusyak et al. (2021) as well as the interaction-weighted estimator by Sun and Abraham (2021). As shown in Appendix Figure C.1, results are very similar to Figure 2.

Figure 2 – Event Study: Investment Revision Effect after a Tax Hike



Notes: This figure shows the estimates of the following event-study regression: $\text{InvestmentRevision}_{i,t} = \sum_{j=-2}^2 \gamma_j \text{TaxHike}_{m,t}^j + \varepsilon_{i,t}$. In Panel (A), we additionally include year and firm fixed effects. In Panel (B), industry-year, state-year, and firm fixed effects are included. The reference period is t_{-1} . The dependent variable is based on the ratio of realized investments over planned investments (elicited in the fall of the previous year). “Downward Revision” is an indicator that is one if the ratio is below one. “Log Revision Ratio” is the natural logarithm of this ratio and excludes outliers below -3 and above $+3$. Industry fixed effects are at the ifo industry classification level that is comparable to two-digit NACE industries. The confidence intervals refer to the levels of 90% (thick line) and 95% (thin line).

Finally, Appendix Table C.1 shows that we obtain similar and slightly more significant results if we apply to the revision ratio the inverse hyperbolic sine transformation, which also captures downward revisions to zero, instead of the natural logarithm. The estimates map into a semi-elasticity of investment with respect to the LBT of around 2.6.⁹

State Dependence. Next, we exploit the long time dimension of our data to analyze potential heterogeneity in effect sizes over the business cycle. While a large literature in macroeconomics studies the state dependence of fiscal policy, there is not yet a consensus whether effects of corporate tax changes are state dependent (Demirel, 2021; Hayo and Mierzwa, 2021; Jones et al., 2015; Ljungqvist and Smolyansky, 2018; Winberry, 2021). As most quasi-experimental evaluations of the effect of corporate taxes on investment behavior rely on few tax changes or just a single tax reform, the treatment variation is typically not large enough to distinguish effect size heterogeneity along the business cycle. In contrast, the long time dimension of our data in combination with the occurrence of multiple local tax changes in each given year allows us to evaluate whether the treatment effect is state dependent.¹⁰

Table 2 presents the estimation results of interacting the tax hike treatment with indicators capturing periods of recession and normal times. To this end, a year is classified as a recession year if at least one quarter of the year is defined as a recession by the German Council of Economic Experts. The average effect that we estimated in Table 1 masks substantial heterogeneity over the business cycle. While in normal times the share of firms that invest less than previously planned increases by 2 percentage points in years of a tax hike, this figure almost triples to 5 to 7 percentage points in recessions. Additional results presented in Appendix Table C.2 show that this finding also holds when we estimate the effects with a linear treatment instead of a treatment indicator, with the log revision ratio instead of the downward revision indicator as the dependent variable, or when we use a narrower definition for recession years.

Further Heterogeneity. While the sample size of our data does not permit a comprehensive heterogeneity analysis, we perform the main estimation for a number of sample splits in Appendix Tables C.3 and C.4. We first show—splitting our sample into firms with more or less than 250 employees—that treatment effects do not differ by firm size. In contrast, the investment effects of accelerated depreciation allowances in the

⁹As the average revision ratio is 1, the estimates have to be divided by $\text{arcsinh}(1) \approx 0.88$ to calculate the semi-elasticity.

¹⁰Municipalities are as likely to raise taxes in recessions as in normal times. The reasons why municipalities increase taxes (also in recession) are diverse, ranging from growing budget requirements to electoral cycles (Foremny and Riedel, 2014) and rent extraction (Langenmayr and Simmler, 2021); see also the discussion in Section 2.

Table 2 – Investment Revisions after a Tax Hike: State Dependence

	(1)	(2)	(3)
Tax Hike Indicator \times			
No Recession	0.024** (0.011)	0.020 (0.012)	0.023* (0.013)
Recession	0.050** (0.021)	0.061*** (0.021)	0.068*** (0.024)
Constant	0.536*** (0.005)	0.536*** (0.001)	0.536*** (0.001)
Observations	35228	35228	35228
Year FE	✓	✓	-
Firm FE	-	✓	✓
Year \times State FE	-	-	✓
Year \times Industry FE	-	-	✓

Notes: This table reports how the probability of investing less then previously planned changes in response to a tax hike in recession and non-recession years. “Downward Revision” is an indicator equal to one if the ratio of realized investments over planned investments (elicited in fall the year before) is below one. “Tax Hike Indicator” is an indicator equal to one if the local corporate tax rate is higher than in the year before. 1980-1982, 1992-1993, 2001-2003, and 2008-2009 are defined as recession years following the classification of the German Council of Economic Experts. Industry fixed effects refer to the ifo industry classification, comparable to two-digit NACE industries. Standard errors in parentheses are clustered at the municipality level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

corporate tax code have often been found to be much stronger among small (liquidity-constrained) firms (e.g. Zwick and Mahon, 2017). We further investigate if tax setting dynamics at the municipality level correlate with the effect sizes. For this purpose, we test if firms in municipalities with frequent tax hikes are more likely to revise their investment decisions. While in general this does not seem to be the case, we find that having experienced a tax hike in the last five years predicts a larger investment response. This result could be consistent with higher policy uncertainty triggering a stronger response after tax hikes.

4 DISCUSSION OF EFFECT SIZES AND MECHANISMS

Magnitude of Investment Response. How do the investment effects estimated in this paper compare to other findings in the literature? In our data, the semi-elasticity of investment with respect to the corporate tax rate is estimated at approximately 3. This is at the upper end of estimates from the earlier literature in public finance on this issue (e.g. surveyed by Hassett and Hubbard, 2002). In contrast, larger estimates have been found in more recent studies that exploit quasi-experimental variation in the US at the

micro level.¹¹ Both Zwick and Mahon (2017) and Ohrn (2018) report a semi-elasticity of around 3 for tax decreases induced by accelerated deduction possibilities for the cost of investment. Further, and closest to our setting, Ohrn (2018) reports a semi-elasticity of 4.7 for a tax decrease induced by a specific tax provision for the manufacturing sector. These larger semi-elasticities could be rationalized with the theoretical work by Chen et al. (forthcoming) which suggests that targeted policies are more effective at stimulating investment than statutory tax rate cuts. Of course, other explanations are possible as well, as key differences in research design and institutional setting remain.

Our results furthermore complement evidence from Isphording et al. (2021), showing that tax hikes in the German LBT reduce plant-level R&D spending by around 2 to 3 percent in the year of implementation. As R&D spending constitutes a (small) part of firm investment, we can directly compare the estimate to our semi-elasticity of investment of around 3. While both estimates suggest comparable effect sizes, our results are obtained for a different sample of firms and under less restrictive identifying assumptions.

To illustrate the economic significance of the estimated effects, we conduct a back-of-the-envelope calculation, described in detail in Appendix D. According to our estimates, for each additional Euro of tax revenues raised, 2.12 Euro of firm investment are lost already in the first year after a tax hike. In recession years, the investment even decreases by 4.24 Euro for each additional Euro of tax revenue. Although these projections rely on several simplifying assumptions and are thus subject to a high degree of uncertainty, they illustrate that the foregone volume of investment is non-negligible.

Discussion of Mechanisms. We finally investigate potential mechanisms behind the investment responses documented in Section 3. While our baseline estimates are in line with the predictions of standard theories of investment (Hall and Jorgenson, 1967), theory fails to explain why the effect of tax hikes should be state dependent. In the following, we discuss three channels which could explain the stronger effect during recessions.

The first channel relates to the fact that investment projects are risky. As investments are only partially deductible from the tax base, profits and losses are treated unequally by the tax authorities.¹² In expectation, tax hikes thus lead to stronger decreases in the net present value of those investment projects with a higher variance of expected returns as first formalized by Domar and Musgrave (1944).¹³ During recessions, the expected return

¹¹Based on a different approach that uses aggregate data and combines a narrative approach with a structural VAR model, Mertens and Ravn (2013) find a comparable semi-elasticity between 2.1 and 4.

¹²As discussed by Fuest et al. (2018), costs of debt financing are usually fully deductible from the LBT, while costs of equity financing are not and loss offset is restricted. Moreover, due to depreciation rules, investment costs are split over several years while the revenues are fully taxed in each year.

¹³While Domar and Musgrave (1944) refer to the personal income tax, the same logic applies to the corporate tax and has been tested in the data. For state-level corporate tax rates in the US, Ljungqvist

to many investment projects becomes more uncertain, as it is unknown when the economy will recover again. Tax hikes should therefore lead to stronger behavioral responses in economic downturns when a higher share of planned investments is risky. While we cannot test this conclusively in our data, we can assess whether firms with more volatile revenue paths react stronger to tax hikes. For this purpose, we calculate the standard deviation of yearly revenue growth for each firm and construct an indicator for having above median volatility. Appendix Table C.5 shows the regression results when the tax hike effect is interacted with this volatility indicator. While the effects are estimated imprecisely and are sensitive to the specified model, they indeed show slightly larger responses of firms with more volatile revenue paths, suggesting that one reason for the state dependence of tax shocks may be the heightened uncertainty about returns to investment during recessions.

