Supplementary Information for

Bonus Depreciation as Instrument for Structural Economic Policy: Effects on Investment and Asset Structure

Appendices

A Present Value of DAL Benefits

A.1 Calculation of DAL Present Value

We calculate the DAL present value as the sum of the tax savings from bonus depreciation during the first year plus the present value of remaining depreciations in the future, and minus the present value of the 'fastest' alternative depreciation scheme without bonus depreciation. Since we calculate the DAL benefit from the perspective of a given period t, we do not account for changes in taxes and the after-tax cost of funds in future periods (e.g., for the reduction of corporate income tax rates resulting from the German tax reform 1999/2000/2001). Taking into account that German tax rates declined after 1998, we calculate a lower-bound estimate of the ex-post DAL benefit, because the value of depreciation benefits increases with the tax rate. We also do not account for the possibility of future tax losses that would reduce the present value of future tax depreciation.[1] We assume that the DAL bonus depreciation is fully utilised in the first year and the investment is executed in the middle of the year. The present value of DAL benefits is then equal to

$$PV_t = \tau_t \cdot \Phi_t \cdot \left[\beta_t + (1 - \beta_t) \cdot \sum_{t+x}^{t+X} \frac{\delta reg_{t+x}}{(1+\rho_{\tau t})^{x-1}} - \sum_{t+x}^{t+X} \frac{\delta alt_{t+x}}{(1+\rho_{\tau t})^{x-1}} \right], \tag{A.1}$$

where Φ_t denotes the total sum of DAL-funded depreciations in the eastern German states in a given year t, τ_t the average tax rate in t, $\rho_{\tau t}$ the after-tax cost of funds in t, and x is an index for following depreciation years. The bonus depreciation rate of a given

[1] In case of a tax loss, the remaining depreciation volume does not result in a reduction of the tax burden (the tax payment is zero anyway), but increases the loss carryforward. Thus, future losses might decrease the present value of the remaining depreciation volume.

period (ranging from 40% to 50%) is denoted β_t. Thus, $(1-\beta_t)$ is the remaining book value that has to be depreciated by the regular scheme. The parameters $0 \leq \delta reg_{t+x} \leq 1$ and $0 \leq \delta alt_{t+x} \leq 1$ describe the allocation of depreciations under the regular scheme and the alternative scheme, respectively.

German tax instalments are affected by depreciation allowances. In line with Cohen et al. (2002), we therefore reduce the number of discounting periods x by one. Subsidy reports of the German Federal Government (German Federal Government, 1995–1999; German Federal Ministry of Finance, 2001–2010) do not report the total amount of depreciations Φ_t, but only the amount of tax losses resulting from bonus depreciation $\tau_t \cdot \Phi_t \cdot \beta_t$. We use this information to calculate $\tau_t \cdot \Phi_t$.

A.2 After-Tax Coft of Funds

An important aspect affecting the present value of depreciation allowances is the after-tax cost of funds. Using the definition of weighted average costs of capital (WACC) (Hulse and Livingstone, 2010; Frank and Shen, 2016), after-tax costs of funds in a given period t can be written as

$$\rho_{\tau t} = \rho_{dt} \cdot d \cdot (1 - \tau_{t^*}) + \rho_{et} \cdot (1 - d). \tag{A.2}$$

In Eq. A.2, ρ_{dt} denotes the pre-tax cost of debt capital at time t, ρ_{et} the cost of equity capital, and d the – for simplicity, this is a constant – fraction of debt capital. The tax deductibility of interest payments at the firm level is included in the tax rate τ_{t^*}, thereby accounting for the limited tax-deductibility of interests for long-term debt with regard to the German local business tax (German: *Gewerbesteuer*).

To approximate the cost of debt capital ρ_{dt} for a given year t, we use average long-term interest rates published by the German Central Bank (German: *Deutsche Bundesbank*).[2] This can be justified by the fact that investments are generally financed by equity and long-term debt, while short-term debt is more relevant for operational business. The average interest rate between 1995 and 2008 was 6.07%. The average fraction of debt cap-

[2]Since the definitions of reported interest rates of the German Central Bank change over time, we rely on a number of different proxies for the cost of debt capital. For 1997 to 2002, we use average interest rates for business credits ranging from € 500,000 to € 5 million (BBK01.SU0509). For 2003 and thereafter, we use interest rates for credits to corporations exceeding € 1 million and a duration of more than 5 years (BBK01.SUD129). For the period from 1991 to 1996, we use floating long term mortgage interest rates (BBK01.SU0049) as business interest rates are not available. We use 'overlapping' periods with more than one possible proxy of interest rates to adjust all interest rates to a consistent definition over the whole period, using interest rates from 1997 to 2002 as our reference point (BBK01.SU0509).

ital is taken from representative balance sheet statistics of the manufacturing industry, which are also provided by the German Central Bank (2001–2012). In line with Hulse and Livingstone (2010), we focus on the ratio of long-term debt to equity. Therefore, we assume that short-term debt and accruals result from operational business and do not affect the after-tax cost of funds of long-term business investment. We do not observe strong changes in d during our sample period. Therefore, we use a fixed average value of $d = 0.3439$.

