Appendix for Online Publication: Downward Revision of Investment Decisions after Corporate Tax Hikes

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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. Finally, Appendix E describes the calculation of effective tax rates in detail.

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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 (*Körperschaftssteuer*). 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 to 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:

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

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.

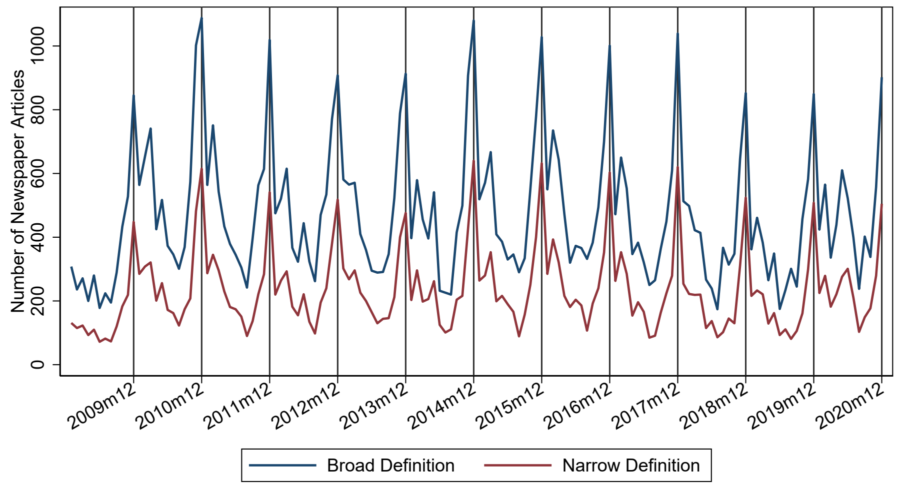


Figure A.1. Timing of Tax Hike News

Note: This figure provides evidence on the point in time when firms typically learn about a tixe 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*)".

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 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. As documented in Appendix B.1, a decision to increase the LBT sends no clear signal about the likelihood of future tax changes.

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 with establishments in more than one municipality are divided between municipalities according to formula apportionment based on the payroll share. As a consequence, profit shifting between municipalities requires the actual re-allocation of the employees (or wages) of a firm, and is thus associated with relatively high costs. 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

This appendix provides comprehensive information on the data sets used in the empirical analysis (including the translated wording of the relevant survey questions from the ifo Investment Survey), explains how we obtain our analysis sample, and reports summary statistics and aggregate time series of our final sample.

1. Administrative Data at the Municipality Level

The administrative data on tax rates and municipality revenues and expenditures used in this paper cover the period from 1980 to 2018. The data largely correspond to the municipality data underlying the analysis in Fuest, Peichl and Siegloch (2018), comprising the period 1993 to 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. For the state of Schleswig-Holstein, data were not available in the year 1980. For Bremen and Saarland, data are only available since 1990. As these are the two smallest states of Germany in terms of GDP and population, jointly comprising less than 2% of the German population, this does not substantially change the composition of our sample. For all years, the data contain information on scaling factors of the LBT. In addition, we know the full municipality budget, that is all categories of expenditures and revenues, for most years. For a more detailed description of the data, we refer to Fuest, Peichl and Siegloch (2018) and Isphording et al. (2021).

There is substantial variation in LBT rates across municipalities and over time. To document this variation, we use the subset of municipalities, where we observe at least one firm during our sample period in the ifo Investment Survey. Figure B.1 plots the raw data of the local scaling factors for each municipality in Western Germany (excl. Berlin) over time, demonstrating that there is a lot of variation in local business taxes in any given year. Municipalities tend to increase the LBT approximately ten times as frequently as decreasing it. In consequence, the statistical power of this variation is too low to investigate the effect of tax drops in our data, and the analysis is thus restricted to tax hikes.[1] Accordingly, Figure B.2 shows that the share of municipalities that increased the LBT in a given year is relatively stable over time and does not differ between recessions and expansions. Moreover, Panel (A) of Figure B.3 plots the fraction of municipalities that underwent a given number of tax hikes in the period between 1980 and 2018. The median municipality experienced three tax hikes, while taxes were never increased in only 6.3% of municipalities. The average duration between two tax hikes in our sample is 14.6 years, the median duration 13 years. Panel

[1] The number of tax decreases that could in principle be used in the analysis is very low. If we followed the protocol in Appendix B.3 to combine the municipality-level data on LBT rates and the firm-level data from the IVS, our analysis could only exploit 236 firm observations (0.7% of all firm-year observations) that face a tax drop in a given year despite spanning a time frame of almost four decades.

(B) displays the mean and various percentiles of the size of tax hikes over time. The distribution of tax hikes is rather stable over time in terms of average size and dispersion. If anything, tax hikes were slightly larger in the early 1980s and slightly lower in the 2010s.

To shed light on the dynamic aspects of tax hikes, Figure B.4 documents how a tax hike in year t_0 influences the probability for future tax hikes in the same municipality. Specifically, the figure displays the coefficients of separate regressions of the following form

$$TaxHike_{m,t+x} = \beta TaxHike_{m,t} + \mu_m + \epsilon_{m,t} \quad \forall x = \{1, 20\},$$

where $TaxHike_{m,t+x}$ is an indicator for a tax hike occurring x years after a tax hike in the same municipality m in year t that is estimated separately for each year in the future $x \in \{1, 20\}$. In the right panel, we include municipality fixed effects. The results show that tax hikes contain little predictive power for future tax hikes. While the unconditional probability for future tax hikes is slightly elevated if a tax hike has recently been enacted, the association is very weak and completely vanishes when including municipality fixed effects, which corresponds to the tax rate variation exploited in our main analyses (that applies firm fixed effects which are themselves nested within municipalities).

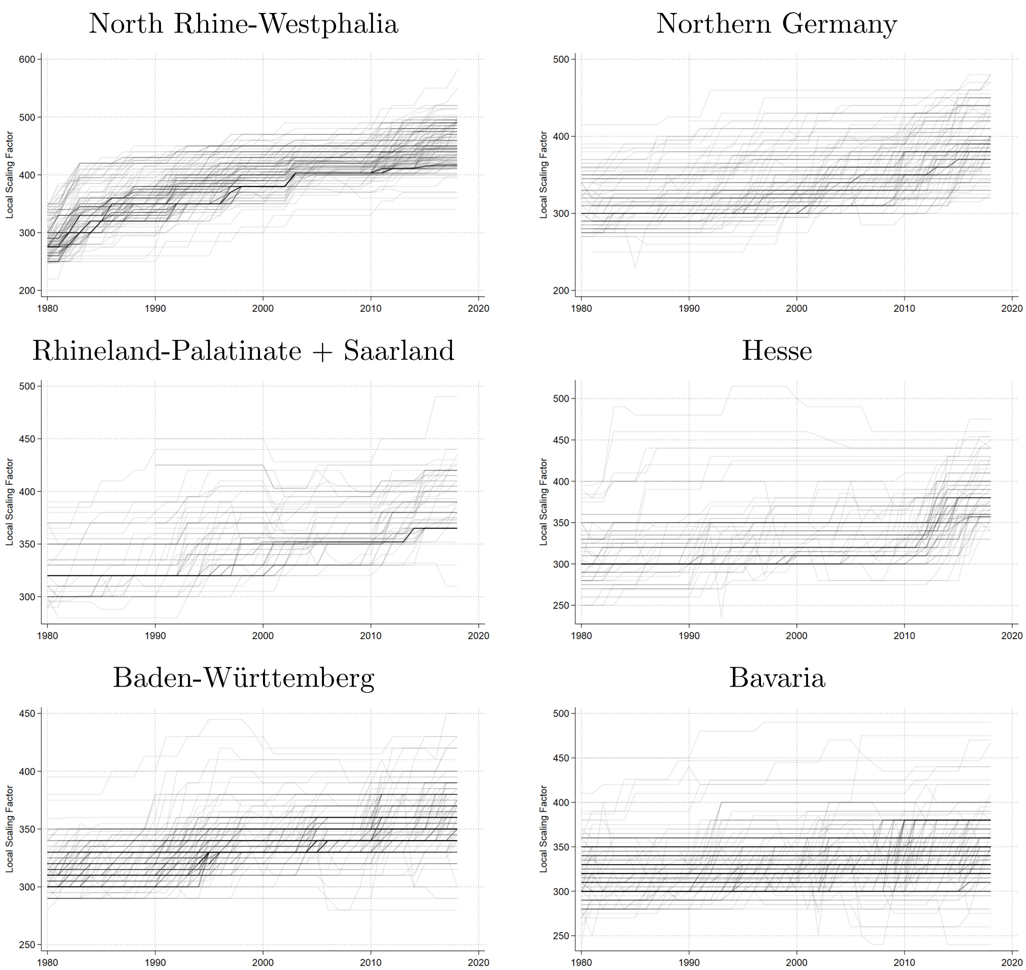


Figure B.1. Time Series of Local Scaling Factors by Municipality

Note: This figure shows the local scaling factors underlying the LBT for each municipality in West Germany (excl. West-Berlin) over the period between 1980 and 2018. "Northern Germany" summarizes the states of Schleswig-Holstein, Hamburg, Bremen, and Lower Saxony.