Second, firm investment is sensitive to cashflow (Almeida et al., 2004). Corporate taxes decrease the cashflow for profitable firms and therefore lower investment. At the same time, Almeida et al. (2004) show that cashflow sensitivity is higher in recessions. During recessions, firms expect a higher probability of being cash constrained in the future and therefore retain more earnings for profitable investment opportunities. Taken together, this could give rise to an interaction effect which reduces investment disproportionately if taxes are increased during recessions. Two regularities in our data support such a mechanism. First, we find that profitable firms react stronger to tax hikes during recessions. We use an indicator for a revenue drop by more than 10 percent compared to the previous year as a proxy for no longer being profitable. While firms that experience a large revenue drop in general revise investments downwards, the revision effect after a tax hike is smaller compared to firms without a large revenue drop during a recession (Appendix Table C.6). Firms with a large decline in revenues might still be profitable if they reduce their labor costs significantly. Appendix Table C.7 shows that the results hold when we exclude firms with a reduction in employees by more than 5 percent as a robustness check. Second, if an adverse financing situation is reported to be a factor for a strong slowdown in investment volumes, the revision effect tends again to be larger in recessions (Appendix Table C.8). Both findings provide suggestive evidence that the stronger investment response in recession may relate to cashflow sensitivity.

Finally, the stronger investment response to tax hikes in recessions could result from diminished possibilities to shift the tax burden to third parties. Fuest et al. (2018) show that workers bear approximately half of the incidence of the LBT in Germany. However, as wages are nominal downward rigid (e.g. Barattieri et al., 2014), firms often cannot decrease

et al. (2017) show that in response to a tax increase the average firm reduces risk as measured by their earnings volatility. Langenmayr and Lester (2017) find similar results in a cross-country panel and among small Spanish firms.

wages in response to adverse economic conditions. This lower bound bites predominantly in recessions, especially given that collective bargaining agreements are still the norm in the German manufacturing sector and bargained wages usually slow down only with a considerable time lag as depicted in Appendix Figure C.3. This could suggest that during recessions, (cashflow sensitive) firms reduce their investment disproportionately as downward rigid wages do not allow shifting the tax burden on workers. Consistent with such a channel, Fuest et al. (2018) report a lower wage incidence for less profitable firms. In our data, we do not observe wages, preventing us from investigating this issue further.

5 CONCLUSION

This paper provides novel empirical evidence on the effect of corporate taxation on firm investment. Our research design allows us to address several concerns that often complicate identification of an investment response. By considering 1,426 tax changes of the German local business tax between 1980 and 2018, we draw on extensive treatment variation and average out idiosyncratic characteristics of single tax reforms. By observing both planned and realized investment volumes, we can control for ex-ante investment plans when estimating the effect of tax hikes on firm investment, eliminating a wide set of further potential confounding factors.

We find significant and economically large investment responses for firms experiencing a tax shock. The share of firms that invest less than previously planned increases by 3 percentage points after a tax hike, with strong heterogeneity along the business cycle. While in normal times the share of firms that revise their investment decisions downwards increases by 2 percentage points in response to a tax hike, this figure triples to over 6 percentage points if taxes are increased during a recession. These findings have direct policy implications that support the countercyclical Keynesian notion of “do not increase taxes during recession”. While we find suggestive evidence that the state dependence of tax shocks could plausibly be related to uncertainty about expected returns to investments, cashflow sensitivity, and tax incidence, more research is needed to disentangle the channels behind this finding.

Overall, our results confirm the view that investment decreases substantially in the corporate tax burden. While our estimates were obtained for increases in the statutory corporate tax rate, prior studies have often evaluated targeted tax policies which were deliberately designed to stimulate investment. We look forward to future research comparing the effects of both types of policies within a unified framework.

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Downward Revision of Investment Decisions after Corporate Tax Hikes

Sebastian Link, Manuel Menkhoff, Andreas Peichl, Paul Schüle

Appendix

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This appendix contains all additional information referenced in the main text, as well as further supplementary material. Appendix [A](#) describes the institutional setting of business taxation in Germany. Appendix [B](#) is the data appendix and provides a detailed description of our data sources, sample selection, and summary statistics. Appendix [C](#) reports additional figures and tables. Appendix [D](#) explains the assumptions behind our back-of-the-envelope calculation.

A BUSINESS TAXATION IN GERMANY

In Germany, business profits are subject to two different taxes. At the national level, profits are either taxed under the personal income tax or under the corporate income tax, depending on the legal form of the firm. In addition, both corporate and non-corporate firms are subject to the local business tax (LBT) at the municipality level.

Corporate Income Tax. Profits of incorporated firms are subject to the national corporate income tax (*Körperschaftsteuer*). The rate of the corporate income tax is currently 15 percent. Until 2000, a split rate imputation system existed in Germany, where retained profits were subject to a tax rate of 40-45 percent whereas distributed profits were taxed at a rate of 30 percent. From 2001-2007, all profits were equally taxed at 25 percent. In all years since 1991, a so-called solidarity surcharge (*Solidaritätszuschlag*) of 5.5 percent of the corporate tax rate was added, dedicated to financing the costs of the German reunification.

Personal Income Tax. Profits of non-corporated firms are subject to the progressive income tax (*Einkommensteuer*). The top marginal tax rate of the personal income tax is currently 45 percent but has been higher in the past, with a maximum of 56 percent in the 1980s. Since 2001, sole proprietors and partners in a partnership have been able to partially offset LBT payments tax against their income tax. This regulation, limiting the bite of the LBT, is however not relevant in our setting, as it only applies to unincorporated businesses, whereas we focus exclusively on the corporate sector.

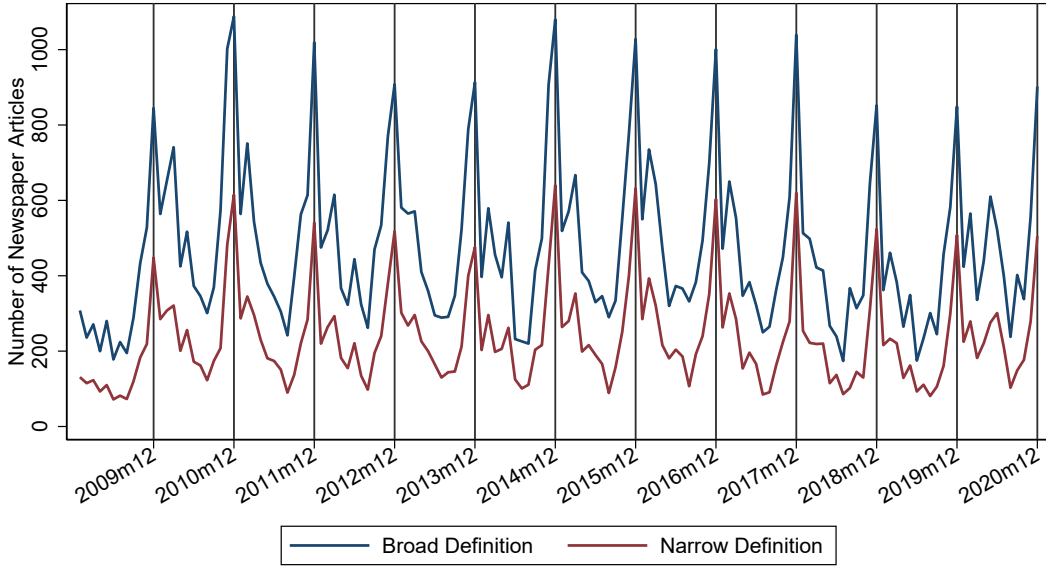
Local Business Tax. In addition, both corporate and non-corporate firms are subject to the LBT (*Gewerbesteuer*). As the corporate tax and the personal income tax, the LBT is a federal tax. For this reason, tax base and liability criteria of the LBT are set at the federal level. The tax rate, in turn, falls under the discretion of the municipalities. More precisely, municipalities decide autonomously on a scaling factor that is then multiplied with a uniform basic tax rate. This results in the following formula:

$$\text{Local Business Tax Rate} = \text{Basic Federal Tax Rate} \times \text{Municipal Scaling Factor}$$

The basic rate, which is fixed at the national level, has been constant with exception to a change in 2008, when it was decreased from 5.0 to 3.5 percent. This means that for the median municipal scaling factor of 3.2, the resulting LBT rate was 16 percent before 2008. After 2008, the tax rate for the median scaling factor of 3.5 was 12.25 percent.

Each year, the municipal council has to vote on next year's municipal scaling factor, even if it remains unchanged. The decision on next year's local scaling factor is taken

Figure A.1 – Timing of Tax Hike News



Notes: This figure provides evidence on the point in time when firms typically learn about a tax hike by displaying the number of monthly newspaper articles covering increases in the LBT, obtained from the German press database Genios. Under the broad definition, we counted search matches for “gewerbesteuer erhöh*”, under the narrow definition for “gewerbesteuer (erhöht* || angehob* || erhöhung) (beschl* || entschei*)”.

jointly with the adoption of the budget in the year’s last meeting of the municipal council. For this reason, tax hikes are typically announced in December. In Figure A.1, we substantiate this empirically, showing that newspaper coverage of municipal tax hikes in a given year indeed peaks in December. This holds for both a narrower definition (in red) and a broader definition (in blue) of newspaper coverage of a hike in the LBT.