In contrast to the cost of long-term debt, the cost of equity is not published by the German Central Bank. While there are a number of proxies for ρ_{et}, there is no generally accepted definition of this variable. Botosan et al. (2011) describe 10 alternative proxies with a positive and significant correlation with future realised returns; we rely on the mean of these 10 proxies for equity cost as reported by Botosan et al. (2011). It should be noted that the values of ρ_{et} are based on U.S. data instead of German data. However, this should not be a severe problem, as Hail and Leuz (2006) do not find evidence for strong differences in the equity cost of capital in both countries. Nevertheless, we re-weight the equity cost by the corresponding differences reported in Hail and Leuz (2006) and obtain an average cost of 11.0%. To obtain average values per year, we relate this value to the average cost of long-term debt and obtain a ratio of 1.814. Thus, average ρ_{et} can be approximated by $\rho_{dt} \cdot 1.814$. This is very close to the relationship between ρ_{et} and ρ_{dt} of 1.8 as assumed by Hulse and Livingstone (2010).

The tax rate τ_{t^*} is a weighted effective tax rate with respect to the deduction of interest expenses of business establishments in eastern Germany. To calculate τ_{t^*}, we account for the distribution between profits generated by corporations (taxed at corporate income tax rates) and by self-employed businesses and partnerships (taxed at personal income tax rates). The fraction of profits generated by corporations is approximated by the corresponding distribution of revenue as documented in the VAT statistics of the German Federal Statistical Office. To calculate the effective tax rate of corporations (partnerships), we use the corporate income tax rate (the maximum marginal personal income tax rate) for accumulated business profits of a given year. We further consider the solidarity tax surcharge (German: *Solidaritätszuschlag*) and the average local business tax rate (German: *Gewerbesteuer*) of the eastern German states. We account for the fact that local business tax payments were deductible from taxable income until 2007. In addition, we account for the local business tax credit for partnerships (German: *Gewerbesteueranrechnung*) and the add-backs of long-term debt for the German local business tax (German: *Hinzurechnungen*).

A.3 Depreciation Regulations

To calculate the parameters $0 \leq \delta reg_{t+x} \leq 1$ and $0 \leq \delta alt_{t+x} \leq 1$ in Eq. A.1, we rely on the depreciation regulations of the German income tax code for different asset classes as well as the distribution of real investments between buildings and equipment for a given year (see Tables 2.1, 3.1 and 4.1 in German Federal Statistical Office, 2010).

In the 1990s, new buildings were generally depreciated over a period of 25 years. For investments after 2000, these depreciation periods for new business buildings were increased to 33.3 years. For the modernisation (extension, improvement) of old buildings, longer depreciation periods of 40 and 50 years (depending on the construction date of the building) were in force. We use the average fraction of new buildings as reported in the German building statistics of the corresponding period to construct weights for old and new buildings. For modernisations, we assume that one half of investments are depreciated over 40 and the other half over 50 years.[3]

Furthermore, we account for declining depreciation schemes for new buildings and modernisations as documented in § 7 Section 5 of the German income tax code. These alternative depreciation schemes were available if (1) the new building was constructed (or an old building was modernised) with a building application before January 1994 or January 1995, respectively, or (2) the building was purchased before January 1994 or January 1995, respectively. As buildings are constructed after the building application has been submitted, we assume that declining depreciation schemes are available for two years after the expiration date (100% in the first year after the expiration and 50% in the second year).

There is no data on average tax depreciation periods for equipment investment in Germany. Therefore, we assume an average depreciation period of seven years as documented by Devereux et al. (2009). In the 1990s, the depreciation rate of the declining balance method for movable assets was 30%. Hence, we assume that all equipment investments use the declining balance method, as long as corresponding depreciations are 'higher' than the alternative linear depreciations. Note that the declining balance method was not available if the bonus depreciation was utilised. Therefore, the consideration of these programs reduces the relative benefit of bonus depreciation to some extent.

[3]We rely on the number of constructed non-residential buildings in the former East (new buildings versus modernisations during the period from 1993 to 1999, which was relevant for the Development Area Law).

B Calculation of Capital Stocks

Our calculation is based on Wagner (2010), who uses depreciation values for tax purposes reported in the Cost Structure Survey, information on the composition of investments from the Investment Survey and average depreciation periods for different asset classes (buildings and equipment) to compute capital stocks. Our method extends this approach in a number of ways and can be described by

$$K_{i,t-1} = \left(D_{it} \cdot \left(\alpha_{it}^{E} \cdot P_t^{E} + \alpha_{it}^{B} \cdot P_t^{B}\right) - I_{it}^{N}\right) \cdot \frac{1}{2}, \tag{B.1}$$

where $K_{i,t-1}$ is the capital stock at the end of the previous period (or beginning of the current period) of the firm i, D_{it} is the depreciation of i in t, α_{it}^{E} is the fraction of equipment investment of a given year, α_{it}^{B} the fraction of building investment in that year, and P_t^{E} $\left(P_t^{B}\right)$ the average depreciation period for equipment (building) investment in Germany in t.

Multiplying the sum of depreciations with the average depreciation period yields the investment value at the beginning of the operating period. To account for depreciations after the beginning of the operating period of an asset, we divide this value by two. Therefore, we assume that the average operating period has expired by a factor of 50% for each asset. This implies further that price-adjusted depreciations are approximately evenly distributed over time. Note that investments in t have a positive effect on D_{it}. If investments are executed in the middle of the year, D_{it} should rather be a measure of the capital stock in the middle of the period instead of the beginning of the period. To account for that aspect, we deduct 50% of net investments I_{it}^{N} (defined as aggregate investment minus disinvestment) of firm i in time t.

