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# Tax Cuts Starve the Beast!

## Evidence from Germany

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### Abstract

This paper empirically evaluates how fiscal policy reacts to changes in the government's fiscal situation. Utilizing panel data from the German states covering the period from 1992 to 2011, we assess to what extent exogenous changes in tax revenues affect total public revenues, aggregate public expenditure as well as specific sub-categories of government spending. Applying the narrative approach pioneered by [Romer and Romer \(2010\)](#), we construct a measure of exogenous tax shocks, allowing us to identify the causal effect of tax changes on fiscal policy. Our findings indicate that tax changes trigger expenditure adjustments into the same direction after 2 to 3 years, specifically with respect to spending on governmental administration, health expenditures and spending on infrastructure.

**Keywords:** Taxation, Fiscal Policy, Tax-Spend, Public Expenditure, Narrative Approach.

**JEL Classification:** E62, H11, H20, H62, H72.

## 1. Introduction

Fiscal discipline currently is a major concern among policy-makers as well as economic pundits. Persistent fiscal imbalances and accelerating public debt levels have triggered heated debates about the sustainability of public finances and the future fiscal policy stance. In this regard, the relationship between public deficits, tax revenues, and public expenditures is of particular interest. In light of the government's inter-temporal budget constraint, the persistent fiscal imbalances must eventually lead to higher taxes or public spending cuts. Consequently, many policy makers and economic scholars call for the immediate implementation of consolidation measures. Their opponents, however, voice concerns that fiscal austerity may disrupt economic recovery and pave the way back into crisis. In Germany, this debate is currently turned upside down. The recent unexpected rise in tax revenues has spurred lively debates about how the additional funds shall be used. While fiscal conservatives opt for using the surplus to reduce the debt burden, others call for public expenditure hikes or tax cuts.

The aim of this paper is to evaluate how governments react to a change in the fiscal situation. More precisely, we study the causal influence of changes in tax revenues on public expenditures. To this end, we utilize panel data from the German states, i.e., the *Bundesländer*, covering the period from 1992 to 2011.

The causal relationship between government revenues and expenditures is a longstanding topic in the empirical public economics literature and dates back to the late 1980s. Our paper relates to a branch of that literature that analyzes the effects of tax changes on government spending. According to the ‘tax-and-spend hypothesis’, as advanced by [Friedman \(1978\)](#), greater resources for the government through rising tax revenues will result in higher public expenditures. Similarly, a reduction in available resources would turn into lower expenditures. A closely related literature branch focuses on the effects of public expenditure adjustments on tax revenues. According to the ‘spend-and-tax hypothesis’, expenditure decisions tend to be made before tax revenues are adjusted accordingly. For example, [Peacock and Wiseman \(1979\)](#) argue that higher taxes are necessary in order to meet higher expenditures that could be due to ‘crisis’ situations. Reductions in government spending would therefore translate into lower tax revenues in the longer run. Yet other researchers argue that, in general, revenues and expenditures are set simultaneously implying a bi-directional causality between taxation and spending. In this context, [Musgrave \(1966\)](#) and [Meltzer and Richard \(1981\)](#) have argued that voters are comparing marginal benefits and costs of governmental programs, thus deciding about the optimal level of expenditures.

A common feature of the aforementioned approaches is that, at least in ‘normal’ times, tax revenues and government expenditure tend to move into the same direction. An alternative perspective can be found in [Wagner \(1976\)](#) and [Buchanan and Wagner \(1977\)](#) who argue that declining revenues are followed by increasing expenditures via a fiscal illusion effect. According to this line of argumentation, a tax reductions would lessen the perceived price of publicly provided goods and services which would in turn lead to an increase in the demand for these goods and, eventually, turns into higher government expenditures. Finally, the ‘institutional separation hypothesis’ conjectures that neither of the two variables has a causal effect on the other (e.g. see [Baghestani and McNown \(1994\)](#) and [Wildavsky \(1997\)](#)).

The vast majority of empirical studies assesses the relationship between taxation and public spending at the national level, in particular for the United States as well as major European countries and, to a smaller extent, also for newly-industrialized countries.<sup>1</sup> Less attention, however, has been devoted to the analysis at the sub-national level concerning individual states and local governments. Examples include [von Furstenberg et al. \(1985\)](#) as well as [Ram \(1988\)](#) who both provide evidence in support of the ‘spend-and-tax’ hypothesis at the state and local government level in the US. Results of the multi-country study of [Joulfaian et al. \(1990\)](#) support the ‘tax-and-spend’ hypothesis at the aggregate state and local government level for the US, Canada and Portugal while the ‘spend-and-tax’ hypothesis seems to hold for Japan, France, the United Kingdom, Greece, Ireland and the Netherlands. Moreover, evidence in support of the ‘institutional separation hypothesis’ is provided for Germany.

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1. For a survey of this literature see [Payne \(2003\)](#).

The lack of consensus in the empirical literature is partly due to the difficulty of identifying exogenous tax policy changes that are not correlated with other fluctuations which have an impact on governments' expenditures. The recent literature has addressed the prevailing identification issue in this context by applying bi-variate vector error correction models in order to account for the possibility of a common stochastic trend in both variables. This approach, however, raises issues of parameter restrictions for the short and long-run relationship between the two variables.