A decision to increase the LBT sends no clear signal about the likelihood of future tax changes. While a tax hike predicts an increase in the unconditional probability for another tax hike in the next five years by 6.8 percentage points, the estimated relationship turns slightly negative when including municipality fixed effects, i.e. conditional on municipality characteristics, future tax hikes are actually less likely. Hence, even under the conservative but implausible assumptions that firms do not account for these municipality characteristics but fully incorporate the remaining information into their decisions, and abstracting from time discounting, our elasticity estimates would at most be scaled downwards by a factor of 0.936.¹

Around three quarters of the revenues of the LBT accrue directly to the municipalities, whereas one quarter is transferred to the federal government. Taxable profits of firms

¹If firms incorporate a higher probability for another tax hike in the future into their investment revision decision, the estimated semi-elasticity is the sum of the reaction to the current tax hike and the higher probability of a tax hike in the coming years. Hence, the elasticity must be scaled down by a factor of $1/(1 + 0.068) \approx 0.936$.

with establishments in more than one municipality are divided between municipalities according to formula apportionment based on the payroll share. The revenues from the LBT are of key importance for municipal budgets, as the LBT constitutes the most important original source of revenue for municipalities in Germany. Besides own tax revenues, municipal budgets are strongly dependent on fiscal transfers from the federal government or the federal states. As the municipalities cannot directly influence these fiscal transfers, the rate of the LBT is the central budget parameter under their control.

B DATA APPENDIX

In this section, we provide comprehensive information on the data sets used in the empirical analysis, provide a translated wording of the relevant survey questions from the ifo Investment Survey, explain how we obtain our analysis sample, and report summary statistics.

B.1 Administrative Data at the Municipality Level

The administrative data on tax rates, municipality revenues and expenditures and local economic conditions we use in this paper cover the period from 1980 to 2018. The data largely correspond to the municipality data underlying the analysis in Fuest et al. (2018), comprising the period 1993-2018. Data for the period from 1980 to 1992 were obtained by filing individual requests to the respective Statistical Offices of the German Federal States. Most importantly, the data contains information on scaling factors of the LBT. In addition, we know the full municipality budget, that is all categories of expenditures and revenues. We furthermore observe county-level GDP as well as unemployment rates compiled by the German federal employment agency. For a more detailed description of the data, we refer to Fuest et al. (2018) and Isphording et al. (2021).

B.2 The ifo Investment Survey

General Information. The ifo Investment Survey (IVS, 2019) is a firm-level survey of the German manufacturing sector. Since its inception in 1955, it is conducted biannually by the ifo Institute, with survey waves in spring and fall of each year. Within the manufacturing sector, all industries at the NACE two-digit level are covered. The repeated panel structure of the ifo Investment Survey allows tracking approximately 1,500 firms over time. The questionnaire elicits three types of questions, covering (i) the planned volume of investment, (ii) the realized volume of investment, and (iii) investment objectives. Realized investment is always reported for the previous year. Next to these investment variables, firms also report revenues and the number of employees. For all model specifications which include year fixed effects at the industry level, we rely on the ifo industry classification that maps firms into 34 industries over the entire sample period. The ifo industry classification is slightly more granular than, but largely comparable to two-digit NACE industries. All items of the questionnaire refer to the firms' plants located in Germany. Sauer and Wohlrabe (2020) provide a comprehensive overview and detailed description of this data source. The data can be accessed via the LMU-ifo Economics & Business Data Center (<https://www.ifo.de/EBDC>).

Table B.1 – Distribution of Firms Responding to the ifo Investment Survey by Industry and Size

WZ08	Industry	ifo Investment Survey				Actual Germany by			
		Small	Medium	Large	Total	Count	Employees	GVA	Payroll
10-12	Food, beverages, and tobacco	1.3	3.5	3.4	8.2	14.0	12.4	7.8	7.0
13-15	Textiles, apparel, and leather	1.2	1.8	0.9	3.9	4.2	1.8	1.1	1.1
16-18	Wood/paper products and printing	3.2	5.7	3.6	12.5	11.8	5.5	4.3	4.0
19	Coke and refined petroleum	-	-	0.4	0.6	0.0	0.3	0.8	0.5
20	Chemicals	0.5	1.1	3.4	5.0	1.5	4.6	6.9	6.0
21	Pharmaceuticals, medicinal chemical, and botanical	-	0.4	0.9	1.3	0.3	1.9	3.1	3.0
22+23	Rubber/plastics products, and other non-metallic	1.6	6.4	6.0	14.0	8.1	9.0	7.6	7.7
24+25	Basic and fabricated metal products	2.5	6.7	8.1	17.4	21.9	15.7	13.2	13.5
26	Computers, electronics, and optical products	0.3	1.1	2.2	3.7	3.7	4.8	5.4	5.5
27	Electrical equipment	0.3	1.6	3.6	5.5	2.9	6.4	7.0	7.5
28	Machinery and equipment	0.6	5.2	10.7	16.5	7.7	15.7	16.7	18.0
29+30	Transport equipment	0.3	0.7	3.9	5.0	1.9	13.2	19.0	19.1
31-33	Other, and installation of machinery and equipment	1.2	2.2	3.0	6.4	21.9	8.6	7.0	7.0
Total		13.1	36.8	50.1	100	100	100	100	100
Actual GER by Count		89.7	7.7	2.6	100				
Actual GER by Employees		19.1	18.6	62.3	100				
Actual GER by Gross Value Added (GVA)		10.6	13.2	76.1	100				
Actual GER by Payroll		10.0	13.9	76.1	100				

Notes: This table compares the distribution of firms in the ifo Investment Survey to the distribution of firms in administrative data by industry and firm size. The ifo Investment Survey data is based on the year 2018. The administrative data is based on the 2018 Statistics on Small and Medium-sized Enterprises (*“Statistik für kleine und mittlere Unternehmen”*) provided by the Federal Statistical Office (EVAS Code 48121). Definition of size classes: small: 0-49 employees; medium: 50-249 employees; large: 250+ employees. Cells are empty if there are less than 4 observations due to data protection.

Representativeness. In Table B.1, we demonstrate the representativeness of the ifo Investment Survey by comparing it to the distribution of firms in administrative data by industry and firm size. The numbers depicted in the table display the percentage share of firms in the respective cells. For instance, 17.4% of firms in the 2018 ifo Investment Survey are in the basic metals and fabricated metal products industry (2-digit WZ08: 24 and 25). This is in between the share of firms by count (21.9%) and weighted by employees (15.7%) in the administrative data. The share of firms by gross value added and payroll in this industry is around 13% in population. Overall, the industry-composition of the ifo Investment Survey is very close to the distribution in administrative data. Regarding the distribution across firm size, the ifo Investment Survey covers a substantial share in each size category. Around a third of firms have between 50 and 249 employees. Thereby, the survey slightly oversamples medium-sized firms while still being representative for small and large firms, since the share of firms is in between the population share of firms by count on the one hand and by employees, gross value added, or payroll on the other hand.

In addition, Bachmann and Zorn (2020) show that aggregate investment growth calculated from the microdata of the ifo Investment Survey is highly correlated with manufacturing investment growth reported by the Federal Statistical Office. Moreover, Bachmann et al. (2017) document cross-sectional and time-series patterns of investment

innovations, constructed by exploiting the difference in expected and realized investment volumes. Lastly, benchmarking the investment growth rates calculated from the survey against official statistics from the German Statistical Office for the period 1980 to 2016, Sauer and Wohlrabe ([2020](#)) report an average absolute estimation error of less than two percentage points.

B.3 Overview of Survey Questions Used in the Paper

Fall Questionnaire (2018)

1. General company information on the current financial year

Employees (as of Sept. 30th): _____ Total revenue (TEUR): _____

2. Gross fixed capital formation (equipment and buildings) in TEUR

	last year	this year	next year
Total (equipment + buildings):	_____	_____	_____

3. Investment targets this year and next year

Our domestic investment activity is influenced positively/negatively by the following factors:

		inducement		no	hampering
		strong	little	influence	little strong
This year:	a) Financing situation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	b) ...				
Next year:	a) Financing situation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	b) ...				

Spring Questionnaire (2018)

1. General company information on the last financial year

Financial year from: _____ to: _____ Focus of production: _____
Employees (as of Sept. 30th): _____ Total revenue (TEUR): _____

2. Gross fixed capital formation (equipment and buildings) in TEUR

	two years ago	last year	this year
Buildings:	_____	_____	_____
Equipment:	_____	_____	_____
Total (buildings + equipment):	_____	_____	_____

B.4 Sample Selection and Summary Statistics

Sample Selection. The sample selection is aimed to construct a valid control group to analyze corporate tax hikes over time and to clean the data to ensure that the results are not driven by outliers. To obtain our final sample, we follow the protocol outlined below:

- We restrict our sample to West Germany and, as Fuest et al. (2018), drop all municipalities which underwent municipal mergers in the observation period. As most of these municipalities were located in East Germany anyway, this does not substantially restrict our sample further (less than 1% of municipalities affected).
- We drop observations in a window of two years before and after a tax hike, if another tax hike occurred in that window.
- We drop all observations for which a tax decrease was enacted, as well as the two years before and after the tax decrease. Fuest et al. (2018) find that while tax hikes are arguably exogenous to shocks to economic variables, a potential endogeneity to economic conditions cannot be ruled out for tax decreases. In addition, only 12.9% of tax changes in the sample are tax decreases. In our setting, we do not have enough statistical power to separately analyze tax decreases.
- In total, the outlined sample selection above reduces the sample size from 8,546 municipalities and 326,510 municipality \times year observations to 8,344 municipalities and 283,717 municipality \times year observations.
- In the firm survey, for variables that are elicited both in the spring and the fall (last year’s number of employees, revenues, and total investment volume), we follow Bachmann et al. (2017) and compute a yearly value by taking the average. We drop the observation if both values deviate more than 20% from the mean.
- As Fuest et al. (2018), we drop firms with legal forms which are exempt from paying the LBT (this affects only 6.2% of the observations).
- We drop firms which participated less than 5 years in the survey.
- To construct the Log Revision Ratio, we calculate the ratio of realized investments over planned investments, take the natural logarithm, and drop outliers (all values smaller than -3 or larger than 3 , where $p1 = -2.63$ and $p99 = 2.67$).
- Matching the municipal and firm-level samples, the final sample consists of 35,228 observations that are spread across 1,190 municipalities.