The depreciation period P_t^{E} for equipment is assumed to be 7 years (see Devereux et al. 2009). For new buildings, the regular periods are 25 years (for old buildings 40 to 50 years). For simplicity, we do not account for declining depreciation schemes for buildings. This can be justified by the fact that declining schemes increase the present values of depreciation allowances, but not the average depreciation over the depreciation period. The composition of different asset classes is estimated by the distribution of investments α_{it}^{E} and α_{it}^{B} of the manufacturing industry in our data, with $\alpha_{it}^{E} + \alpha_{it}^{B} = 1$. To account for measurement error, we calculate average values for α_{it}^{E} and α_{it}^{B} by year, industry, business size (large firms compared to small firms with up to 250 staff members) and region (western versus eastern Germany).

The tax depreciation period for new buildings increased to 33.3 years in 2001, while depreciation periods for modernization remained unchanged. The increased depreciation

period is only relevant for new installments. Thus, considering economic growth and declining depreciation schemes of preceding periods, we assume a declining adaptation process of the average depreciation period per firm over 25 years with
$D_{2000+x} = D_{2000} + \Delta \cdot \sqrt{\frac{x}{25}}$, where D_{2000} denotes the average depreciation period in 2000 (29 years on average for old and new buildings), x the number of years after 2000 and the increase in the average depreciation period resulting from the reform. This yields an average depreciation period for buildings of 35.66 years in 2008.

The computation of capital stock may be affected by measurement error in D_t. This is especially a problem for a high variation of tax depreciations over time, implying a fluctuating capital stock. To account for that, we rely on estimated capital stocks of future periods to obtain a more consistent estimate of the capital stock of preceding periods. Hence, we define the capital stock of the preceding period as the capital stock of the following period plus investments and minus depreciations and disinvestments in t. In addition to fixed assets, and extending Wagner (2010), we consider leased investments as increasing the effective capital-in-kind. We rely on data from the Investment Survey to compute the ratio of leased assets to fixed assets by year, industry, business size and region (western versus eastern Germany). The value of fixed assets of each firm is multiplied by one plus the computed ratio.

A drawback of our data is that depreciation volumes of the Cost Structure Survey are only available at the firm level. Therefore, we allocate depreciations to the establishment. We compute the ratio of the capital stock to the number of staff members by year, industry, business size (large firms compared to small firms with up to 250 staff members) and region (establishments in the western and establishments in the East). Using these ratios, we allocate the firms' capital stock to the establishments.

C Calculation of Tax Burden and Elasticities

C.1 Effective Net-of-Tax Rate

The effective net-of-tax rate of investments in eastern German establishments can be written as

$$NETR_t = \frac{1 - \tau_t^W \cdot Z_t^W - s_t^W}{1 - \tau_t^E \cdot Z_t^E - s_t^E} \cdot \frac{1 - \tau_t^E}{1 - \tau_t^W}, \tag{C.1}$$

where τ_t^E, Z_t^E, s_t^E (τ_t^W, Z_t^W, s_t^W) denote the tax rate on profits, the present value of depreciations per € invested, and the effective ISL subsidy rate for eastern (western) Germany in a given period, respectively. As introduced in Appendix A, τ_t^E and τ_t^W are based on weighted tax rates of partnerships and corporations including taxes on income, the solidarity tax surcharge, and the local business tax. To calculate τ_t^E (τ_t^W), we use average local business tax multipliers (German: Hebesätze) for the eastern (western) German states. Z_t^E and Z_t^W are calculated as in Appendix A. The after-tax costs of funds of Appendix A.2 are used to compute discounted values of depreciation allowances.

We account for the fact that applications for ISL subsidies are generally related to investments of the preceding year. Therefore, the effective subsidy rate s_t^E is defined as the nominal ISL rate discounted by one period. As shown in Table 1, the ISL rate for equipment investment of large firms was 5% (small firms 10%) from 1995 to 1998, 10% (small firms 20%) in 1999, and 12.5% (small firms 25%) thereafter. Regarding building investment, funding rates were zero before 1999 and 10% (12.5%) for initial investments in 1999 (after 1999). In this case, there were no increased rates for firms with no more than 250 staff members. There was also a higher subsidy rate of 8% for equipment investments of all firms before 1997 if investments had been initiated before June 1994. We assume that this is relevant for 50% of investments in 1995 and 0% thereafter. Correspondingly, we assume that the increase of funding rates in 2000 (from 10.0% to 12.5%) was relevant for 50% of businesses in that period and for 100% thereafter. Note that s_t^W is zero, as ISL subsidies were restricted to investments in the eastern states. In addition, there was a funding gap for investments initiated before August 25, 1997 and completed after December 31, 1998. For simplicity, we do not consider this aspect in our calculations. This can be justified by the fact that this funding gap was not expected by owners and managers.