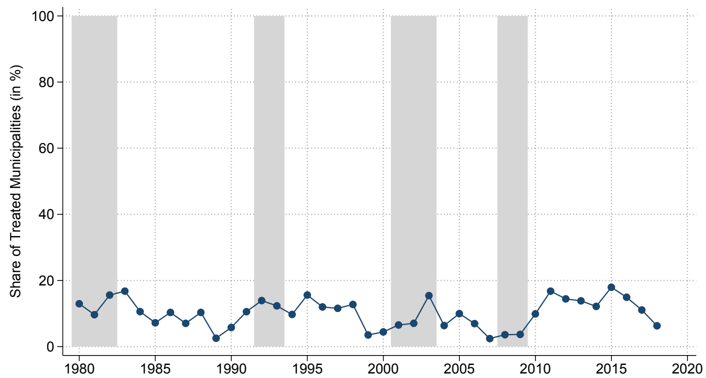


Figure B.2. Share of Municipalities Increasing the LBT over Time

Note: This figure shows the share of municipalities that increased the LBT in a given year. Gray shaded areas indicate recessions as defined by the German Council of Economic Experts.

(A) Number of Tax Hikes per Municipality

(B) Distribution of Tax Hikes over Time

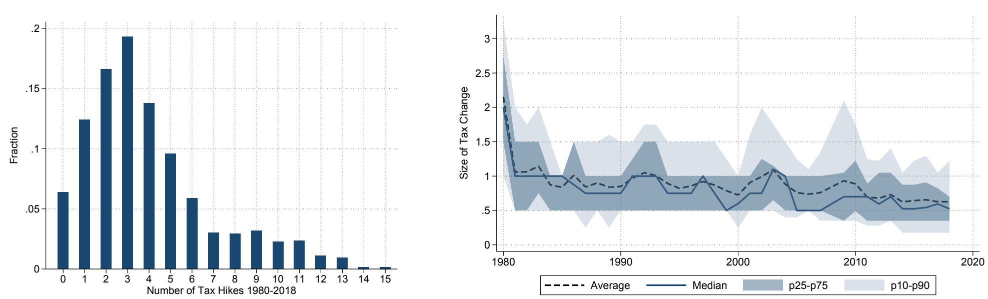


Figure B.3. Number of Tax Hikes and Distribution of Tax Changes

Note: Panel (A) plots the fraction of municipalities that underwent a given number of tax hikes in the period between 1980 and 2018. Panel (B) displays the average size of tax hikes (in percentage points) along with various distributional parameters, i.e., the median, the interquartile range, and the range between the 10th and 90th percentile of tax hikes in a given year.

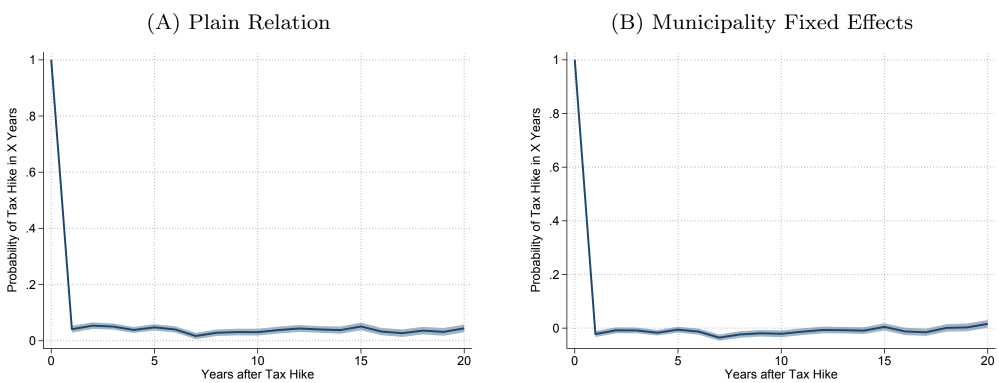


Figure B.4. Predictability of Tax Hikes as a Function of Past Tax Hikes in the Same Municipality

Note: This figure reports how a tax hike in year t_0 influences the probability for future tax hikes in the same municipality, by showing the estimates of separate regressions with tax hike indicators x years in the future as dependent variable and a tax hike indicator for the current year as explanatory variable: $TaxHike_{m,t+x} = \beta TaxHike_{m,t} + \mu_m + \epsilon_{m,t} \ \forall x = \{1, 20\}$. In the right panel, we include municipality fixed effects, so that the graph shows the probability of future tax hikes conditional on knowing the institutional and political economy patterns of the own municipality.

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. The aim of the IVS is to supplement investment data collected by the German Statistical Office, which is only available with a time lag of two years, with more recent data by means of extrapolations at the industry level. The survey is part of the European Commission's sponsored investment surveys in its member countries and participation in the survey is supported by several industry associations. All of this background information is contained in the cover letter of each survey. The aggregated investment volume of the participants of the IVS represents approximately 56% of overall investment in the manufacturing sector (see Sauer and Wohlrabe (2020), p. 145).

The repeated panel structure of the ifo Investment Survey allows tracking approximately 1,500 firms over time. As outlined in greater detail below, 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-related variables, firms also report annual 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. After a protection period of one and a half years, the anonymized data can be accessed via the LMU-ifo Economics & Business Data Center under strict non-disclosure regulations (`https://www.ifo.de/en/ebdc`).

The survey is usually completed by high-level management personnel at the firms' controlling departments (Sauer and Wohlrabe, 2020). The ifo Institute incentivizes the participation to the survey by automatically providing the participants with the survey results free of charge as a thank-you for their cooperation. In order to create an additional incentive for participation in the investment survey, this reporting includes more detailed information, e.g., at more disaggregate sectoral levels, compared to the results that are reported publicly.

Representativeness and Accuracy. — 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, 17.3% 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

Table B.1—Distribution of Firms in the IVS by Industry and Size

		ifo Investment Survey				Actual Germany by			
WZ08	Industry	Small	Medium	Large	Total	Count	Employees	GVA	Payroll
10-12	Food, beverages, and tobacco	1.1	3.6	3.6	8.2	14.0	12.4	7.8	7.0
13-15	Textiles, apparel, and leather	1.2	1.8	1.0	4.1	4.2	1.8	1.1	1.1
16-18	Wood/paper products and printing	3.0	5.7	3.5	12.2	11.8	5.5	4.3	4.0
19	Coke and refined petroleum	-	-	0.3	0.6	0.0	0.3	0.8	0.5
20	Chemicals	-	1.1	3.4	4.7	1.5	4.6	6.9	6.0
21	Pharmaceuticals, medicinal chemical, and botanical	-	0.4	1.0	1.4	0.3	1.9	3.1	3.0
22+23	Rubber/plastic products, and other non-metallic	1.4	6.4	6.4	14.2	8.1	9.0	7.6	7.7
24+25	Basic and fabricated metal products	2.1	6.8	8.4	17.3	21.9	15.7	13.2	13.5
26	Computers, electronics, and optical products	-	1.0	2.4	3.6	3.7	4.8	5.4	5.5
27	Electrical equipment	-	1.3	3.8	5.3	2.9	6.4	7.0	7.5
28	Machinery and equipment	0.5	5.3	11.1	17.0	7.7	15.7	16.7	18.0
29+30	Transport equipment	-	0.8	4.0	4.9	1.9	13.2	19.0	19.1
31-33	Other, and installation of machinery and equipment	1.2	2.1	3.2	6.4	21.9	8.6	7.0	7.0
Total		11.4	36.5	52.2	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				

Note: 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.

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 general, the accuracy of the IVS data appears to be quite high, as the average deviations of the survey results from the data of the Federal Statistical Office for the manufacturing sector as a whole are only relatively minor. For instance, 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. Similarly, 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. Sauer and Wohlrabe (2020) stress that it should be borne in mind that, at the time investments were recorded in the survey, the balance sheets of some of the companies may not yet be final, while the official results, on the other hand, are based on the final balance sheet figures.

Lastly, and in line with evidence presented in Appendix B.3, Bachmann, Elstner and Hristov (2017) present a series of stylized facts on the cross-sectional and time-series properties of revisions of investment plans, i.e., the difference between ex ante planned and ex post realized investment volumes, showing that these deviations are meaningful along many dimensions. For example, they document that the overall distribution of revisions is not systematically skewed, while their cross-sectional average is procyclical. This indicates that participants provide accurate investment plans given their current level of knowledge at the time of the survey.

Wording of Questions in the IVS Used in the Paper. — In the following, we present the translated wording of the questions of the IVS that we use in the paper.

Fall Questionnaire

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	☐	☐	☐	☐	☐
	b) ...					
Next year:	a) Financing situation	☐	☐	☐	☐	☐
	b) ...					

Spring Questionnaire

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):	_______	_______	_______

3. *Construction and Descriptive Statistics of the Merged Dataset*

Protocol for Construction of Merged Dataset. — In constructing the final sample used for analysis, we have aimed at establishing a valid control group to analyze corporate tax hikes over time, and at cleaning 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, Peichl and Siegloch (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 (only 1.4% 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, Peichl and Siegloch (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 13.5% 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 8,522 municipalities and 326,274 municipality $\times$ year observations to 8,266 municipalities and 283,846 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, Elstner and Hristov (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, Peichl and Siegloch (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 for which we observe revisions in investment plans in less than 5 years.
- 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/larger than p1/p99 in each year).
- Matching the municipal and firm-level samples, the final sample consists of 35,310 observations that are spread across 1,192 municipalities.

- 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).

Firms in the Merged Dataset: Descriptive Statistics. — Table B.2 displays summary statistics for the firms in our sample. For each firm, we can rely on information on reported planned and realized investment volumes in 17 years on average. The median firm is a typical representative of the "German Mittelstand" employing 264 workers, generating annual revenues of 45 million Euro (CPI inflation-adjusted and—if denominated in German Mark—converted to 2015 Euros), and investing 1.4 million Euro each year. As described in Appendix B.2, the IVS covers firms of all sizes. While slightly oversampling medium-sized firms, it is still representative for small and large firms. Accordingly, 10% of firms in our sample have at most 38 employees, annual revenues of 5.2 million Euro and invest as little as 88,000 Euro per annum. In contrast, the 10% largest firms employ at least 1,950 workers and have annual revenues of almost half a billion Euro and total annual investment of at least 19 million Euro. As shown in Figure B.5, the firm size is consequently highly skewed according to the number of employees (Panel A), while the distribution of its logarithm displays a bell-shape (Panel B). As demonstrated in Panel A of Table B.3, firms experiencing a tax hike in year t are largely comparable to firms in the control group according to key firm characteristics measured in year $t-1$. Further, the pre-treatment averages of both main outcome variables (Log Revision Ratio and Downward Revision Indicator measured in year t_{-1}) are not statistically different for firms that eventually are affected by a tax hike in year t_0 and firms ending up in the control group, see Panel B.