Table B.2 – Summary Statistics

	Observations without Tax Hikes		Observations with Tax Hikes		Municipalities with Tax Hikes		
	N	Share $\frac{I_{i,t}}{E_{i,t-1}(I_{i,t})} < 1$	N	Share $\frac{I_{i,t}}{E_{i,t-1}(I_{i,t})} < 1$	N	Mean	SD
1980-1984	2,651	0.45	264	0.50	119	1.05	0.83
1985-1989	4,718	0.44	333	0.49	129	0.92	0.54
1990-1994	4,569	0.53	550	0.59	259	1.08	0.53
1995-1999	4,640	0.51	415	0.53	229	0.94	0.47
2000-2004	4,799	0.58	268	0.60	178	1.06	0.55
2005-2009	4,531	0.59	162	0.67	107	0.78	0.51
2010-2014	4,207	0.58	414	0.58	264	0.74	0.42
2015-2018	2,460	0.60	247	0.63	151	0.69	0.38
Full Sample	32,575	0.54	2653	0.57	1,436	0.91	0.54

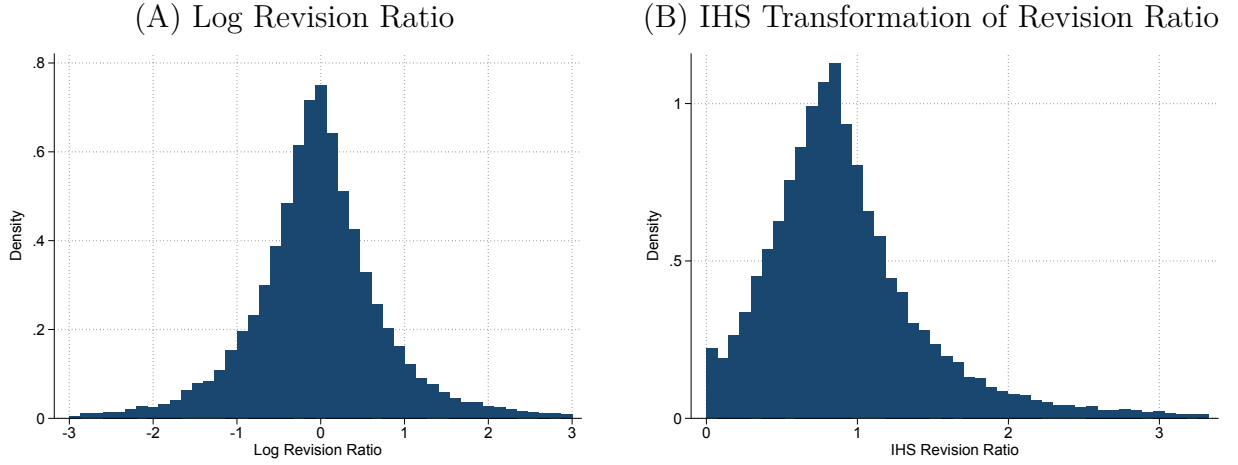
Notes: This table reports summary statistics for the final sample used in the empirical analysis. $\frac{I_{i,t}}{E_{i,t-1}(I_{i,t})} < 1$ denotes an indicator that is one if the ratio of realized investments over planned investments is below one.

- We express all nominal variables, i.e. the amounts of revenues and investments, in real terms of constant 2015 Euro by converting German Mark to Euro and adjusting for inflation using the German Consumer Price Index (CPI).

Summary Statistics. Table B.2 provides summary statistics for our final sample of 32,575 firm-year observations, corresponding to on average 1,500 firms per year. The median firm—of the total number of about 2,700 firms in the final sample—stays for 16 years in the survey. Columns 2 through 5 plot the number of observations and the share of firms investing less than previously planned, separately for firms located in municipalities with tax hikes and those not increasing their taxes. The last three columns display the number of municipalities in the respective period which increased their taxes, jointly with the mean and the standard deviation of the size of the tax hike.

Table B.2 shows that our estimations can rely on 1,436 tax hikes in 797 municipalities that are distributed rather uniformly across time. We are hence able to exploit many and fairly large tax reforms for identification: Each year, approximately 8 percent of firms are exposed to a tax hike. The average tax hike amounts to 0.92 percentage points, corresponding to a 5 percent increase on average. Comparing the share of investment downward revisions among treated and untreated firms, we find treated firms to be three percentage points more likely to invest less than previously planned. In every five-year interval of our data, treated firms have an—at least weakly—higher share of

Figure B.1 – Distribution of the Log Revision Ratio and IHS Transformation



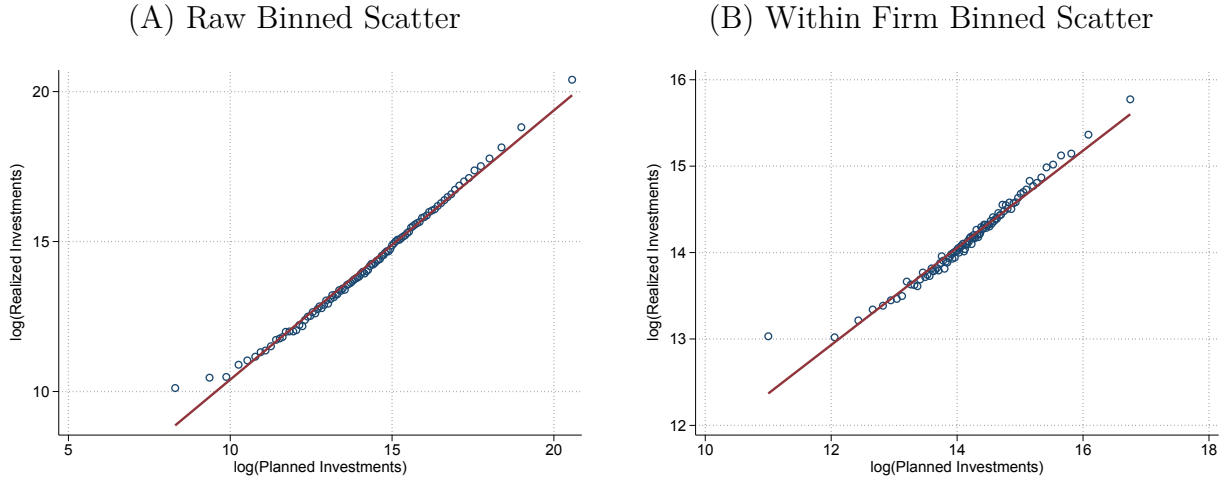
Notes: This figure shows the histogram of the Log Revision Ratio in panel (A) as well as the histogram of the inverse hyperbolic sine (IHS) transformation of the revision ratio in panel (B) in our sample. The Log Revision Ratio is defined as the logarithm of the ratio between realized and planned investment and constitutes one of the two main variables used in the analysis. The hyperbolic sine transformation is defined as $\ln(x + \sqrt{x^2 + 1})$ where x is equal to the ratio of realized over planned investment. For exhibitional reasons, the Log Revision Ratio excludes outliers below -3 and above $+3$ and the hyperbolic sine transformation excludes outliers above the 99th percentile.

downward revisions than untreated firms. This provides a first indication that firms revise investments downwards after a tax hike. Further, we observe firms in treated municipalities within all states of West Germany, about three quarters are in urban and one quarter in rural areas.

Investment Plans and Realizations. Our identification approach relies on the investment plans of firms. Next, we display the distribution of the investment revision ratio and illustrate the strong explanatory power of investment plans for actual investments.

Figure B.1 shows the distribution of the log revision ratio as well as the inverse hyperbolic sine transformation of the revision ratio. While we exclude outliers on both tails of the distribution of the log revision ratio, this is only necessary on the right tail for the inverse hyperbolic sine transformation since the function is defined at zero (equal to approx. 0.88) and not infinity in the limit when converging to zero. Only 0.7% of observations have a revision ratio of zero, hence we do not lose many observations when using the log revision ratio. The log revision ratio is roughly centered around zero, which means that on average, firms invest as much as they have planned. Overall, both distributions indicate that (1) firms revise investments frequently and similarly upwards and downwards and (2) regression results are most likely not driven by outliers in the dependent variable.

Figure B.2 – Correlation of Planned and Realized Investment



Notes: This figure shows scatter plots between log planned investments and log realized investments where observations are binned in 100 percentiles. The left panel uses raw data, while the right panel purges for firm fixed effects. The red line is a linear fit of the data.

Figure B.2 displays binned scatter plots of the relationship between planned and realized investments (both in logs). In the left panel, we observe a strong linear relation of planned and realized investments that virtually corresponding to the 45 degree line. However, this might be partly mechanically driven by level differences between firms. Purging for firm fixed effects, the right panel demonstrates that also within a firm, an increase in planned investments is strongly associated with an increase in realized investments and vice versa in a linear relation.