C.2 Investment Elasticities

Following Zwick and Mahon (2017), we calculate investment elasticities with respect to the net of the effective tax rate $1 - \tau_\epsilon$ (in the following NETR), respectively the reciprocal of the tax term of the user cost of capital. For the calculation of the effective tax rate, we rely on the same assumptions as for the calculation of the relative tax burdens Appendix C.1) Consistent with our regression approach, we focus on the relative tax benefit of establishments in eastern Germany. Thus, we rule out any other tax law changes affecting establishments in both parts of Germany equally. We define the additional relative tax incentive of eastern German establishments during the treatment period as the difference between the average relative NETR in the treatment period and the average relative NETR in the post-treatment period. Thus, the change in the relative tax incentive of eastern German establishments is

$$\Delta NETR = \overline{NETR}_{TREAT} - \overline{NETR}_{POST}, \tag{C.2}$$

with $NETR_t = \frac{1-\tau_t^W \cdot Z_t^W - s_t^W}{1-\tau_t^E \cdot Z_t^E - s_t^E} \cdot \frac{1-\tau_t^E}{1-\tau_t^W}$. We calculate $\Delta NETR$ for large and small firms for three classes of buildings and equipment: 1a) initial building investment, 1b) new buildings (no initial investment), 1c) modernisation of buildings (no initial investment), 2a) initial equipment investment, 2b) non-initial equipment investment, and 2c) non-fundable equipment investment. To calculate the aggregate average $\Delta NETR$ for small and large firms, we make assumptions about the average distribution of these six different types of investments. Note that there are no official statistics on initial investments according to ISL or the fundability of assets.

As extensions of an establishment are considered as initial investment according to ISL, the majority of building constructions should be initial investments. Hence, in case of the aggregate volume of building investments, we assume that the majority (55%) are initial investments. Corresponding to the German building statistics, about 20% of building investments are modernizations. We regard the remainder (25% of building investments) as constructions, but not as initial investments (e.g. extensions of buildings, major enhancements of buildings). In case of equipment investments, we assume that the majority (55%) are replacement investments and are therefore not considered as initial investments. This is consistent with the empirical observation that the increased funding rates of the ISL 1999 did not result in a significant increase in aggregate ISL subsidy payments. As most equipment in the manufacturing sector was fundable (e.g. machines), we assume that non-fundable equipment is only 1/5 of the remaining equipment investments. Thus, the remainder (4/5) falls on fundable initial equipment investments.

D Additional Robustness Tests and Analyses

D.1 DAL and Building Prices

Goolsbee (1998) finds evidence that investment tax incentives increase asset prices, which dampens their impact on real investment. While studies on bonus depreciation do not provide support for such pricing effects (House and Shapiro 2008; Edgerton 2011; Zwick and Mahon 2017), we account for that by deflating building investment at the intensive margin by a regional building price index. Corresponding price indices are provided by the statistical offices of ten major federal German states. The state of Berlin has been excluded from our data. For the remaining five states (Bremen, Hamburg, Mecklenburg-West

Pomerania, Rhineland-Palatinate, and Schleswig-Holstein), we rely on average building price indices for the western and the eastern German states. These average price indices are calculated using the average of existing GDP-weighted price indices for states in the former West (Baden-Württemberg, Bavaria, Hessen, Lower Saxony, North Rhine-Westphalia and Saarland) and in the former East (Brandenburg, Saxony, Saxony-Anhalt and Thuringia). Using building price indices from states in the East and the West, we calculate weighted building price indices for both parts of Germany and report the results in Table D.1.

Table D.1: Building price indices: manufactoring sector

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
East	97.9	98.1	97.3	96.3	95.0	94.7	94.1	94.3	95.3	97.8	100.0	102.5	110.4	114.6
West	93.9	94.2	93.9	94.5	94.7	95.9	96.7	96.9	97.2	98.4	100.0	102.3	109.6	113.6

Notes: Weighted average building price indices for the manufacturing sector in the eastern and western German states. We calculate the indices from GDP-weighted price indices in the manufacturing sector as reported by the Statistical State Offices for the western German federal states (Baden-Württemberg, Bavaria, Hessen, Lower Saxony, North Rhine-Westphalia and Saarland) and the eastern states (Brandenburg, Saxony, Saxony-Anhalt and Thuringia). Due to the specific economic and legal conditions in Berlin, we do not account for price developments in that area. There are no corresponding price indices available for Bremen, Hamburg, Mecklenburg-West Pomerania, Rhineland-Palatinate or Schleswig-Holstein.

We find only weak pricing effects. Using 2005 as reference year, the building price index in eastern Germany in the treatment period (1995–1998) exceeds the index for western Germany by 3.0 percentage points on average, while it is slightly lower than the western German index in the post-treatment period (1.2 percentage points). Even if one were to assume that this change in the difference of the building price indices is exclusively the result of the DAL, this suggests a DAL treatment effect of 4.2 percentage points (estimated by the difference in the differences of 3.0 and minus 1.2) or 4.4% of the building price level in 1999. This is minor if compared to our estimated average response for real building investments of 83% that we calculate in Section 5.2.

D.2 Propensity Score Matching

To ensure the comparability and similarity of our treatment group and control group, we use propensity score matching (Caliendo and Kopeinig 2008). Relying on one-to-one matching with replacement and the base year 1999, we generate a pre-matched control group that is similar to our treatment group. We match on the following variables: investment activity (as measured by the logarithm of building investment and the logarithm of equipment investment; both increased by one to avoid undefined values), establishment size and economic activity (as measured by the logarithm of sales revenue and the logarithm of the number of employees), industry, firm type (single establishment firm, multi-establishment firm, multinational firm, establishment of a foreign firm), and the type of goods produced (input goods, investment goods, durables, commodities). We do not use the capital stock as a matching characteristic, as this variable has been constructed using the information on investments (for the calculation of the capital stock see Appendix B). We select 1999 as our base year for matching but also consider outcome values from future periods (2000–2008) for our time-variant matching variables to account for the common trends assumption. To ensure a minimum common support, we drop establishments with propensity scores that are higher than the maximum (and lower than the minimum) propensity score in our control group. We end up with a final sample of 89,734 observations from 7,406 establishments.