Documenting variation in investment over time, Figure B.6 displays a calendar time graph of the investment plans and investment realizations. Relatedly, Figure B.7 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. Note, however, that this potential trend does not affect our analysis since we include year fixed effects in the regressions and thus rely on differences between firms in a given year for identification.

Figure B.8 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%. This variable is used in Section III.C, where we discuss potential channels of state-dependence in the effect of tax hikes on investment revisions.

Table B.2—Summary Statistics of Firms in the Sample

	p10	p50	p90	Mean
Employees	38	264	1,950	1,361
Revenues	5,194	44,901	451,899	418,842
Investment	88	1,435	19,163	17,751
Obs. per Firm	7	16	29	17

Note: This table shows the 10th, 50th, and 90th percentile, and the mean of employees, revenues, and realized investment for the firms in our sample. "Obs. per Firm" refers to the number of years a firm is observed in our sample, i.e, the number of years for which firms report both ex ante planned and ex post realized volumes of investment. Revenues and investment are displayed in thousands of Euro.

Table B.3—Balance Statistics of Firms in the Treatment and Control Group

	Treated	Control	p-value
	(1)	(2)	(3)
	Mean_{t-1}	Mean_{t-1}	(1)=(2)
Panel (A): Firm Characteristics			
Employees	1,283	1,376	0.54
Revenues	337,895	434,071	0.14
Realized Investment	14,401	18,372	0.15
Panel (B): Main Outcome Variables			
Downward Revision of Investment Plans (Share)	0.54	0.53	0.34
Log Revision Ratio	-0.04	-0.03	0.59

Note: This table presents balance statistics of firms experiencing a tax hike in year t_0 and untreated firms, respectively (both measured in the pre-event year t_{-1}). Panel (A) covers firm characteristics including the number of employees, annual revenues (in thousands of Euro), and realized investment (in thousands of Euro). Panel (B) refers to the main outcome variables, i.e., the Downward Revision Indicator and the Log Revision Ratio. Column (3) presents the p-values of a t-test on the equality of the means depicted in Columns (1) and (2).

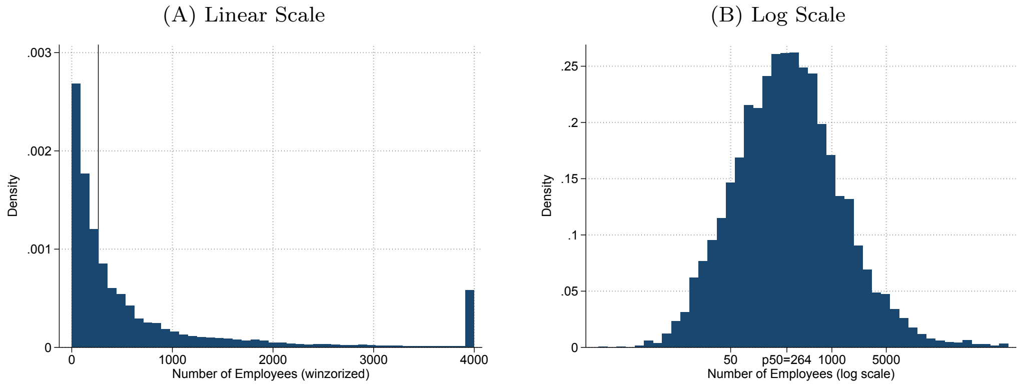


FIGURE B.5. DISTRIBUTION OF FIRMS BY NUMBER OF EMPLOYEES

Note: Panel (A) shows a histogram of the number of employees for the firms in our sample. The distribution is winsorized at a value of 4,000 employees. The vertical line denotes the median number of employees, which is 264. Panel (B) shows a histogram of the natural logarithm of the number of employees for the firms in our sample. The labels on the x-axis refer to the absolute number of employees.

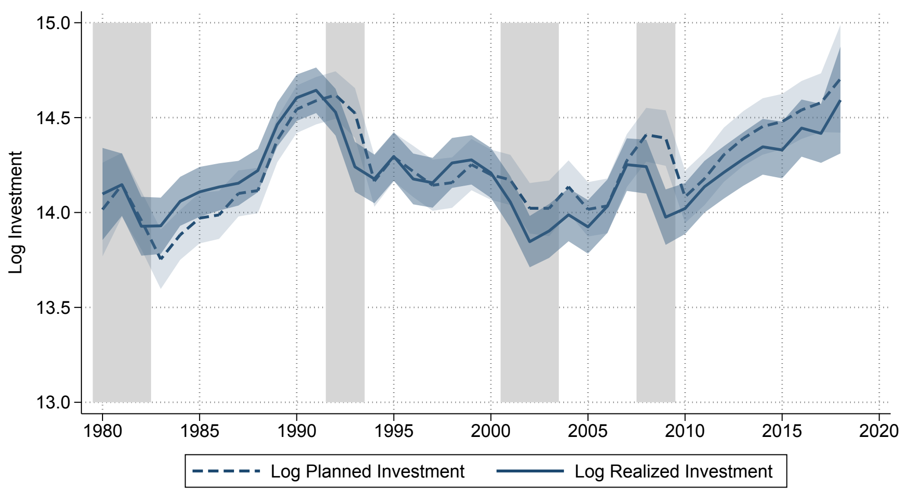


FIGURE B.6. TIME SERIES OF INVESTMENT PLANS AND REALIZATIONS

Note: This figure shows time trends of log planned investment and log realized investment in the period 1980 to 2018, for all firms with a non-missing log revision ratio. The shaded areas indicate 95% pointwise confidence intervals. Gray shaded areas indicate recessions as defined by the German Council of Economic Experts.

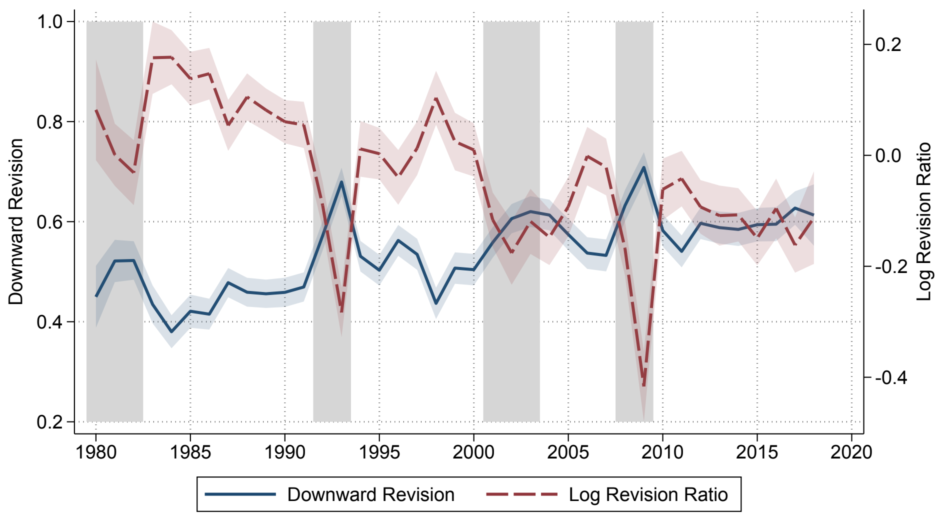


Figure B.7. Time-Series of Investment Revisions

Note: 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 to 2018 in our sample. Blue and red shaded areas indicate 95% point-wise confidence intervals. Gray shaded areas indicate recessions as defined by the German Council of Economic Experts.

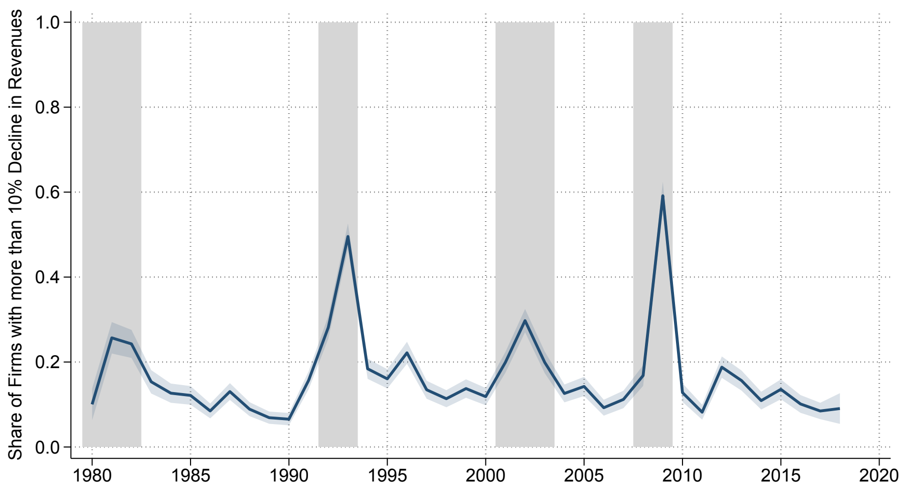


Figure B.8. Time-Series of Share of Large Revenue Drops

Note: 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 to 2018. Blue shaded areas indicate 95% point-wise confidence intervals, while gray shaded areas indicate recessions as defined by the German Council of Economic Experts.