To investigate this more formally, we regress log realized investments on planned investments as well as lagged realized and planned investments (see Table B.3). Columns (1) and (2) correspond to the linear fit depicted in Figure B.2. In Column (2), we observe that log planned investments are highly significantly correlated with log realized investments after controlling for level differences between firms. Planned investments can explain more than a quarter of the variation of realized investments within firms. The fact that the estimated coefficient is smaller than one is most likely driven by attenuation bias due to measurement error. Columns (3) and (4) show that also lagged log realized and lagged log planned investments have a substantial positive correlation with realized investments, although the within R^2 is lower than for planned investments. In fact, when we run a joint regression with all three explanatory variables, planned investments are much more strongly related to realized investments than lagged realized or planned investments, see Column (5). Hence, investment plans for next year contain a large amount of information that is changing within firms from year to year and is highly predictive for investments that are subsequently realized in that period.

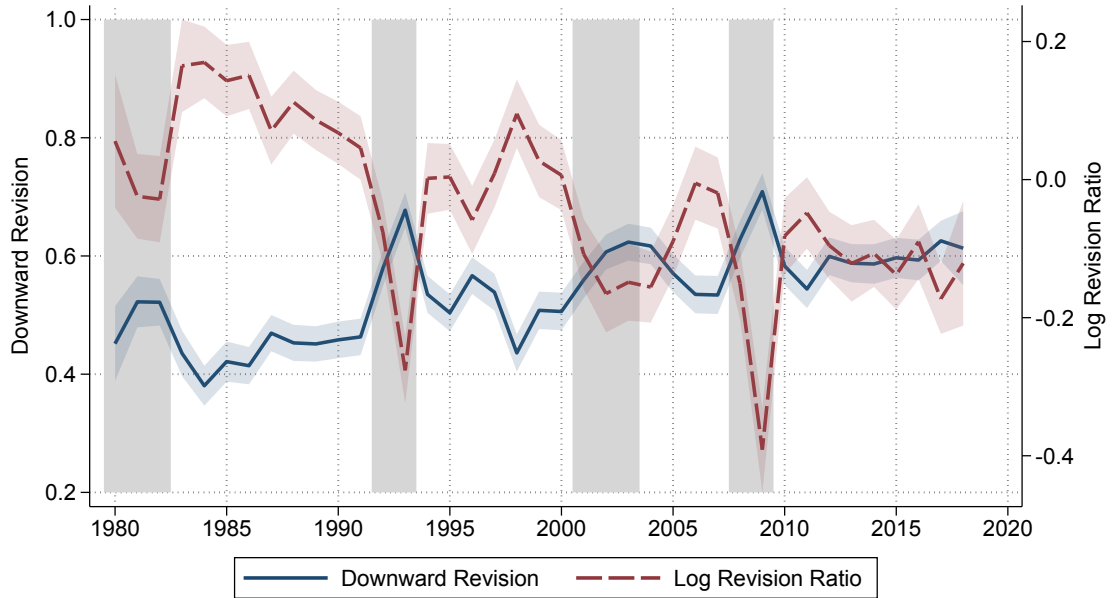
Table B.3 – Information Content of Plans for Realized Investment

	(1)	(2)	(3)	(4)	(5)
Log(Planned Investments)	0.898*** (0.002)	0.562*** (0.005)			0.449*** (0.007)
L.Log(Realized Investments)			0.419*** (0.006)		0.170*** (0.007)
L.Log(Planned Investments)				0.345*** (0.007)	0.050*** (0.007)
Constant	1.421*** (0.031)	6.185*** (0.073)	8.307*** (0.085)	9.354*** (0.095)	4.700*** (0.102)
Observations	34981	34981	27207	27251	27207
R^2 (within)	0.83	0.27	0.17	0.10	0.29
Firm FE	-	✓	✓	✓	✓

Notes: This table reports estimates from linear regressions of log realized investments on (lagged) log planned investments and lagged log realized investments. R^2 (within) displays the share of variation in log realized investments that be can explained by the model in Column (1), and after absorbing firm fixed effects in Columns (2) - (5). Robust standard errors in parentheses. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

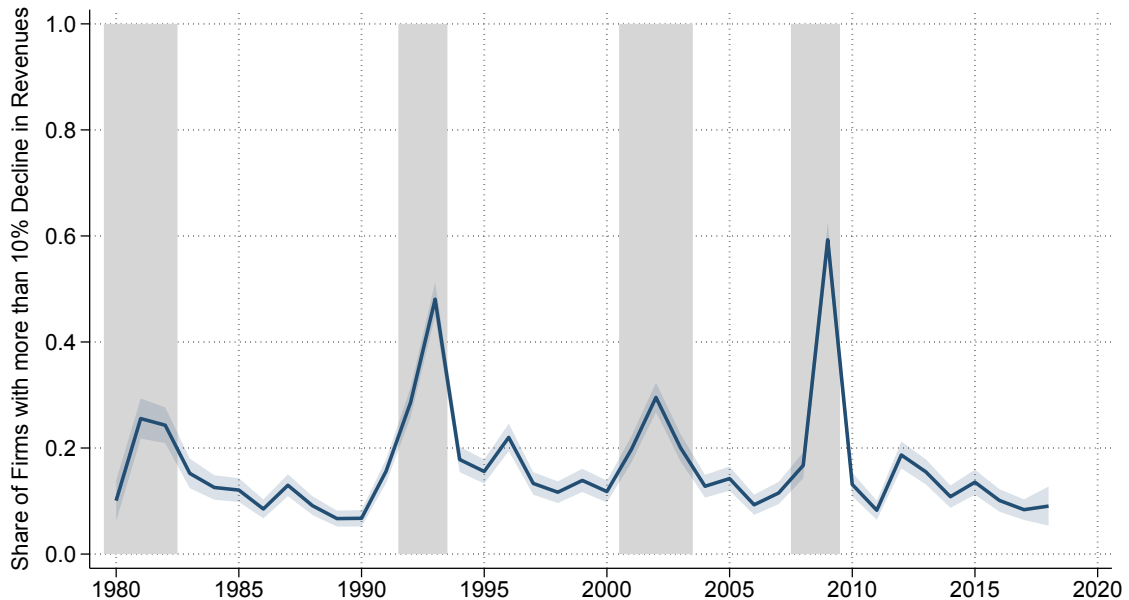
Time Series of Investment Revisions. Figure B.3 presents the share of downward revisions of investment (blue, solid) and the average log revision ratio (red, dashed) over time. The gray shaded areas indicate recession periods. During recessions, the share of downward revisions increases and the log revision ratio decreases. In addition, there might be a slight time trend towards a higher share of firms that revise their investments downwards. However, this is irrelevant for our analysis since we include year fixed effects in the regressions. We therefore do not rely on variation over time for identification, but rather on differences between firms in the same year. Figure B.4 shows the share of firms that report a decline in revenues by more than 10% compared to the previous year. In normal times, we observe that around 10% of firms experience such a revenue drop. In recessions, this share spikes up to 60%. We use this variable in Section 4, where we discuss potential channels of state-dependence in the effect of tax hikes on investment revisions.

Figure B.3 – Time-Series of Investment Revisions



Notes: This figure shows time series of the Log Revision Ratio (right axis), defined as the logarithm of the ratio between realized and planned investment, and the downward revision dummy (left axis), indicating whether a firm has invested less than planned, for the period 1980-2018 in our sample. Blue and red shaded areas indicate 95% pointwise confidence intervals. Gray shaded areas indicate recessions as defined by the German Council of Economic Experts.

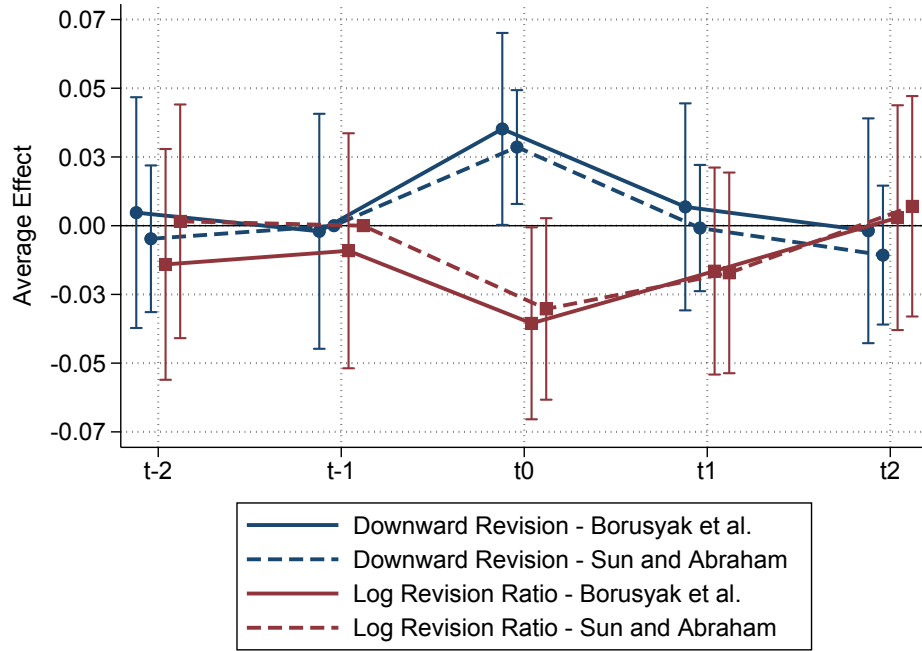
Figure B.4 – Time-Series of Share of Large Revenue Drops



Notes: This figure depicts the time series of the share of firms with large revenue drops, defined as a year-to-year decline in revenues of more than 10%, over the period 1980-2018. Blue shaded areas indicate 95% pointwise confidence intervals, while gray shaded areas indicate recessions as defined by the German Council of Economic Experts.