Table D.2 depicts the results from performing the baseline model (Table 3) for the matched sample. The coefficient estimates are in line with Table 3 qualitatively and quantitatively.

Table D.2: Aggregate investment at the extensive and intensive margin–Matched Sample

Variables	Extensive margin				Intensive margin			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DiD	0.0213***	0.0207***	0.0180***	0.0181***	0.1450***	0.1450***	0.1210***	0.1210***
	(0.0049)	(0.0049)	(0.0052)	(0.0052)	(0.0303)	(0.0299)	(0.0312)	(0.0309)
Capital stock				0.0048**				0.1230***
				(0.0019)				(0.0106)
Revenue per capital				-0.0162***				101.9
				(0.0011)				(86.66)
Unemployment rate			-0.0011	-0.0011			-0.0159***	-0.0148***
			(0.0001)	(0.0001)			(0.0055)	(0.0055)
GDP per capita			-0.0215	-0.0230			0.0866	0.0470
			(0.0166)	(0.0166)			(0.1010)	(0.0997)
Population			-0.0152	-0.0145			0.0496	0.0636
			(0.0105)	(0.0105)			(0.0680)	(0.0673)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry–year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Observations	89,734	89,734	89,734	89,734	81,777	81,777	81,777	81,777
Establishments	7,406	7,406	7,406	7,406	7,375	7,375	7,375	7,375
R-squared	0.371	0.373	0.373	0.374	0.669	0.673	0.673	0.675
Adjusted R-squared	0.314	0.315	0.315	0.316	0.636	0.640	0.640	0.641

Notes: OLS regressions with establishment fixed effects and clustered standard errors at the establishment level (in parentheses). In models (1)-(4), the dependent variable is a dummy variable with a value of one for an establishment i with positive aggregate investments in t (extensive margin). In models (5)-(8), the dependent variable is the logarithm of positive aggregate investments of establishment i in t (intensive margin). DiD is an interaction term of a dummy variable for establishments in Eastern German states and a dummy variable for the DAL treatment period (1995–1998). Capital stock is the logarithm of capital stock of establishment i and Revenue per capital is the ratio of sales revenue to the capital stock. Unemployment rate is the unemployment rate of the district of establishment i in t in percentage points. GDP per capita (Population) is the logarithm of the gross domestic product per capita (the number of inhabitants) of this district. ***, **, and * indicate significance levels of 0.01, 0.05, and 0.1, respectively.

D.3 Investment Loopholes and Delays

As the DAL bonus depreciation provided a temporal enhancement in depreciation opportunities and the expiration of the program might have been a foreseeable event for firms, a potential reaction of firms could have been a temporal anticipation of investments that would have been executed otherwise in future periods. Thus, firms might anticipate investments from the period after the expiration (after 1998) of the program into the subsidy period (before 1998). If this is the case, it could lead to abnormal reduction of investment activity in treated eastern establishments compared to control establishments in western Germany. Therefore, we perform an additional test, considering not only the overall treatment effect in the period before the expiration (baseline model) but also a treatment effect in the post-DAL year 1999. We estimate the following model:

$$I_{it} = \beta_0 + \beta_1 \cdot DiD_{it} + \beta_2 \cdot PostDiD_{it} + \phi \cdot X_{it} + \alpha_i + \gamma_t + \theta_{it} + \epsilon_{it}. \tag{D.1}$$

In this model, $PostDiD_{it}$ is an interaction term of the post-DAL year 1999 and a dummy variable with a value of one for establishments in eastern German states. As documented by Table D.3, and opposite from expectations regarding an investment hole, we still find a positive regression coefficient for $PostDiD_{it}$. Thus and in line with our graphical evidence in Figure 2, we still find evidence for slightly higher investment activity in eastern establishments in the post-DAL year 1999. An explanation for our finding is the presence of temporal delays of investments that were initially intended to be executed within the DAL period. Considering that DAL-driven investment were especially relevant for buildings and project delays are a common problem in the building industry, it should not be surprising that not all DAL-related projects were finished in time before the funding period ended. Notwithstanding, Table D.3 does not provide evidence that investment projects were anticipated from the past-DAL period to maximise tax benefits before the DAL period ended.

Table D.3: Tests for post–DAL investment effects

Variables	Extensive margin				Intensive margin			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DiD	**0.0407*** **	**0.0383*** **	**0.0351*** **	**0.0356*** **	**0.1450*** **	**0.1240*** **	**0.1130*** **	**0.1210*** **
	(0.0036)	**(0.0036)**	**(0.0039)**	**(0.0039)**	**(0.0206)**	**(0.0204)**	**(0.0216)**	**(0.0213)**
Post DiD	**0.0184*** **	**0.0174*** **	**0.0163*** **	**0.0173*** **	**0.0405* **	**0.0347**	**0.0337**	**0.0505** **
	(0.0043)	**(0.0043)**	**(0.0044)**	**(0.0044)**	**(0.0218)**	**(0.0218)**	**(0.0221)**	**(0.0220)**
Capital stock				0.0089***				0.1310***
				(0.0009)				(0.0050)
Revenue per capital				-0.0302*				0.3230*
				(0.0181)				(0.171)
Unemployment rate			-0.0019***	-0.0018***			-0.0127***	-0.0111***
			(0.0006)	(0.0006)			(0.0033)	(0.0033)
GDP per capita			-0.0052	-0.0064			0.1800***	0.1610**
			(0.0093)	(0.0093)			(0.0633)	(0.0628)
Population			-0.0174**	-0.0170**			-0.0180	-0.0132
			(0.0074)	(0.0074)			(0.0397)	(0.0393)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry–year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Observations	544,085	544,085	544,085	544,085	470,548	470,548	470,548	470,548
Establishments	68,289	68,289	68,289	68,289	63,733	63,733	63,733	63,733
R-squared	0.472	0.472	0.472	0.473	0.702	0.704	0.704	
Adjusted R-squared	0.396	0.397	0.397	0.397	0.655	0.657	0.657	