Relationship between Planned and Realized Investment. — Our identification approach relies on the investment plans of firms. In the following, we display the distribution of the investment revision ratio and illustrate the strong explanatory power of investment plans for actual investments.

Figure B.9 shows the distribution of the log revision ratio, trimmed at the first and 99th percentile. The log revision ratio is centered around zero, which means that on average, firms invest as much as they have previously planned. Overall, the approximately normal distribution in Figure B.9 indicates that firms revise investments frequently and similarly upwards and downwards.

Next, we provide further evidence that investment plans are highly informative for subsequently realized investment volumes. As shown in Figure 2 in the main part of the paper, the relationship between planned and realized investment volumes is highly linear and virtually corresponding to the 45 degree line. According to the corresponding regression output presented in Column (1) of Table B.4, 84% of the unconditional variation in (log) realized investment is explained by the investment plans for the respective year ($R^2 = 0.84$). The estimated slope is 0.91 and thus close to one. Moreover, the horse-race regression depicted in Column (2) demonstrates that planned investment regarding year t is much more strongly correlated with the ex post realizations in t than with realized levels in the previous year. As shown in Columns (3) and (4), these patterns even hold when controlling for firm fixed effects and investment plans are still strongly positively associated with ex post realized investment. Taken together, investment plans appear to contain accurate information on subsequent year's investment that goes beyond the extrapolation of the level of investment that was realized in the year these plans are reported to the IVS.

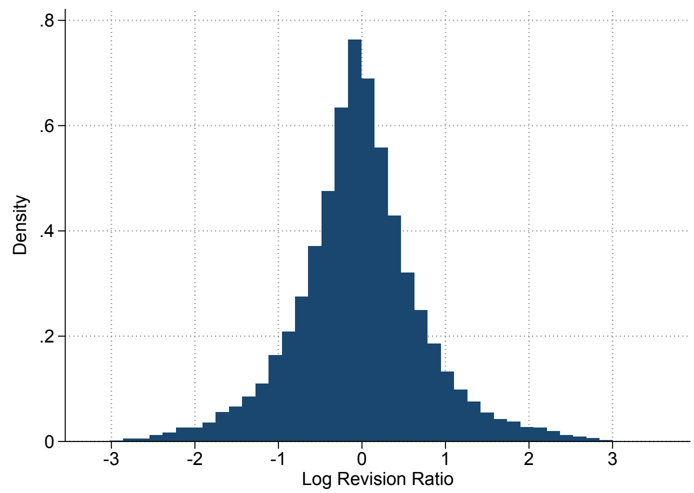


Figure B.9. Distribution of the Log Revision Ratio

Note: This figure shows a histogram of the Log Revision Ratio 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. For exhibitional reasons, the outliers below p1 and above p99 are not depicted here.

Table B.4—Information Content of Investment Plans for Realized Investment

	Log(Realized Investment)			
	(1)	(2)	(3)	(4)
Log(Planned Investment)	0.908	0.552	0.574	0.462
	(0.005)	(0.011)	(0.012)	(0.012)
L.Log(Realized Investment)		0.395		0.195
		(0.011)		(0.011)
Constant	1.276	0.731	6.064	4.886
	(0.067)	(0.047)	(0.165)	(0.164)
Observations	25282	25282	25282	25282
R^2	0.84	0.87	0.89	0.89
R^2 (within)	-	-	0.27	0.30
Firm FE	-	-	✓	✓

Note: This table reports estimates from linear regressions of log realized investment in year t_0 (I_{t0}) on log planned investment ($E_{t-1}(I_{t0})$) and log realized investment in the previous year (I_{t-1}). Columns (3) and (4) in addition purge for fixed effects at the firm-level. The sample is restricted to observations in years without changes in the LBT. Robust standard errors in parentheses.

C. Supplementary Figures and Tables

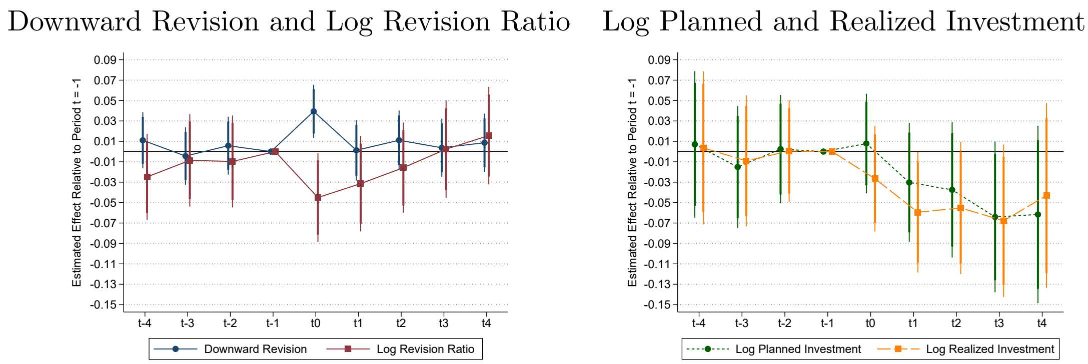


Figure C.1. Long Event Study: Effect of Tax Hike on Investment Plans, Realizations, and Revisions

Note: This figure shows event-study estimates of the downward revision (blue, solid line) and the log revision ratio (red, solid lines) in the left panel and log planned investment (green, short dashed lines) and log realized investment (orange, long dashed lines) in the right panel on the tax hike indicator and fixed effects at the levels of firm identifiers and years with longer event windows. The reference period is t_{-1}. "Log Revision Ratio" is the natural logarithm of the ratio between the ex post realized and ex ante planned volume of investment. In the right panel, the sample is trimmed outside the event window. Inspired by Dube et al. (2023), when estimating the effects with respect to log planned and realized investment, firms are assigned to another firm identifier after the year that is in the middle between two tax hikes in order to ensure that there is only one treatment for each unit and to allow for different long-run trends. In addition, end-periods t-4 and t+4 are binned in the right panel. The confidence intervals refer to the significance levels of 90% (thick lines) and 95% (thin lines).

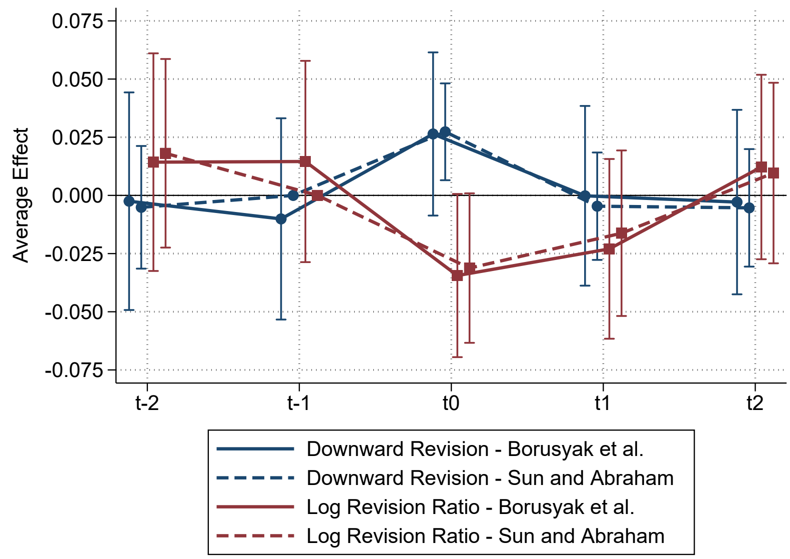


Figure C.2. Investment Revision Effect after a Tax Hike:Alternative Estimators

Note: This figure shows the estimates of the imputation estimator introduced by Borusyak, Jaravel and Spiess (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 (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. Confidence bands refer to the 95% level.

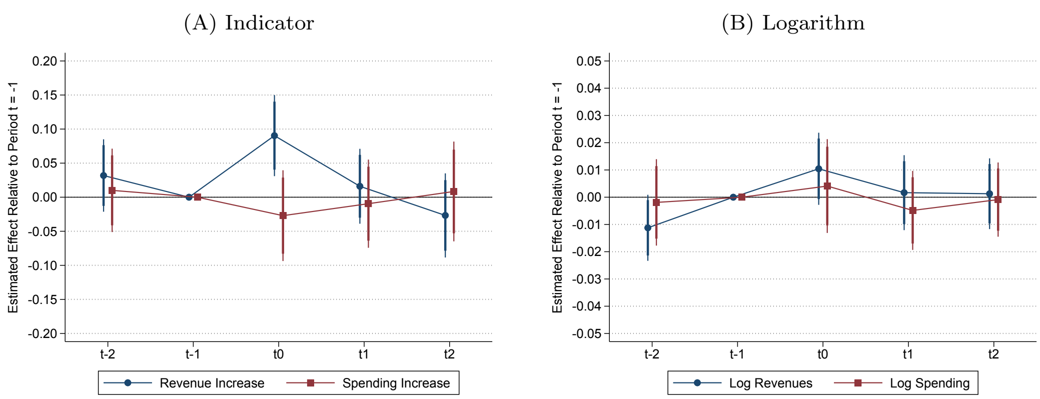


FIGURE C.3. EVENT STUDY: EXPENDITURES AND REVENUES OF MUNICIPALITIES

Note: This figure shows the estimates of the following event-study regression: $\mathrm{Y}_{m,t} = \sum_{j=-2}^{2} \gamma_j \mathrm{TaxHike}^{j}_{m,t} + \mu_i + \phi_{l,t} + \psi_{s,t} + \varepsilon_{i,t}$, 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, $\mathrm{Y}_{m,t}$ represents an indicator that is one when municipal revenues/spending increases compared to the previous year. In the right panel, $\mathrm{Y}_{m,t}$ 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%.