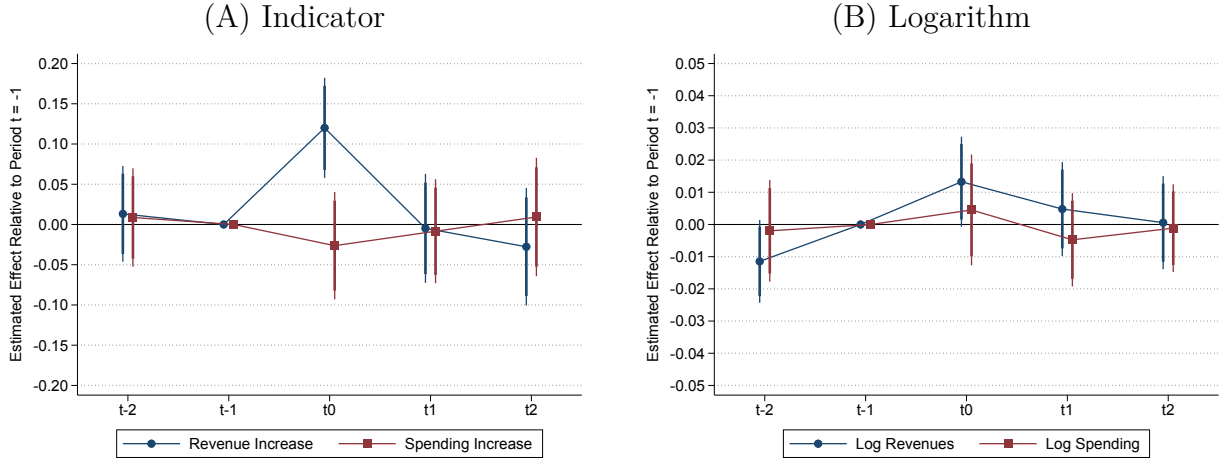
C SUPPLEMENTARY FIGURES AND TABLES

Figure C.1 – Investment Revision Effect after a Tax Hike:
Alternative Estimators



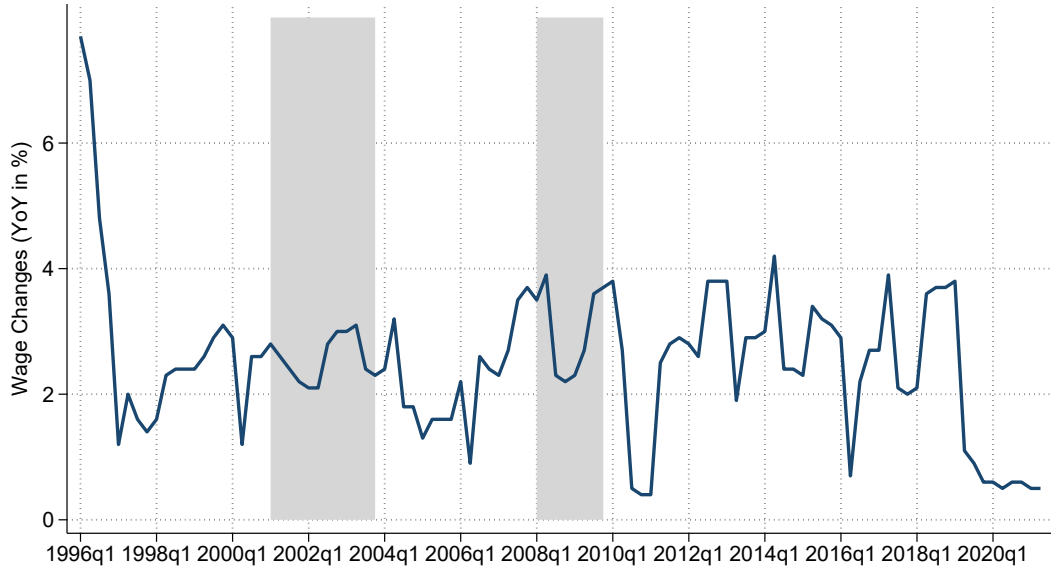
Notes: This figure shows the estimates of the imputation estimator introduced by Borusyak et al. (2021) (solid lines) and the interaction-weighted estimator by Sun and Abraham (2021) (dashed lines). The dependent variable is based on the ratio of realized investments over planned investments (elicited in fall the year before). “Downward Revision” is an indicator that is one if the ratio is below one (blue/circle). “Log Revision Ratio” is the log of the ratio and excludes outliers below -3 and above $+3$ (red/square). The treatment “Tax Hike Indicator” is an indicator that is one if the local corporate tax rate is higher than in the previous year. Time fixed effects and firm fixed effects are absorbed in the estimation. Firms are split into multiple observations in the middle between two tax hikes to ensure that there is only one treatment for each unit. This is feasible due to the nature of the dependent variable, which indicates deviations from investment plans that rule out a long-run effect. Confidence bands refer to the 95% level.

Figure C.2 – Event Study: Expenditures and Revenues of Municipalities



Notes: This figure shows the estimates of the following event-study regression: $Y_{m,t} = \sum_{j=-2}^2 \gamma_j \text{TaxHike}_{m,t}^j + \mu_i + \phi_{l,t} + \psi_{s,t} + \varepsilon_{i,t}$, where μ_i are firm fixed effects, $\psi_{s,t}$ year fixed effects at the industry level, and $\phi_{l,t}$ state-year fixed effects. In the left panel, $Y_{m,t}$ represents an indicator that is one when municipal revenues/spending increases compared to the previous year. In the right panel, $Y_{m,t}$ represents log municipal revenues/spending. The reference period is $t - 1$. Industry fixed effects are at the ifo industry classification level that is comparable to the level of two-digit NACE industries. Standard errors are clustered at the municipality level. The thick and thin confidence bands refer to the levels of 90% and 95%.

Figure C.3 – Collectively Bargained Wage Growth in Manufacturing



Notes: This figure shows year-on-year changes of the index of hourly earnings in the manufacturing sector without special payments obtained from the German Statistical Office. Grey shaded areas indicate recessions as defined by the German Council of Economic Experts.

**Table C.1 – Robustness of Estimated Treatment Effect:
Inverse Hyperbolic Sine Transformation**

	Inverse Hyperbolic Sine Revision Ratio				
	(1)	(2)	(3)	(4)	(5)
Tax Hike Indicator: $\mathbb{1}(\Delta tax_{m,t} > 0)$					
	-0.026** (0.011)	-0.026** (0.011)	-0.022* (0.011)	-0.023** (0.011)	-0.026** (0.012)
Constant	0.928*** (0.005)	0.928*** (0.005)	0.927*** (0.001)	0.927*** (0.001)	0.928*** (0.001)
Tax Hike in Percentage Points: $\Delta tax_{m,t}$					
	-0.017* (0.009)	-0.021** (0.009)	-0.020** (0.009)	-0.023** (0.009)	-0.024** (0.011)
Constant	0.927*** (0.005)	0.927*** (0.005)	0.927*** (0.001)	0.927*** (0.001)	0.927*** (0.001)
Observations	34876	34876	34876	34876	34874
Year FE	-	✓	-	✓	-
Firm FE	-	-	✓	✓	✓
Year \times State FE	-	-	-	-	✓
Year \times Industry FE	-	-	-	-	✓

Notes: This table reports estimates from linear regressions based on Equation 1. The dependent variable “Inverse Hyperbolic Sine Revision Ratio” is the inverse hyperbolic sine transformation of the ratio of realized investments over planned investments (elicited in fall the year before) and excludes outliers above the 99th percentile. “Tax Hike Indicator” is an indicator that is one if the local corporate tax rate is higher than in the year before. “Tax Hike” is the change in the local corporate tax rate in percentage points compared to the previous year. Industry fixed effects are at the ifo industry classification level that is comparable to the level of two-digit NACE industries. Standard errors in parentheses are clustered at the municipality level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.2 – Treatment Effect Heterogeneity: State Dependence