Notes: OLS regressions with establishment fixed effects and clustered standard errors at the establishment level (in parentheses). In models (1)-(4), the dependent variable is a dummy variable with a value of one for an establishment i with positive aggregate investments in t (extensive margin). In models (5)-(8), the dependent variable is the logarithm of positive aggregate investments of establishment i in t (intensive margin). DiD is an interaction term of a dummy variable for establishments in Eastern German states and a dummy variable for the DAL treatment period (1995–1998). Post DiD is an interaction term of a dummy variable for establishments in Eastern German states and a dummy variable for the post DAL year 1999. Capital stock is the logarithm of capital stock of establishment i and Revenue per capital is the ratio of sales revenue to the capital stock. Unemployment rate is the unemployment rate of the district of establishment i in t in percentage points. GDP per capita (Population) is the logarithm of the gross domestic product per capita (the number of inhabitants) of this district. ***, **, and * indicate significance levels of 0.01, 0.05, and 0.1, respectively.

D.4 Alternative Control Variable Settings

The following tables report regression results for four alternative control variable settings to control if our results are driven by control variable choices. In Table 4, we investigate investment types including the full set of control variables. Table D.4 reports the same analysis without controls and industry-year fixed effects, similar to the simplest baseline analyses for total investment (Table 3). The results confirm our baseline findings in Table 4. Like in table 3, we obtain quantitatively larger effects if we do not include regression controls and industry-year fixed effects. We find an increase of 10.5% (baseline 7.3%) for equipment, of 92.9% (baseline 76.6%) for building investment and of 121.3% (108.0%) for land investment.

A potential concern might be that our regression controls are endogenous with investment as dependent variable. Therefore, we estimate an alternative specification with once-lagged regression control variable and report results in Table D.5. As the choice of lagged controls reduces our observation period, the number of firm-year observation decreases to 468,549. If we use the investment responses of the different asset classes (equipment, buildings, land) to calculate an aggregate investment response (similar to Table 5), we obtain an overall investment response of 15.0%, which is very close to our baseline estimate.

Another concern might be an omitted varialbe bias. Therefore, we perform a robustness check that adds additional control variables at the level of the firm. These include the legal form of the company (corporation or pass-through entity), interest expenses per capital stock as a measure for liquidity and capital constraints and operating income (EBITDA) per capital stock as a measure for profitability. These variables are provided by the Cost Structure Survey and therefore only available for less than 50% of our sample. We report results in Table D.5. Using the investment responses of the different asset classes (equipment, buildings, land) to calculate an aggregate investment response (similar to Table 5), we obtain an overall investment response of 14.5%, which is very close to our baseline estimate.

Finally, we extend the robustness check of Panel B in Table 5 by adding firm-year fixed effects. In doing so, we control for each firm-year combination and thus use only the variation at the establishment level to identify the DAL effect. Hence, holding firm-year combinations constant, we compare investment activities of eastern and western establishments of the same firm, to estimate the DAL effect. Our results confirm the evidence in Panel B of Table 5. Using the investment responses of the different asset classes (equipment, buildings, land) to calculate an aggregate investment response, we obtain an overall investment response of 34.9%, which is close to Table 5.

Table D.4: Investment types without controls

Variables	Equipment		Buildings		Land		Buildings and land share
	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive	Intensive
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DiD	**0.0375***** **(0.0035)**	**0.0573***** **(0.0185)**	**0.0867***** **(0.0052)**	**0.3910***** **(0.0466)**	**0.0215***** **(0.0026)**	**0.4630**** **(0.1990)**	**0.0404***** **(0.0027)**
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry–year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	544,085	468,458	544,085	114,285	544,085	18,175	470,228
Establishments	68,289	63,616	68,289	30,828	68,289	9,716	63,640
R-squared	0.470	0.708	0.449	0.485	0.273	0.614	0.287
Adjusted R-squared	0.393	0.662	0.370	0.295	0.169	0.168	0.176

Notes: OLS regressions with establishment fixed effects and clustered standard errors at the firm level (in parentheses). For equipment (building, land) investment at the extensive margin in Model (1) (3, 5), the dependent variable is a dummy variable with a value of one for an establishment i with positive equipment (building, land) investments in t. For equipment (building, land) investment at the intensive margin in Model (2) (4, 6), the dependent variable is the logarithm of positive equipment (building, land) investments of establishment i in t. In Model (7), the dependent variable is the natural logarithm of the ratio of building plus land investments to total investments. DiD is an interaction term of a dummy variable for establishments in Eastern German states and a dummy variable for the DAL treatment period (1995–1998). ***, **, and * indicate significance levels of 0.01, 0.05, and 0.1, respectively.