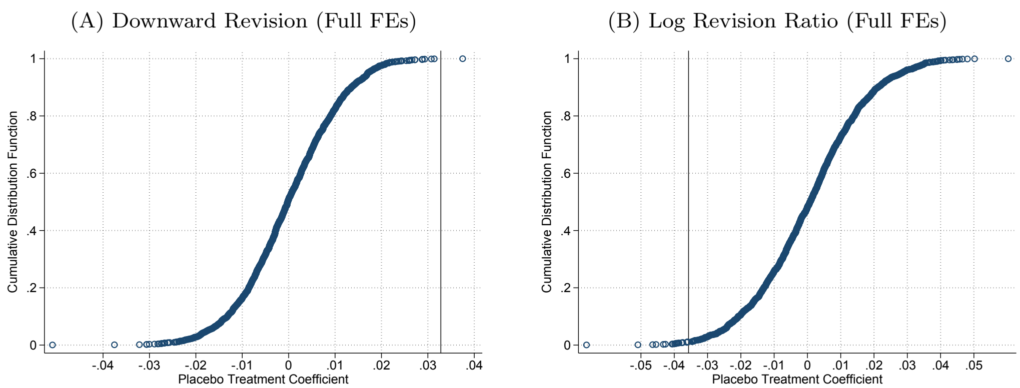


Figure C.4. Investment Revisions after a Tax Hike: Permutation Test

Note: This figure reports the empirical cumulative distribution functions of estimates from 2000 placebo tests. In a Monte Carlo exercise, tax hikes ($\mathbb{1}\left(\Delta tax_{m,t} > 0\right)$) are randomly allocated to municipalities by holding the share of treated municipalities constant. Then, Model (1) is estimated with the full set of fixed effects. In Panel (A), the dependent variable is $\mathbb{1}\left(\frac{I_{i,t}}{E_{i,t-1}(I_{i,t})} < 1\right)$, i.e., an indicator that is one if the fraction of realized investment over planned investment is below one. In Panel (B), the dependent variable is $ln\left(\frac{I_{i,t}}{E_{i,t-1}(I_{i,t})}\right)$, i.e., the natural logarithm of the investment revision ratio. The vertical lines correspond to the baseline estimates from Column 5 in Panels A1 and B1 of Table 2. In Panel (A), 0.05% of the estimates are equal or larger than the baseline estimate. In Panel (B), 1.15% of the estimates are equal or smaller than the baseline estimate.

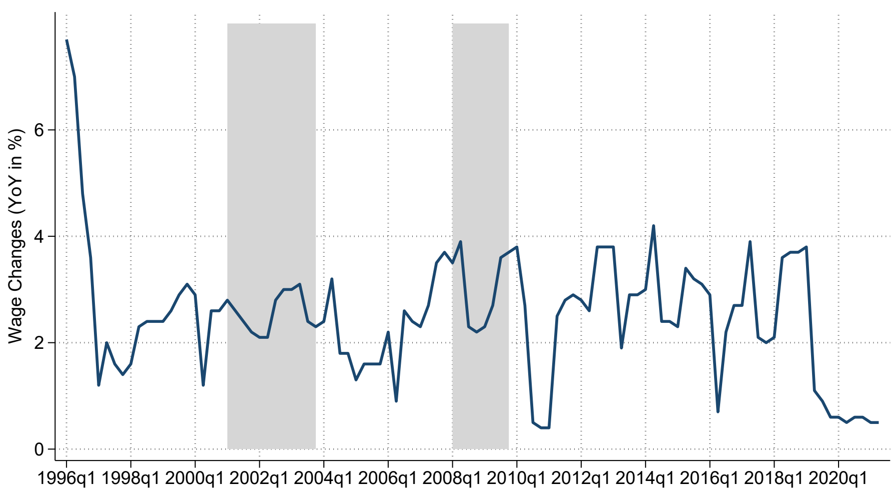
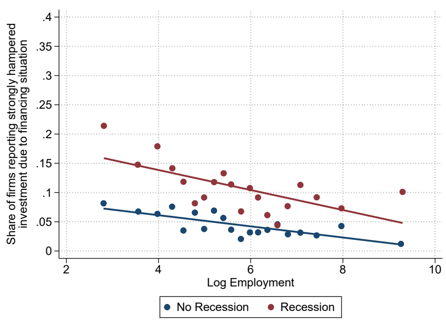


Figure C.5. Collectively Bargained Wage Growth in Manufacturing

Note: 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.

(A) Investment Hampered by Financing Conditions



(B) Investment Hampered by Earnings Situation

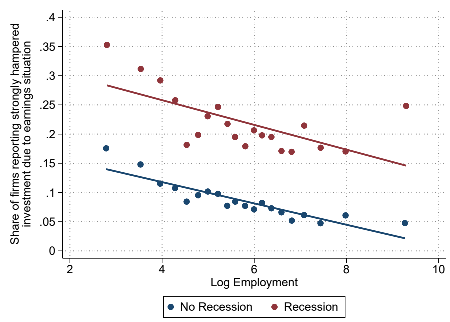


Figure C.6. Obstacles to Investment by Firm Size

Note: This binscatter plot depicts the share of firms reporting that their investment activity is strongly negatively affected by adverse financing conditions (Panel A) and the earnings situation (Panel B) by firm size, separately for recession and non-recession years. Recession years are defined as 1980-1982, 1992-1993, 2001-2003, and 2008-2009, as classified by the German Council of Economic Experts. Panel A uses the same survey question as Table C.7 in which firms report how financial constraints influence their current year's investment activity on a scale between 1 (strongly induced) and 5 (strongly hampered), see Appendix B for the exact wording. Panel B uses the answer category "role of earnings situation" of the same survey question.

Table C.1—Robustness: Baseline Estimates Excl. Reunification Period

	(1)	(2)	(3)	(4)	(5)
Panel (A): Downward Revision					
A1: Tax Hike Indicator: $\mathbb{1}(\Delta tax_{m,t} > 0)$					
	0.026	0.031	0.033	0.039	0.049
	(0.013)	(0.013)	(0.014)	(0.014)	(0.014)
Constant	0.540	0.539	0.539	0.539	0.538
	(0.005)	(0.005)	(0.001)	(0.001)	(0.001)
A2: Tax Hike in Percentage Points: $\Delta tax_{m,t}$					
	0.008	0.019	0.022	0.030	0.038
	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)
Constant	0.541	0.540	0.540	0.540	0.539
	(0.005)	(0.005)	(0.001)	(0.001)	(0.001)
Observations	25960	25960	25911	25911	25911
Panel (B): Log Revision Ratio					
B1: Tax Hike Indicator: $\mathbb{1}(\Delta tax_{m,t} > 0)$					
	-0.039	-0.049	-0.035	-0.046	-0.062
	(0.020)	(0.019)	(0.020)	(0.020)	(0.022)
Constant	-0.039	-0.038	-0.039	-0.038	-0.037
	(0.007)	(0.007)	(0.001)	(0.001)	(0.001)
B2: Tax Hike in Percentage Points: $\Delta tax_{m,t}$					
	-0.031	-0.051	-0.047	-0.062	-0.073
	(0.017)	(0.016)	(0.018)	(0.018)	(0.021)
Constant	-0.039	-0.038	-0.038	-0.037	-0.037
	(0.007)	(0.007)	(0.001)	(0.001)	(0.001)
Observations	25310	25310	25255	25255	25255
Firm FE	-	-	✓	✓	✓
Year FE	-	✓	-	✓	-
Year × State FE	-	-	-	-	✓
Year × Industry FE	-	-	-	-	✓

Note: This table re-estimates our baseline results from Table 2, excluding the years between the reunification of Germany in 1990 and the end of the government of Helmut Kohl in 1998, i.e., a period when many subsidy programs for investment, especially in East Germany, were in place that might have influenced investment decisions of West German firms. "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. "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.

Table C.2—Treatment Effect Heterogeneity: State Dependence

	Downward Revision				Log Revision Ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel (A): Baseline Recession Definition by the German Council of Economic Experts								
Tax Hike Indicator ×								
No Recession	0.018	0.021			-0.011	-0.019		
	(0.012)	(0.013)			(0.018)	(0.020)		
Recession	0.062	0.069			-0.084	-0.086		
	(0.022)	(0.024)			(0.034)	(0.036)		
Tax Hike ×								
No Recession			0.013	0.015			-0.019	-0.024
			(0.011)	(0.012)			(0.016)	(0.019)
Recession			0.037	0.043			-0.064	-0.063
			(0.016)	(0.018)			(0.027)	(0.028)
Constant	0.536	0.535	0.536	0.536	-0.033	-0.032	-0.033	-0.032
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
H0: Coefficients Equal	0.069	0.074	0.201	0.195	0.059	0.105	0.16	0.266
Panel (B): Alternative Recession Definition by Negative Year-on-Year Real GDP Growth								
Tax Hike Indicator ×								
No Recession	0.019	0.020			-0.021	-0.024		
	(0.011)	(0.012)			(0.017)	(0.018)		
Recession	0.089	0.112			-0.079	-0.107		
	(0.028)	(0.030)			(0.047)	(0.051)		
Tax Hike ×								
No Recession			0.013	0.013			-0.024	-0.024
			(0.010)	(0.011)			(0.015)	(0.017)
Recession			0.066	0.084			-0.089	-0.107
			(0.024)	(0.026)			(0.039)	(0.042)
Constant	0.536	0.535	0.536	0.536	-0.033	-0.032	-0.033	-0.032
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
H0: Coefficients Equal	0.017	0.004	0.038	0.012	0.243	0.126	0.12	0.065
Observations	35310	35310	35310	35310	34421	34421	34421	34421
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	-	✓	-	✓	-	✓	-
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Note: 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. "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. The p-values at the bottom of each panel indicate whether the coefficients are statistically different from each other. Standard errors in parentheses are clustered at the municipality level.