	Downward Revision				Log Revision Ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel (A): Baseline Recession Definition by the German Council of Economic Experts</i>								
Tax Hike Indicator ×								
No Recession	0.020 (0.012)	0.023* (0.013)			-0.011 (0.019)	-0.016 (0.021)		
Recession	0.061*** (0.021)	0.068*** (0.024)			-0.069** (0.034)	-0.081** (0.037)		
Tax Hike ×								
No Recession			0.016 (0.011)	0.017 (0.012)			-0.017 (0.018)	-0.021 (0.021)
Recession			0.036** (0.016)	0.043** (0.019)			-0.050* (0.027)	-0.061** (0.030)
Constant	0.536*** (0.001)	0.536*** (0.001)	0.537*** (0.001)	0.537*** (0.001)	-0.035*** (0.001)	-0.034*** (0.001)	-0.035*** (0.001)	-0.034*** (0.001)
<i>Panel (B): Alternative Recession Definition by Negative Year-on-Year Real GDP Growth</i>								
Tax Hike Indicator ×								
No Recession	0.021* (0.011)	0.022* (0.012)			-0.021 (0.017)	-0.022 (0.019)		
Recession	0.085*** (0.027)	0.108*** (0.030)			-0.053 (0.047)	-0.090* (0.052)		
Tax Hike ×								
No Recession			0.016 (0.010)	0.015 (0.011)			-0.024 (0.016)	-0.024 (0.018)
Recession			0.059*** (0.021)	0.081*** (0.026)			-0.052 (0.040)	-0.089** (0.043)
Constant	0.536*** (0.001)	0.536*** (0.001)	0.537*** (0.001)	0.537*** (0.001)	-0.035*** (0.001)	-0.034*** (0.001)	-0.035*** (0.001)	-0.034*** (0.001)
Observations	35228	35228	35228	35228	34552	34552	34552	34552
Year FE	✓	-	✓	-	✓	-	✓	-
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Notes: This table reports estimates from linear regressions based on Equation 1, where the tax hike treatment is split into recession and non-recession years. In Panel (A), 1980-1982, 1992-1993, 2001-2003, and 2008-2009 are classified as recession years as defined by the German Council of Economic Experts. In Panel (B), 1982, 1993, 2002, 2003, and 2009 are classified as recession years as these years showed negative real GDP growth according to World Bank data: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=DE>). The dependent variable is based on the ratio of realized investments over planned investments (elicited in fall the year before). “Downward Revision” is an indicator that is one if the ratio is below one. “Log Revision Ratio” is the log of the ratio and excludes outliers below -3 and above $+3$. “Tax Hike Indicator” is an indicator that is one if the local corporate tax rate is higher than in the year before. “Tax Hike” is the change in the local corporate tax rate in percentage points compared to the previous year. Industry fixed effects are at the ifo industry classification level that is comparable to the level of two-digit NACE industries. Standard errors in parentheses are clustered at the municipality level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

**Table C.3 – Treatment Effect Heterogeneity:
Firm Size and Settlement Structure**

	Downward Revision				Log Revision Ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel (A): Heterogeneity by Firm Size</i>								
Tax Hike Indicator ×								
Small Firms	0.030*	0.033*			-0.028	-0.033		
	(0.017)	(0.017)			(0.029)	(0.030)		
Large Firms	0.029**	0.035**			-0.023	-0.031		
	(0.013)	(0.014)			(0.017)	(0.020)		
Tax Hike ×								
Small Firms			0.023	0.027*			-0.035	-0.041
			(0.014)	(0.015)			(0.025)	(0.027)
Large Firms			0.023**	0.025*			-0.024	-0.030
			(0.012)	(0.013)			(0.016)	(0.019)
Constant	0.536***	0.536***	0.537***	0.537***	-0.035***	-0.034***	-0.035***	-0.034***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
<i>Panel (B): Heterogeneity by Settlement Structure</i>								
Tax Hike Indicator ×								
Urban Area	0.028**	0.031**			-0.016	-0.023		
	(0.012)	(0.013)			(0.018)	(0.021)		
Rural Area	0.040*	0.047*			-0.066*	-0.070*		
	(0.023)	(0.025)			(0.036)	(0.039)		
Tax Hike ×								
Urban Area			0.021**	0.023*			-0.019	-0.024
			(0.011)	(0.012)			(0.017)	(0.020)
Rural Area			0.031*	0.036*			-0.069**	-0.071**
			(0.018)	(0.020)			(0.028)	(0.031)
Constant	0.536***	0.536***	0.537***	0.537***	-0.035***	-0.035***	-0.035***	-0.035***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	35228	35228	35228	35228	34552	34552	34552	34552
Year FE	✓	-	✓	-	✓	-	✓	-
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Notes: This table reports estimates from linear regressions based on Equation 1. In Panel (A), the tax hike treatment is split into small (< 250 employees) and large (≥ 250 employees) firms. In Panel (B) the treatment variables are interacted with indicators of urban and rural areas following the classification of the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) that is mainly based on population density. The dependent variable is based on the ratio of realized investments over planned investments (elicited in fall the year before). “Downward Revision” is an indicator that is one if the ratio is below one. “Log Revision Ratio” is the log of the ratio and excludes outliers below -3 and above $+3$. “Tax Hike Indicator” is an indicator that is one if the local corporate tax rate is higher than in the year before. “Tax Hike” is the change in the local corporate tax rate in percentage points compared to the previous year. Industry fixed effects are at the ifo industry classification level that is comparable to the level of two-digit NACE industries. Standard errors in parentheses are clustered at the municipality level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.4 – Treatment Effect Heterogeneity: Tax Hike Dynamics

	Downward Revision				Log Revision Ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel (A): Heterogeneity by the Frequency of Tax Hikes</i>								
Tax Hike Indicator ×								
Few Tax Hikes	0.025 (0.016)	0.030* (0.017)			-0.018 (0.027)	-0.025 (0.031)		
Many Tax Hikes	0.032** (0.014)	0.036** (0.015)			-0.029 (0.020)	-0.036 (0.023)		
Tax Hike ×								
Few Tax Hikes			0.027** (0.013)	0.027* (0.015)			-0.036* (0.021)	-0.035 (0.024)
Many Tax Hikes			0.021* (0.012)	0.025* (0.014)			-0.025 (0.020)	-0.035 (0.024)
Constant	0.536*** (0.001)	0.536*** (0.001)	0.537*** (0.001)	0.537*** (0.001)	-0.035*** (0.001)	-0.034*** (0.001)	-0.035*** (0.001)	-0.034*** (0.001)
Observations	35228	35228	35228	35228	34552	34552	34552	34552
<i>Panel (B): Heterogeneity by Occurrence of a Tax Hike in the Last 5 Years</i>								
Tax Hike Indicator ×								
≥ 1 Hike in Last 5 Years	0.043** (0.019)	0.055*** (0.021)			-0.062** (0.027)	-0.073** (0.031)		
No Hike in Last 5 Years	0.018 (0.013)	0.021 (0.013)			0.002 (0.021)	-0.002 (0.023)		
Tax Hike ×								
≥ 1 Hike in Last 5 Years			0.035** (0.016)	0.048** (0.019)			-0.055** (0.023)	-0.070** (0.028)
No Hike in Last 5 Years			-0.001 (0.024)	-0.010 (0.025)			-0.041 (0.039)	-0.037 (0.041)
Constant	0.541*** (0.001)	0.541*** (0.001)	0.542*** (0.001)	0.541*** (0.001)	-0.041*** (0.001)	-0.041*** (0.001)	-0.041*** (0.001)	-0.041*** (0.001)
Observations	33140	33121	33140	33121	32485	32466	32485	32466
Year FE	✓	-	✓	-	✓	-	✓	-
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Notes: This table reports estimates from linear regressions based on Equation 1. In Panel (A), the tax hike treatment variable is interacted with dummies splitting the sample into municipalities with few (≤ 3) and many (> 3) tax hikes over the entire sample period. In Panel (B), the tax hike treatment is split into cases where at least one tax hike has already occurred in the previous five years and where no tax hike occurred in the previous five years in the respective municipality. The dependent variable is based on the ratio of realized investments over planned investments (elicited in fall the year before). “Downward Revision” is an indicator that is one if the ratio is below one. “Log Revision Ratio” is the log of the ratio and excludes outliers below -3 and above $+3$. “Tax Hike Indicator” is an indicator that is one if the local corporate tax rate is higher than in the year before. “Tax Hike” is the change in the local corporate tax rate in percentage points compared to the previous year. Industry fixed effects are at the ifo industry classification level that is comparable to the level of two-digit NACE industries. Standard errors in parentheses are clustered at the municipality level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.5 – Treatment Effect Heterogeneity: Volatility of Revenue Growth

	Downward Revision				Log Revision Ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tax Hike Indicator ×								
Low Revenue Growth Volatility	0.026*	0.032**			-0.003	-0.010		
	(0.015)	(0.015)			(0.021)	(0.023)		
High Revenue Growth Volatility	0.035**	0.038**			-0.050**	-0.055**		
	(0.015)	(0.016)			(0.024)	(0.026)		
Tax Hike ×								
Low Revenue Growth Volatility			0.020	0.023			-0.005	-0.011
			(0.013)	(0.014)			(0.019)	(0.021)
High Revenue Growth Volatility			0.028**	0.031**			-0.056***	-0.060**
			(0.013)	(0.015)			(0.021)	(0.025)
Constant	0.536***	0.536***	0.537***	0.537***	-0.035***	-0.034***	-0.035***	-0.034***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	35079	35075	35079	35075	34414	34410	34414	34410
Year FE	✓	-	✓	-	✓	-	✓	-
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Notes: This table reports estimates from linear regressions based on Equation 1, where the tax hike treatment is split into firms with low and high revenue growth volatility (split at median of firm-level standard deviation in revenue growth elicited in the ifo Investment Survey). The dependent variable is based on the ratio of realized investments over planned investments (elicited in fall the year before). “Downward Revision” is an indicator that is one if the ratio is below one. “Log Revision Ratio” is the log of the ratio and excludes outliers below -3 and above $+3$. “Tax Hike Indicator” is an indicator that is one if the local corporate tax rate is higher than in the year before. “Tax Hike” is the change in the local corporate tax rate in percentage points compared to the previous year. Industry fixed effects are at the ifo industry classification level that is comparable to the level of two-digit NACE industries. Standard errors in parentheses are clustered at the municipality level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.6 – Treatment Effect Heterogeneity: Current Revenue Growth I