Table D.5: Lagged control variables

Investment type	Aggregate investment		Equipment		Buildings		Land	
Investment margin	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DiD	**0.0330*** **	**0.0880*** **	**0.0329*** **	**0.0184**	**0.0764*** **	**0.3130*** **	**0.0211*** **	**0.3850* **
	(0.0037)	**(0.0206)**	**(0.0038)**	**(0.0196)**	**(0.0057)**	**(0.0524)**	**(0.0030)**	**(0.2320)**
Establishment controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry–year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	468,549	407,241	468,549	405,481	468,549	97,531	468,549	15,522
Establishments	63,628	58,068	63,628	57,817	63,628	26,309	63,628	8,528
R-squared	0.490	0.716	0.488	0.722	0.462	0.506	0.286	0.641
Adjusted R-squared	0.412	0.668	0.409	0.675	0.380	0.309	0.176	0.183

Notes: OLS regressions with establishment fixed effects and clustered standard errors at the establishment level (in parentheses). ***, **, and * indicate significance levels of 0.01, 0.05, and 0.1, respectively.

Table D.6: Reduced sample and firm controls

Investment type	Aggregate investment		Equipment		Buildings		Land	
Investment margin	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DiD	**0.0250*** **	**0.1000*** **	**0.0266*** **	**0.0339**	**0.0816*** **	**0.2970*** **	**0.0167*** **	**0.6300* **
	(0.0061)	**(0.0374)**	**(0.0044)**	**(0.0360)**	**(0.0111)**	**(0.0877)**	**(0.0064)**	**(0.3800)**
Establishment controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry–year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	192,232	175,188	192,232	174,596	192,232	54,255	192,232	8,941
Establishments	42,879	39,077	42,879	38,946	42,879	??	42,879	5,001
R-squared	0.568	0.798	0.568	0.802	0.551	0.561	0.372	0.642
Adjusted R-squared	0.448	0.740	0.448	0.745	0.428	0.348	0.198	0.164

Notes: OLS regressions with establishment fixed effects and clustered standard errors at the establishment level (in parentheses). ***, **, and * indicate significance levels of 0.01, 0.05, and 0.1, respectively.

Table D.7: Mixed firms with parent–year fixed effects

Investment type	Aggregate investment		Equipment		Buildings		Land	
Investment margin	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DiD	**0.0182**	**0.3830*** **	**0.0159**	**0.3130*** **	**0.0769*** **	**0.2990**	**0.0171** **	**0.9610**
	(0.0123)	**(0.0846)**	**(0.0124)**	**(0.0835)**	**(0.0155)**	**(0.2520)**	**(0.0084)**	**(0.8560)**
Establishment controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry–year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,508	29,584	37,508	29,336	37,508	6,631	37,508	492
Establishments	7,165	5,651	7,165	5,654	7,165	2,153	7,165	334
R-squared	0.490	0.716	0.488	0.722	0.462	0.506	0.286	0.641
Adjusted R-squared	0.412	0.668	0.409	0.675	0.380	0.309	0.176	0.183

Notes: OLS regressions with establishment fixed effects and clustered standard errors at the establishment level (in parentheses). ***, **, and * indicate significance levels of 0.01, 0.05, and 0.1, respectively.

D.5 Firm Heterogeneity and Asset Structure

In Tables D.8, D.9, and D.10, we report regression results using triple difference specifications as in Table 5, but using equipment (Table D.8), building (Table D.9), and land (Table D.10) investments at the extensive and intensive margins as dependent variable.

Table D.8: Firm heterogeneity for equipment investment

Margin	Extensive	Intensive
	(1)	(2)
DiD	0.0207*	0.0589
	(0.0122)	(0.0887)
DiD Large	0.0062	0.2470***
	(0.0125)	(0.0746)
DiD Group	0.0309**	0.0602
	(0.0152)	(0.0871)
DiD Owner	-0.0119	0.1410
	(0.0204)	(0.1290)
DiD Corp	-0.0015	-0.1180
	(0.0127)	(0.0906)
Firm type controls	Yes	Yes
Establishment controls	Yes	Yes
County controls	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Industry–year FE	Yes	Yes
Observations	243,919	218,491
Establishments	45,381	42,835
R-squared	0.542	0.785
Adjusted R-squared	0.436	0.732

Notes: OLS regressions with establishment, year, and industry-year fixed effects. Standard errors are clustered at the establishment level (in parentheses). DiD is an interaction term of a dummy variable for establishments in the Eastern German states and a dummy variable for the DAL treatment period (1995–1998). DiD Large is an interaction term of a dummy variable for firms with at least 250 staff members (Large) and DiD. DiD Group is an interaction term of a dummy variable for firms with more than one establishment (Group) and DiD. DiD Owner-Managed is an interaction term of a dummy variable for firms that are managed by an owner (Owner-Managed) and DiD. DiD Corporation is an interaction term of a dummy variable for corporations with limited liability (Corporation) and DiD. ***, **, and * indicate significance levels of 0.01, 0.05, and 0.1, respectively.

As seen in Table D.8, results for equipment are widely in line with Table 5. We find some evidence for a stronger increase in investment activity for multi-establishment firms with the opportunity for subsidy shopping as well as strong evidence for a positive aggregate response for large firms with at least 250 employees that is primarily driven by the large increase of investments at the intensive margin for this type of firms. For owner-managed and corporate firms, there is no evidence for statistically significant effect.