Table C.3—Difference-in-Differences: Investment Revisions after a Tax Hike

	Log Revision Ratio				
	(1)	(2)	(3)	(4)	(5)
Net-of-Tax Change	1.849	2.617	2.217	2.764	3.032
	(1.119)	(1.070)	(1.177)	(1.138)	(1.312)
Constant	-0.033	-0.033	-0.033	-0.033	-0.032
	(0.006)	(0.006)	(0.001)	(0.001)	(0.001)
Observations	34421	34421	34421	34421	34421
Firm FE	-	-	✓	✓	✓
Year FE	-	✓	-	✓	-
Year × State FE	-	-	-	-	✓
Year × Industry FE	-	-	-	-	✓

Note: This table reports estimates from linear regressions of the log revision ratio on the percent change in the net-of-tax rate, defined as $log(1-\tau_t) - log(1-\tau_{t-1})$, as main explanatory variable. 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.

Table C.4—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	0.029	0.034			-0.012	-0.020		
	(0.015)	(0.015)			(0.021)	(0.022)		
High Revenue Growth Volatility	0.029	0.032			-0.045	-0.050		
	(0.015)	(0.016)			(0.023)	(0.024)		
Tax Hike Indicator ×								
Low Revenue Growth Volatility			0.022	0.024			-0.016	-0.019
			(0.013)	(0.014)			(0.018)	(0.020)
High Revenue Growth Volatility			0.022	0.025			-0.052	-0.054
			(0.013)	(0.014)			(0.020)	(0.023)
Constant	0.536	0.535	0.536	0.536	-0.033	-0.033	-0.033	-0.033
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
H0: Coefficients Equal: p-value	0.993	0.912	0.987	0.967	0.275	0.331	0.18	0.227
Observations	35155	35151	35155	35151	34281	34277	34281	34277
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	-	✓	-	✓	-	✓	-
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Note: 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. "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. The p-values at the bottom of each panel indicate whether the coefficients are statistically different from each other. Standard errors in parentheses are clustered at the municipality level.

Table C.5—Treatment Effect Heterogeneity: Current Revenue Growth I

	Downward Revision				Log Inv. Revision			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tax Hike Indicator ×								
No Recession ×								
No Strong Revenue Drop	0.018	0.024			-0.013	-0.022		
	(0.013)	(0.013)			(0.019)	(0.021)		
Strong Revenue Drop	0.009	-0.002			0.010	0.009		
	(0.034)	(0.034)			(0.053)	(0.054)		
Recession ×								
No Strong Revenue Drop	0.072	0.080			-0.085	-0.088		
	(0.026)	(0.029)			(0.040)	(0.042)		
Strong Revenue Drop	0.032	0.037			-0.067	-0.066		
	(0.037)	(0.038)			(0.064)	(0.068)		
Strong Revenue Drop	0.105	0.094	0.105	0.094	-0.190	-0.172	-0.191	-0.173
	(0.008)	(0.009)	(0.008)	(0.008)	(0.014)	(0.014)	(0.014)	(0.014)
Tax Hike ×								
No Recession ×								
No Strong Revenue Drop			0.014	0.017			-0.021	-0.027
			(0.011)	(0.013)			(0.017)	(0.020)
Strong Revenue Drop			0.007	-0.006			-0.004	0.002
			(0.030)	(0.031)			(0.046)	(0.048)
Recession ×								
No Strong Revenue Drop			0.047	0.054			-0.077	-0.077
			(0.019)	(0.022)			(0.031)	(0.034)
Strong Revenue Drop			0.004	0.008			-0.019	-0.017
			(0.031)	(0.033)			(0.052)	(0.056)
Constant	0.518	0.520	0.519	0.520	-0.002	-0.004	-0.002	-0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
H0: Coefficients Equal: p-value	0.379	0.354	0.243	0.256	0.817	0.787	0.347	0.376
Observations	35138	35138	35138	35138	34257	34257	34257	34257
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	-	✓	-	✓	-	✓	-
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Note: 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. “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. The p-values at the bottom of each panel indicate whether the coefficients are statistically different from each other. Standard errors in parentheses are clustered at the municipality level.

Table C.6—Treatment Effect Heterogeneity: Current Revenue Growth II

	Downward Revision				
	(1)	(2)	(3)	(4)	(5)
Tax Hike Indicator ×					
No Recession ×					
No Strong Revenue Drop	0.024	0.018	0.024	0.027	0.034
	(0.012)	(0.013)	(0.013)	(0.017)	(0.018)
Strong Revenue Drop	0.001	0.009	-0.002	-0.035	-0.009
	(0.033)	(0.034)	(0.034)	(0.057)	(0.061)
Recession ×					
No Strong Revenue Drop	0.058	0.072	0.080	0.078	0.078
	(0.026)	(0.026)	(0.029)	(0.035)	(0.039)
Strong Revenue Drop	0.011	0.032	0.037	-0.036	-0.020
	(0.034)	(0.037)	(0.038)	(0.073)	(0.076)
Strong Revenue Drop	0.122	0.105	0.094	0.087	0.072
	(0.008)	(0.008)	(0.009)	(0.013)	(0.014)
Constant	0.515	0.518	0.520	0.497	0.498
	(0.005)	(0.002)	(0.002)	(0.002)	(0.002)
N	35139	35138	35138	21255	21193
Firm FE	-	✓	✓	✓	✓
Year FE	✓	✓	-	✓	-
Year × State FE	-	-	✓	-	✓
Year × Industry FE	-	-	✓	-	✓
Exclude Labor Drop	-	-	-	Yes, $> 5\%$	Yes, $> 5\%$

Note: 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.

Table C.7—Treatment Effect Heterogeneity: Financial Constraints

	Downward Revision				Log Inv. Revision			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tax Hike Indicator ×								
No Recession ×								
No Fin. Constr.	0.025	0.024			-0.009	-0.011		
	(0.015)	(0.016)			(0.022)	(0.024)		
Fin. Constr.	-0.004	-0.017			-0.051	-0.045		
	(0.055)	(0.057)			(0.116)	(0.121)		
Recession ×								
No Fin. Constr.	0.024	0.039			-0.040	-0.061		
	(0.029)	(0.030)			(0.044)	(0.047)		
Fin. Constr.	0.126	0.153			-0.066	-0.095		
	(0.065)	(0.070)			(0.125)	(0.127)		
Fin. Constr.	0.113	0.111	0.115	0.113	-0.225	-0.214	-0.226	-0.214
	(0.017)	(0.017)	(0.017)	(0.017)	(0.031)	(0.032)	(0.031)	(0.031)
Tax Hike ×								
No Recession ×								
No Fin. Constr.			0.026	0.021			-0.023	-0.018
			(0.014)	(0.016)			(0.023)	(0.025)
Fin. Constr.			-0.025	-0.039			-0.048	-0.045
			(0.050)	(0.053)			(0.101)	(0.108)
Recession ×								
No Fin. Constr.			0.013	0.024			-0.019	-0.030
			(0.023)	(0.025)			(0.036)	(0.040)
Fin. Constr.			0.066	0.089			-0.056	-0.066
			(0.064)	(0.077)			(0.107)	(0.116)
Constant	0.550	0.550	0.551	0.551	-0.054	-0.054	-0.054	-0.054
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
H0: Coefficients Equal: p-value	0.168	0.138	0.449	0.426	0.849	0.802	0.746	0.767
Observations	23661	23640	23661	23640	23123	23101	23123	23101
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	-	✓	-	✓	-	✓	-
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Note: 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. "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. The p-values at the bottom of each panel indicate whether the coefficients are statistically different from each other. Standard errors in parentheses are clustered at the municipality level.

Table C.8—Treatment Effect Heterogeneity:Firm Size and Settlement Structure

	Downward Revision				Log Revision Ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel (A): Heterogeneity by Firm Size								
Tax Hike Indicator ×								
Small Firms	0.029	0.031			-0.031	-0.035		
	(0.017)	(0.017)			(0.027)	(0.028)		
Large Firms	0.028	0.034			-0.027	-0.036		
	(0.014)	(0.014)			(0.017)	(0.019)		
Tax Hike ×								
Small Firms			0.021	0.024			-0.040	-0.043
			(0.015)	(0.016)			(0.023)	(0.025)
Large Firms			0.022	0.024			-0.030	-0.034
			(0.012)	(0.013)			(0.016)	(0.018)
Constant	0.536	0.535	0.536	0.536	-0.033	-0.032	-0.033	-0.032
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
H0: Coefficients Equal	0.951	0.869	0.972	0.989	0.899	0.96	0.73	0.756
Panel (B): Heterogeneity by Settlement Structure								
Tax Hike Indicator ×								
Urban Area	0.027	0.030			-0.020	-0.028		
	(0.012)	(0.013)			(0.018)	(0.019)		
Rural Area	0.037	0.043			-0.069	-0.070		
	(0.023)	(0.025)			(0.034)	(0.037)		
Tax Hike ×								
Urban Area			0.019	0.022			-0.023	-0.027
			(0.011)	(0.012)			(0.016)	(0.019)
Rural Area			0.029	0.032			-0.072	-0.072
			(0.017)	(0.019)			(0.026)	(0.028)
Constant	0.536	0.535	0.536	0.536	-0.033	-0.032	-0.033	-0.032
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
H0: Coefficients Equal	0.688	0.641	0.64	0.649	0.199	0.314	0.106	0.184
Observations	35310	35310	35310	35310	34421	34421	34421	34421
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	-	✓	-	✓	-	✓	-
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Note: 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 ($\geq$ 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. "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. The p-values at the bottom of each panel indicate whether the coefficients are statistically different from each other. Standard errors in parentheses are clustered at the municipality level.