	Downward Revision				Log Revision Ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tax Hike Indicator ×								
No Recession ×								
No Strong Revenue Drop	0.020 (0.013)	0.026* (0.013)			-0.016 (0.020)	-0.021 (0.022)		
Strong Revenue Drop	0.014 (0.034)	0.000 (0.034)			0.027 (0.056)	0.033 (0.056)		
Recession ×								
No Strong Revenue Drop	0.068*** (0.026)	0.075*** (0.029)			-0.071* (0.040)	-0.080* (0.044)		
Strong Revenue Drop	0.040 (0.036)	0.045 (0.038)			-0.059 (0.065)	-0.068 (0.069)		
Strong Revenue Drop	0.105*** (0.008)	0.093*** (0.009)	0.105*** (0.008)	0.093*** (0.008)	-0.197*** (0.014)	-0.176*** (0.015)	-0.198*** (0.014)	-0.177*** (0.014)
Tax Hike ×								
No Recession ×								
No Strong Revenue Drop			0.017 (0.012)	0.020 (0.013)			-0.022 (0.019)	-0.027 (0.022)
Strong Revenue Drop			0.013 (0.032)	-0.002 (0.033)			0.017 (0.051)	0.031 (0.051)
Recession ×								
No Strong Revenue Drop			0.044** (0.018)	0.051** (0.023)			-0.063** (0.031)	-0.071** (0.036)
Strong Revenue Drop			0.012 (0.030)	0.016 (0.032)			-0.014 (0.053)	-0.025 (0.056)
Constant	0.519*** (0.002)	0.521*** (0.002)	0.520*** (0.001)	0.522*** (0.002)	-0.003 (0.003)	-0.006** (0.003)	-0.003 (0.002)	-0.006** (0.003)
Observations	35051	35051	35051	35051	34380	34380	34380	34380
Year FE	✓	-	✓	-	✓	-	✓	-
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Notes: This table reports estimates from linear regressions based on Equation 1, where the tax hike treatment effect is estimated separately for each combination of recession and non-recession years and indicators of strong and weak revenue drops. A strong revenue drop is defined as a decline in revenues by more than 10% compared to the previous year. The dependent variable is based on the ratio of realized investments over planned investments (elicited in fall the year before). “Downward Revision” is an indicator that is one if the ratio is below one. “Log Revision Ratio” is the log of the ratio and excludes outliers below -3 and above $+3$. “Tax Hike Indicator” is an indicator that is one if the local corporate tax rate is higher than in the year before. “Tax Hike” is the change in the local corporate tax rate in percentage points compared to the previous year. 1980-1982, 1992-1993, 2001-2003, and 2008-2009 are classified as recession years as defined by the German Council of Economic Experts. Industry fixed effects are at the ifo industry classification level that is comparable to the level of two-digit NACE industries. Standard errors in parentheses are clustered at the municipality level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.7 – Treatment Effect Heterogeneity: Current Revenue Growth II

	(1)	(2)	(3)	(4)	(5)
Tax Hike Indicator ×					
No Recession ×					
No Strong Revenue Drop	0.027** (0.012)	0.020 (0.013)	0.026* (0.013)	0.027 (0.017)	0.034* (0.018)
Strong Revenue Drop	0.004 (0.033)	0.014 (0.034)	0.000 (0.034)	-0.022 (0.057)	0.003 (0.061)
Recession ×					
No Strong Revenue Drop	0.062** (0.025)	0.068*** (0.026)	0.075*** (0.029)	0.079** (0.033)	0.077** (0.039)
Strong Revenue Drop	0.018 (0.034)	0.040 (0.036)	0.045 (0.038)	-0.027 (0.072)	-0.014 (0.076)
Strong Revenue Drop	0.122*** (0.008)	0.105*** (0.008)	0.093*** (0.009)	0.085*** (0.014)	0.069*** (0.015)
Constant	0.516*** (0.005)	0.519*** (0.002)	0.521*** (0.002)	0.498*** (0.002)	0.499*** (0.002)
<i>N</i>	35052	35051	35051	21145	21089
Year FE	✓	✓	-	✓	-
Firm FE	-	✓	✓	✓	✓
Year X State FE	-	-	✓	-	✓
Year X Industry FE	-	-	✓	-	✓
Exclude Labor Drop	-	-	-	Yes, < -5%	Yes, < -5%

Notes: This table reports estimates from linear regressions based on Equation 1, where the tax hike treatment effect is estimated separately for each combination of recession and non-recession years as well as indicators of strong and weak revenue drop observations. A strong revenue drop is defined as a decline in revenue by more than 10% compared to the previous year. In Columns (4) and (5), we drop firm observations that have a decrease in employees by more than 5% compared to the previous year. “Downward Revision” is an indicator that is one if the ratio of realized investments over planned investments (elicited in fall the year before) is below one. “Tax Hike Indicator” is an indicator that is one if the local corporate tax rate is higher than in the year before. 1980-1982, 1992-1993, 2001-2003, and 2008-2009 are classified as recession years as defined by the German Council of Economic Experts. Industry fixed effects are at the ifo industry classification level that is comparable to the level of two-digit NACE industries. Standard errors in parentheses are clustered at the municipality level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.8 – Treatment Effect Heterogeneity: Financial Constraints

	Downward Revision				Log Revision Ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tax Hike Indicator ×								
No Recession ×								
No Fin. Constr.	0.025*	0.024			-0.007	-0.005		
	(0.015)	(0.016)			(0.022)	(0.025)		
Fin. Constr.	0.008	-0.011			-0.023	-0.014		
	(0.056)	(0.058)			(0.129)	(0.136)		
Recession ×								
No Fin. Constr.	0.024	0.039			-0.030	-0.058		
	(0.028)	(0.030)			(0.045)	(0.048)		
Fin. Constr.	0.115*	0.138*			-0.051	-0.068		
	(0.066)	(0.071)			(0.127)	(0.131)		
Fin. Constr.	0.114***	0.110***	0.116***	0.112***	-0.225***	-0.213***	-0.225***	-0.213***
	(0.017)	(0.017)	(0.016)	(0.016)	(0.031)	(0.032)	(0.031)	(0.032)
Tax Hike ×								
No Recession ×								
No Fin. Constr.			0.025*	0.020			-0.023	-0.015
			(0.015)	(0.017)			(0.023)	(0.026)
Fin. Constr.			-0.014	-0.035			-0.038	-0.031
			(0.052)	(0.054)			(0.114)	(0.122)
Recession ×								
No Fin. Constr.			0.015	0.026			-0.016	-0.037
			(0.022)	(0.025)			(0.035)	(0.041)
Fin. Constr.			0.052	0.069			-0.034	-0.038
			(0.066)	(0.080)			(0.113)	(0.122)
Constant	0.552***	0.552***	0.552***	0.552***	-0.057***	-0.057***	-0.056***	-0.057***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
Observations	23722	23706	23722	23706	23312	23297	23312	23297
Year FE	✓	-	✓	-	✓	-	✓	-
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Notes: This table reports estimates from linear regressions based on Equation 1, where the tax hike treatment effect is estimated separately for each combination of recession and non-recession years as well as indicators on whether the financing situation is reported to be a factor for a strong slowdown in investment volumes or not. To construct the financing indicator, we use a question from the fall survey (available since 1989), where firms rate on a scale from 1 (strong stimulus) to 5 (strong slowdown) different factors that influence investments in the current year, see Appendix B for the exact wording. We construct an indicator that is one if a firm reports the highest category (5). The dependent variable is based on the ratio of realized investments over planned investments (elicited in fall the year before). “Downward Revision” is an indicator that is one if the ratio is below one. “Log Revision Ratio” is the log of the ratio and excludes outliers below -3 and above $+3$. “Tax Hike Indicator” is an indicator that is one if the local corporate tax rate is higher than in the year before. “Tax Hike” is the change in the local corporate tax rate in percentage points compared to the previous year. 1980-1982, 1992-1993, 2001-2003, and 2008-2009 are classified as recession years as defined by the German Council of Economic Experts. Industry fixed effects are at the ifo industry classification level that is comparable to the level of two-digit NACE industries. Standard errors in parentheses are clustered at the municipality level. Levels of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

D BACK-OF-THE-ENVELOPE CALCULATION

In the following, we present the assumptions underlying the back-of-the-envelope calculation used to approximate the investment loss for each additional Euro of tax revenue.

The median firm in our sample generates yearly revenues of 45 million Euro. Among the subsample of firms that can be linked to information on the cashflow/revenue ratio balance sheet data, the median profit margin is 4.4%. Assuming that this figure corresponds to all firms in the sample, this translates into 1.98 million Euro of aggregate profits. A one percentage point increase in the LBT increases the tax burden of the median firm by—and thus overall tax revenues of—19,800 Euro.

Moreover, the median investment-revenue ratio amounts to 3% in the microdata of the ifo Investment Survey. Hence, the median firm invests approximately 1.4 million Euro each year. Given the estimated semi-elasticity of 3 (see Section 3), a one percentage point increase in the LBT is associated with decreased investment of the median firm by roughly 42,000 Euro. Finally, dividing 42,000 by 19,800 gives that 2.12 Euro of investment volume is lost for each additional Euro of tax revenue.

In crisis years, we estimate a semi-elasticity of investments with respect to the LBT rate of 6. Assuming that the relation between the profit margin and investment-revenue ratio is the same in a recession, investments even decrease by 4.24 Euro for each additional Euro of tax revenue.²

²In fact, the profit margin decreases slightly more than the investment-revenue ratio in recessions. Incorporating this relation in the calculation would lead to an even higher loss of investments for each additional Euro of tax revenue in recessions.

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