Table D.9: Firm heterogeneity for building investment

Margin	Extensive	Intensive
	(1)	(2)
DiD	0.0444	-0.0315
	(0.0276)	(0.222)
DiD Large	0.0283	0.5740***
	(0.0205)	(0.1620)
DiD Group	0.0286	-0.1180
	(0.0203)	(0.1730)
DiD Owner	0.0510	0.3140
	(0.0381)	(0.3170)
DiD Corp	0.0101	0.2210
	(0.0276)	(0.2190)
Firm type controls	Yes	Yes
Establishment controls	Yes	Yes
County controls	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Industry–year FE	Yes	Yes
Observations	243,918	66,783
Establishments	45,381	19,964
R-squared	0.529	0.539
Adjusted R-squared	0.420	0.339

Notes: OLS regressions with establishment, year, and industry-year fixed effects. Standard errors are clustered at the establishment level (in parentheses). DiD is an interaction term of a dummy variable for establishments in the Eastern German states and a dummy variable for the DAL treatment period (1995–1998). DiD Large is an interaction term of a dummy variable for firms with at least 250 staff members (Large) and DiD. DiD Group is an interaction term of a dummy variable for firms with more than one establishment (Group) and DiD. DiD Owner-Managed is an interaction term of a dummy variable for firms that are managed by an owner (Owner-Managed) and DiD. DiD Corporation is an interaction term of a dummy variable for corporations with limited liability (Corporation) and DiD. ***, **, and * indicate significance levels of 0.01, 0.05, and 0.1, respectively.

For building investments, the results in Table D.9 are somewhat different from the results for aggregate investments in Table 5. Most notably, we do not find significant effects for DiD Group but likewise a very strong and positive effect for DiD Large at the intensive margin. Thus, especially investments with a very large investment response (buildings) seem to be abnormally high for large firms with low tax planning costs. This documents that large firms use bonus depreciation to a higher extent than their smaller counterparts. For land investment (Table D.10), there are no statistically significant triple difference interaction terms, which might be partially due to smaller observation numbers.

Table D.10: Firm heterogeneity for land investment

Margin	Extensive	Intensive
	(1)	(2)
DiD	0.0332**	0.1960
	(0.0163)	(0.8390)
DiD Large	-0.0149	0.6090
	(0.0133)	(0.7240)
DiD Group	-0.0089	0.3780
	(0.0121)	(0.8070)
DiD Owner	0.0109	0.5210
	(0.0230)	(0.9740)
DiD Corp	-0.0149	-0.1110
	(0.0165)	(0.8530)
Firm type controls	Yes	Yes
Establishment controls	Yes	Yes
County controls	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Industry–year FE	Yes	Yes
Observations	243,919	10,737
Establishments	45,381	5,855
R-squared	0.346	0.640
Adjusted R-squared	0.196	0.166

Notes: OLS regressions with establishment, year, and industry-year fixed effects. Standard errors are clustered at the establishment level (in parentheses).DiD is an interaction term of a dummy variable for establishments in the Eastern German states and a dummy variable for the DAL treatment period (1995–1998). DiD Large is an interaction term of a dummy variable for firms with at least 250 staff members (Large) and DiD. DiD Group is an interaction term of a dummy variable for firms with more than one establishment (Group) and DiD. DiD Owner-Managed is an interaction term of a dummy variable for firms that are managed by an owner (Owner-Managed) and DiD. DiD Corporation is an interaction term of a dummy variable for corporations with limited liability (Corporation) and DiD. ***, **, and * indicate significance levels of 0.01, 0.05, and 0.1, respectively.

D.6 Interaction Effects with Local Business Tax Rates

Table D.11: Local business tax interaction effects

Investment type	Aggregate investment				Building & land share	
Margin	Extensive	Extensive	Intensive	Intensive		
Model	(1)	(2)	(3)	(4)	(5)	(6)
DiD	**0.0906*****	**0.0928*****	**0.2660****	**0.2320***	**0.0423****	**0.0489****
	(0.0260)	**(0.0271)**	**(0.1350)**	**(0.1390)**	**(0.0209)**	**(0.0210)**
DiD × Weighted LBT Rate	**-0.396****		**-1.021**		**-0.0309**	
	(0.1750)		**(0.9610**		**(0.1400)**	
Weighted LBT Rate	**-0.1890**		**2.1270*****		**-0.0384**	
	(0.1190)		**(0.6430)**		**(0.0756)**	
DiD × LBT Rate		**-0.4130****		**-0.8050**		**-0.0765**
		(0.1820)		**(0.9400)**		**(0.1420)**
LBT Rate		**-0.1210**		**1.8450****		**-0.0811**
		(0.1330)		**(0.7280)**		**(0.0876)**
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	543,765	543,646	470,271	470,172	469,951	469,852
R-squared	0.473	0.473	0.705	0.705	0.289	0.289
Adjusted R-squared	0.397	0.397	0.658	0.658	0.177	0.177

Notes: OLS regressions with establishment fixed effects and clustered standard errors at the firm level (in parentheses). For the models (1) and (2), he dependent variable is a dummy variable with a value of one for an establishment i with positive aggregate investments in t. For the models (3) and (4), the dependent variable is the natural logarithm of positive aggregate investment. For the models (5) and (6), the dependent variable is the share of building and land investments to aggregate investments. DiD is an interaction term of a dummy variable for establishments in Eastern German states and a dummy variable for the DAL treatment period (1995–1998). (Weighted) LBT Rate is the (wage-weighted) local business tax rate of establishment i in year t and DiD × (Weighted) LBT Rate is an interaction term of DiD and this tax rate variable; ***, **, and * indicate significance levels of 0.01, 0.05, and 0.1, respectively.