Table C.9—Treatment Effect Heterogeneity: Tax Hike Dynamics

	Downward Revision				Log Revision Ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel (A): Heterogeneity by the Frequency of Tax Hikes								
Tax Hike Indicator ×								
Few Tax Hikes	0.024	0.028			-0.014	-0.020		
	(0.015)	(0.016)			(0.026)	(0.029)		
Many Tax Hikes	0.031	0.036			-0.038	-0.046		
	(0.015)	(0.015)			(0.020)	(0.021)		
Tax Hike ×								
Few Tax Hikes			0.021	0.021			-0.030	-0.029
			(0.013)	(0.014)			(0.019)	(0.022)
Many Tax Hikes			0.021	0.027			-0.038	-0.046
			(0.013)	(0.014)			(0.019)	(0.022)
Constant	0.536	0.535	0.536	0.536	-0.033	-0.032	-0.033	-0.032
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
H0: Coefficients Equal:								
p-value	0.721	0.733	0.998	0.775	0.464	0.468	0.762	0.584
Observations	35310	35310	35310	35310	34421	34421	34421	34421
Panel (B): Heterogeneity by Occurence of a Tax Hike in the Last 5 Years								
Tax Hike Indicator ×								
$\geq$ 1 Hike in Last 5 Years	0.039	0.052			-0.050	-0.067		
	(0.019)	(0.021)			(0.026)	(0.029)		
No Hike in Last 5 Years	0.019	0.020			-0.012	-0.014		
	(0.013)	(0.013)			(0.021)	(0.022)		
Tax Hike ×								
$\geq$ 1 Hike in Last 5 Years			0.030	0.044			-0.043	-0.062
			(0.016)	(0.019)			(0.022)	(0.027)
No Hike in Last 5 Years			0.013	0.013			-0.023	-0.021
			(0.011)	(0.012)			(0.017)	(0.019)
Constant	0.540	0.540	0.541	0.541	-0.040	-0.039	-0.039	-0.039
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
H0: Coefficients Equal:								
p-value	0.358	0.195	0.386	0.155	0.257	0.145	0.489	0.204
Observations	33220	33201	33220	33201	32375	32356	32375	32356
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	-	✓	-	✓	-	✓	-
Year × State FE	-	✓	-	✓	-	✓	-	✓
Year × Industry FE	-	✓	-	✓	-	✓	-	✓

Note: 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. "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.

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 cash-flow/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—and thus overall tax revenues—by 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 III), 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]

It is furthermore necessary to also take the (long-term) behavioral response of firms into account: as tax increases decrease firm investment, future firm profits should also be reduced, resulting in lower tax revenues of the municipalities. Unfortunately, we cannot estimate the elasticity of firms' profits with respect to changes in investment based on our data. We circumvent this constraint by separately calculating the behavioral response for reasonable lower and upper bounds of this elasticity, i.e., assuming that foregone investment maps into foregone future profits with half of the median profit margin (2.2%) or with five times the median profit margin (22%). For the median firm, which lowered investment by 42,000 Euro, this translates into lower profits between 924 Euro and 9,240 Euro. As the average LBT rate is approximately 15%, this leads to an additional reduction in tax revenues between 139 Euro and 1,386 Euro. Taken together, we approximate that incorporating the behavioral response increases the investment loss for each additional Euro of tax revenue from 2.12 Euro to an estimate in the range between 2.14 Euro (42000/(19800-139)) and 2.28 Euro (42000/(19800-1386)).

From this approximation of the behavioral response, we can also derive the marginal value of public funds (MVPF) in the spirit of Hendren and Sprung-

[2]In 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.

Keyser (2020), given as:

$$MVPF = \frac{\text{Beneficiaries' Willingness to Pay}}{\text{Net Cost to Government}}$$

In our setting, firms are the beneficiaries and their willingness to pay is equal to the change of the tax burden. The net cost of the government equals the change of tax revenues plus the additional revenue changes via the behavioral response. According to this, our estimates point at a MVPF in the range between $(19,800)/(19,800-139) = 1.01$ and $1.08 = (19,800)/(19,800-1,386)$, i.e., slightly above one.

E. Calculation of Effective Tax Rates

This appendix describes how we calculate effective tax rates used in the alternative specification presented in Section III.B based on the statutory LBT rates used in the main specification. When talking about effective tax rates, we always refer to marginal—rather than average—tax rates.[3] Nicodème (2001) provides a helpful overview on different approaches of computing effective tax rates. Our procedure is guided by the classic framework of Hall and Jorgenson (1967), as, e.g., recently applied by Furno (2022). The key difference between the two concepts is that while the statutory tax rate is the one imposed by law on taxable profits, the effective tax rate is the percentage of profits actually paid by a company after taking into account deductions including depreciation of assets, exemptions, tax credits, and preferential rates. Note that in the case of the German case, the most important feature are depreciation rules (denoted with z below) while the other components play a negligible role. To compute effective tax rates in the setting of the LBT, we proceed as follows:

- We first obtain depreciation schedules separately for machinery m and buildings b, the two main types of investment for which different depreciation rules apply. To do so, we use information from the Oxford Corporate Tax Database (`https://oxfordtax.sbs.ox.ac.uk/cbt-tax-database`). Indeed, over our sample period of almost 40 years, the depreciation rules have changed repeatedly.
- To illustrate this change over time, we calculate the present discounted value (PDV) of a depreciation, denoted by z_m (for machinery) and z_b (for buildings), respectively. As the choice of the adequate discount rate is not innocuous in our setting, we employ the following two different specifications, whose resulting z_m and z_b are depicted in Figure E.2:

  I. We follow Zwick and Mahon (2017) and set the discount rate to 7%.

  II. We use time-varying interest rates for discounting to accommodate for the fact that over the sample period the interest rates on firm loans have been declining substantially, from close to 10% in 1980 to less than 2% in recent years, with considerable variation in between.[4] In contrast to most other studies in the literature that rely on a single or few tax reforms within shorter time periods, time-variation in interest rates may have large implications for the PDV of a depreciation in our analysis that covers a period of almost 40 years.

[3]Note that in the German context marginal and average tax rates are approximately the same, since the tax rate is flat and there are only a few exceptions, e.g., no tax credits.

[4]The time series of average interest rates on firm loans displayed in Figure E.1 builds on three different charts provided by the Deutsche Bundesbank (German Central Bank), as the effective interest rate for non-financial corporations is only available since 2003. The breaks are indicated by the dashed vertical lines. Over our entire sample period, the average interest rate according to this graph has been 5.1%.

- Next, we calculate the combined depreciation schedule, z, for each firm, i.e., a weighted average of z_m and z_b based on firms' respective share of investment in machinery and buildings. However, as we do not observe these investment shares in machinery and buildings for each firm in all years of the survey, we have to impute these values (in some years). We consider two distinct specifications for this imputation:

  I. In each year, we assign the average share of investment in machinery and buildings based on aggregate data from the Federal Statistical Office of Germany (only available since 1990, imputed for the years before). This way, the investment shares vary over time, but are the same for all firms in our sample in a given year. Across years, the average share of investment in machinery amounts to 88%.

  II. We use the firm-specific share of investment in machinery and buildings reported to the ifo Investment Survey. As this information is provided less frequently to the IVS compared to the overall level of investment, we use the firm-specific mean across all years if firms reported machinery and building investments at least three times. To retain the sample size, we replace missing values by the values obtained from method I.

- Having obtained the depreciation schedule z, the effective tax rate is then given by

$$\tau_{eff} = 1 - \frac{1-\tau}{1-z*\tau},$$

  which only depends on z and the statutory LBT rate τ in the German case as there are no relevant tax credits in the LBT that would complicate the calculation.

- Finally, we calculate the change in the effective tax rate if a tax hike takes place in a given year. Here, we set z in both years (t_0 and t_{-1}) equal to the value of the tax hike year. Thereby, we isolate the effect of tax changes by making the arguably reasonable assumption that firms know the z value of the next year when forming their investment plans.[5]

The results show that, across all specifications, the variation captured by changes in effective tax rates is strongly associated with the underlying changes in the LBT rate as plotted in Figure E.3.

In alternative specifications, we also express changes in the costs for investment in terms of the user cost of capital instead of effective tax rates. This only requires

[5]Note that while German municipalities have the power and discretion to change τ, i.e. the LBT rate, they cannot change the depreciation rules z that are determined at the Federal level.

a simple transformation:

$$UserCost = \frac{1 - z * \tau}{1 - \tau}$$

Hence,

$$\tau_{eff} = 1 - UserCost^{-1},$$

which means that switching from effective tax rates to a user cost approach will not impact our results apart from rescaling the magnitude of the coefficients. That the user cost of capital yields virtually the same results as using effective tax rates is also visible in Figure E.4, which plots the change in the user cost of capital against the change in effective tax rates for all tax hikes in our sample.

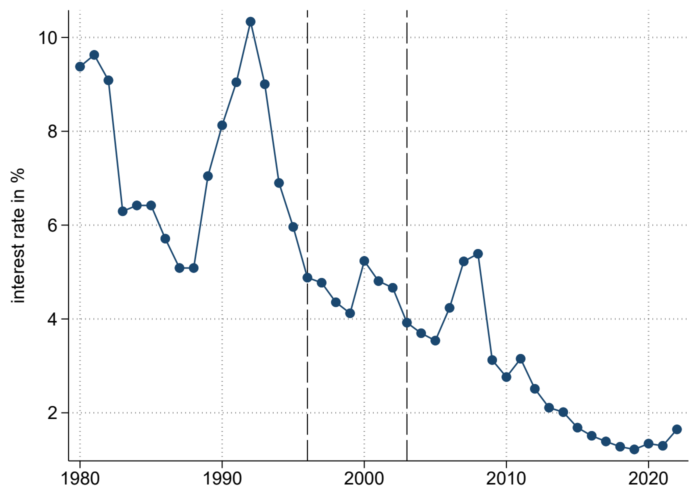


Figure E.1. Time Series of Average Interest Rate on Loans for Firms

Note: This figure shows a time series of the average lending rate for firms. From 2003 onward, the effective interest rate for non-financial corporations is used. For the year 1997 to 2002, the effective interest rate to firms for loans between 500,000 and 5 million Euro is used and adjusted upwards (roughly 1 p.p.) to ensure a smooth transition in 2003. For the years 1980 to 1996, the discount rate of the Deutsche Bundesbank is used and adjusted upwards (roughly 4 p.p.) to ensure a smooth transition in 1997. The two dashed vertical lines indicate the breaks in the time series. Source: Deutsche Bundesbank.

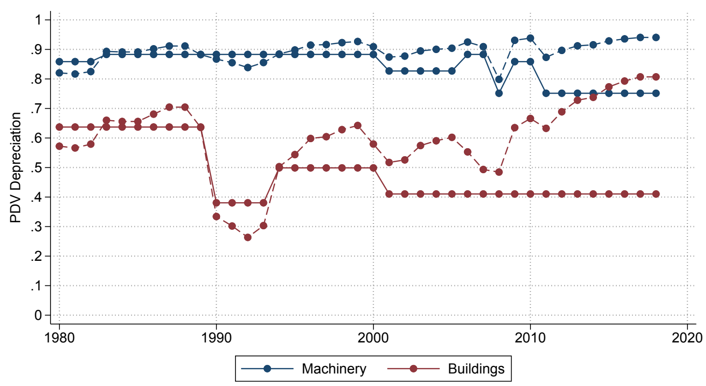


Figure E.2. Present Discounted Value of Depreciation: 7% vs Time-Varying Interest Rate

Note: This figure shows values of the present discounted value of depreciation for machinery (z_m) and buildings (z_b) in the period 1980 to 2018. Depreciation schedules are obtained from the Oxford Corporate Tax Database. The solid line assumes a time-constant discount rate of 7% following Zwick and Mahon (2017), the dashed line calculates the PDV based on the time-varying interest rate on firm loans as displayed in Figure E.1.

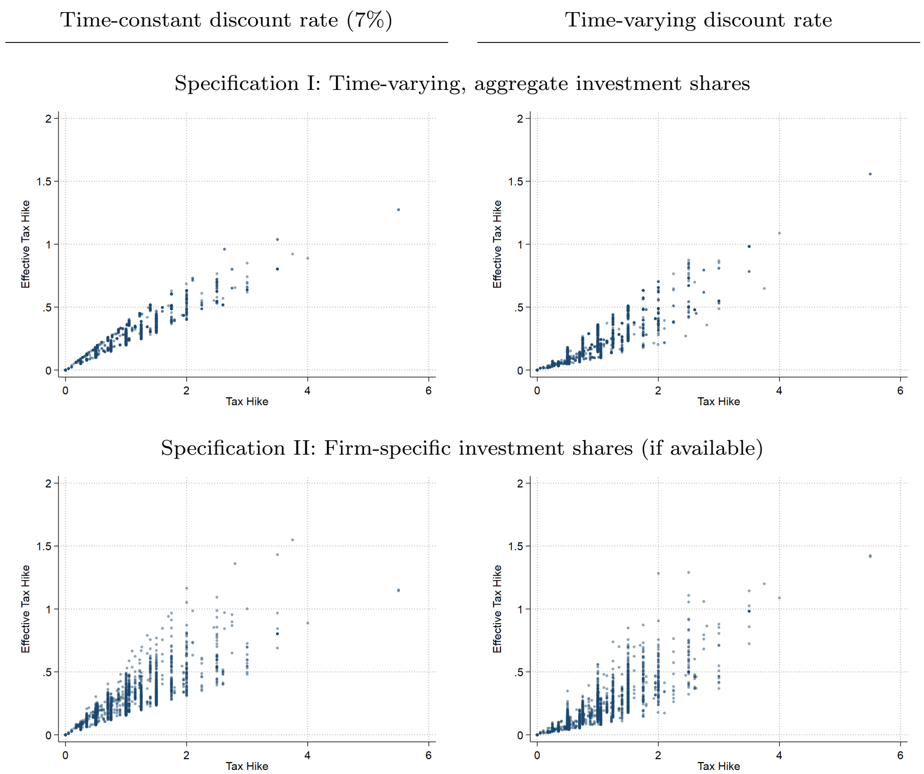


FIGURE E.3. RELATION OF CHANGES IN LBT RATE AND CHANGES IN EFFECTIVE TAX RATES

Note: For each tax hike in our sample, this figure plots its size in terms of an effective tax hike (τ_{eff}; y-axis) against its size as a statutory tax hike (x-axis). As we do not observe the investment shares in machinery and buildings for each firm in all years of the survey, we must impute these values. We consider two distinct specifications in which τ_{eff} is either calculated based on the average share of investment in machinery and buildings based on aggregate data from the Federal Statistical Office of Germany (Specification "I") or on the firm-specific share of investment in machinery and buildings reported to the ifo Investment Survey whenever available (Specification "II"). In the left panel, we assume a time-constant discount rate of 7% following Zwick and Mahon (2017), in the right panel we calculate the PDV based on the time-varying interest rate on firm loans as displayed in Figure E.1.

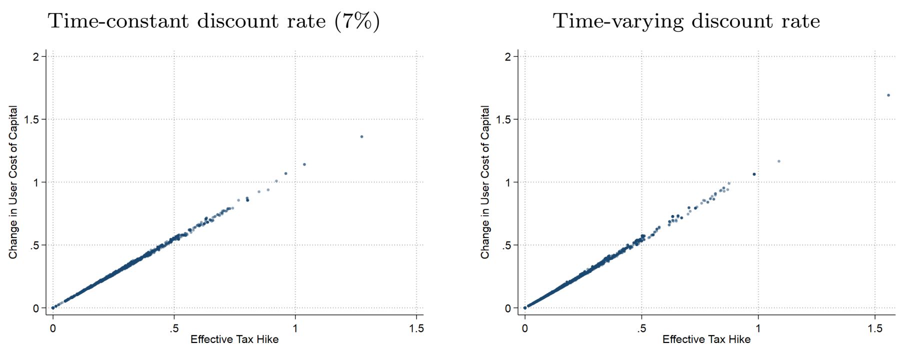


Figure E.4. Relation of Changes in Effective Tax Rates and Changes in User Cost of Capital

Note: This figure plots the change in the user cost of capital (multiplied with 100) against the change in effective tax rates for all tax hikes in our sample, assuming that the share of investment allocated to machinery and buildings is constant across firms, but varying over time (Specification I). In the left panel, we assume a time-constant discount rate of 7% following Zwick and Mahon (2017), in the right panel we calculate the PDV based on the time-varying interest rate on firm loans as displayed in Figure E.1.

REFERENCES

Bachmann, Rüdiger, Steffen Elstner, and Atanas Hristov. 2017. "Surprise, Surprise – Measuring Firm-level Investment Innovations." *Journal of Economic Dynamics and Control*, 83: 107–148.

Bachmann, Rüdiger, and Peter Zorn. 2020. "What Drives Aggregate Investment? Evidence from German Survey Data." *Journal of Economic Dynamics and Control*, 115: 103873.

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess. 2021. "Revisiting Event Study Designs: Robust and Efficient Estimation." *Available at: https://arxiv.org/abs/2108.12419.*

Dube, Arindrajit, Daniele Girardi, Oscar Jorda, and A Taylor. 2023. "A Local Projections Approach to Difference-in-Differences Event Studies." *NBER Working Paper*, 31184.

Fuest, Clemens, Andreas Peichl, and Sebastian Siegloch. 2018. "Do Higher Corporate Taxes Reduce Wages? Micro-Evidence from Germany." *American Economic Review*, 108(2): 393–418.

Furno, Francesco. 2022. "The Macroeconomic Effects of Corporate Tax Reforms." *Available at: https://ssrn.com/abstract=4023666.*

Hall, Robert E., and Dale W. Jorgenson. 1967. "Tax Policy and Investment Behavior." *American Economic Review*, 57(3): 391–414.

Hendren, Nathaniel, and Ben Sprung-Keyser. 2020. "A Unified Welfare Analysis of Government Policies." *Quarterly Journal of Economics*, 135(3): 1209–1318.

Isphording, Ingo, Andreas Lichter, Max Löffler, Thu-Van Nguyen, Felix Pöge, and Sebastian Siegloch. 2021. "Profit Taxation, R&D Spending, and Innovation." *CEPR Discussion Paper*, 16702.

IVS. 2019. *Ifo Investment Survey Industry 1964-2019.* LMU-ifo Economics & Business Data Center, Munich, doi: 10.7805/ebdc-ivs-ind-2019.

Nicodème, Gaetan. 2001. "Computing Effective Corporate Tax Rates: Comparisons and Results." *MPRA Working Paper*, 3808.

Sauer, Stefan, and Klaus Wohlrabe. 2020. *ifo Handbuch der Konjunkturumfragen.* ifo Beiträge zur Wirtschaftsforschung.

Sun, Liyang, and Sarah Abraham. 2021. "Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects." *Journal of Econometrics*, 225(2): 175–199.

Zwick, Eric, and James Mahon. 2017. "Tax Policy and Heterogeneous Investment Behavior." *American Economic Review*, 107(1): 217–248.