Following the advances in [Romer and Romer \(2010\)](#) for the US, [Cloyne \(2013\)](#) for the UK and [Hayo and Uhl \(2014\)](#) for Germany, we use a narrative record to compile a list of tax changes that are uncorrelated with other macroeconomic fluctuations. Having assembled this list of exogenous tax policy changes together with their projected revenue changes for each state, we use it to consistently estimate the effect of revenue shocks on local governments' expenditures, thus following a novel approach to the tax-spend debate that has been untapped in the past. The German states provide a particularly suitable laboratory for this approach as they have hardly any competencies with respect to deciding about their taxes (and tax revenues, accordingly) as compared to the federal level. This makes us even more confident that the tax revenue shock series that we consider as exogenous are in fact not affected by contemporaneous or future spending decisions of the states.

To the best of our knowledge, we are the first to use panel data of 16 German states ('Länder') between 1992 and 2011 with detailed information on state-level expenditure items, including spending on public safety, culture and social security, thus making an important extension of the previous literature in this dimension.

The remainder of this paper is structured as follows. Section 2 provides background information on the fiscal federalism system in Germany and the competencies of the German states. The construction of our exogenous tax shock series is explained in section 3. In section 4, we introduce our empirical model. Section 5 presents our results, followed by extensions and robustness checks in section 6. Section 7 concludes.

## 2. Fiscal Federalism in Germany

The German federal system consists of three governmental levels – federal, state, and municipal – each one endowed with its own fiscal competencies as specified by the German Constitution. Since the German reunification in 1990, there are 16 German states ('Bundesländer'). Three of the 16 are so-called city-states (Berlin, Bremen, and Hamburg), which combine state and municipal-level competencies. The competencies assigned to the German states are extensive and mainly defined in Articles 71-74 of the constitution. They include policy areas such as social security, public safety, education, cultural affairs, administration, and health.

Although equipped with far-reaching competencies and responsibilities, the German states hardly have any tax setting authority. With few exceptions, tax rates are set and tax revenues are collected by the federal government. In order to ensure that each state has sufficient means to perform its functions and to harmonize living conditions across all 16 German states, tax revenues are allocated across states applying a multi-step mechanism (so-called 'Länderfinanzausgleich' or fiscal equalization scheme).

In a first step, the vertical allocation mechanism, tax revenues from the income tax, corporate tax, capital gains tax and value added tax are allocated across the different levels of government according to fixed ratios. I.e., the federal government and the state governments each receive 42.5% of the income tax, 50% of the corporate tax and 44% of the capital gains tax. With regard to the value added tax, the federal level receives 51.4% and the state governments 46.4% of the revenues. The remainder is for the municipal governments. Revenues from some other tax measures are fully allocated either to the federal government (e.g., energy and tobacco taxes) or the state governments (e.g., inheritance tax).

In the second step, the horizontal allocation mechanism, each single state's share of the total amount of tax revenues allocated to the state level is determined. Income tax revenues are distributed in order to roughly match the amount of taxes paid by each state's inhabitants. The allocation of corporate tax revenues follows a similar principle. Each state's share of total tax revenues depends on the amount of taxes paid by the firms having their head-quarter or affiliated production units in that state. The allocation of VAT tax revenues to a large extent serves the purpose to harmonize tax revenues across states. Up to 25% of the total VAT revenues are assigned to those states that have received below-average per capita tax revenues out of other tax instruments. The remainder is distributed according to the number of inhabitants in each state.

The fiscal equalization scheme comprises a third and fourth step that both aim at further mitigating the differences in per-capita tax revenues across states. In the third step, states with higher than average per-capita tax revenues are paying to those states with below average per capita tax revenues. The justification for this redistributive scheme is that each state is believed to be in need of financial resources of an comparable level in order to properly fulfill its functions. As a final step, in case of remaining differences with regard to per-capita tax revenues, the federal government pays grants to those states that still have below-average financial resources available.

### 3. Constructing an Exogenous Tax Shock Series

To identify the causal effect of tax shocks on fiscal policy outcomes, we adopt the narrative approach pioneered by [Romer and Romer \(2010\)](#). To this end, we collect information on all discretionary changes in the federal tax legislation in Germany over the period from 1988 to 2011 along with the expected impact of each tax legislation change on tax revenues. Our source of information is the *Finanzbericht* (fiscal report), an annual publication of the Federal Ministry of Finance. The *Finanzbericht* contains detailed information on every piece of tax legislation, including (i) the date the tax bill was passed, (ii) the detailed motivation behind the tax measure, and (iii) forecasts of the annual impact on tax revenues over the next years for each level of government, i.e., federal, state, and municipal level. Note that the forecasts for the state and municipal level represent aggregates, i.e., the *Finanzbericht* reports the prospected cumulative revenue impact for all states and municipalities combined.

To construct a measure of exogenous tax shocks, we proceed in several steps. First, we assign each piece of tax legislation to one out of seven different categories, depending on the motivation behind the tax measure. Thereby, we closely follow the schemes applied in [Romer and Romer \(2010\)](#), [Cloyne \(2013\)](#) and [Hayo and Uhl \(2014\)](#). By rules of the

parliamentary procedure, the motivation for any tax change needs to be explained in the draft of a bill, which allows us to identify each tax bill's intention.

The first category comprises tax changes that are primarily intended to stabilize supply or demand-driven fluctuations in aggregate output. We label these tax measures 'counter-cyclical'. There are several examples of tax changes falling into this category, most prominently the fiscal stimuli packages that were implemented during the recent economic and financial crisis in 2010 ('Konjunkturpaket').<sup>2</sup>

The second category are 'spending-driven' tax changes. This label refers to tax measures that are implemented in anticipation of higher future public expenditures in the short and mid-run. Examples include the increase in taxes on cigarettes in 2003 that was explicitly adopted with the aim of financing the fight against international terrorism. Related to this are tax measures that were implemented in order to consolidate public finances. These 'deficit-driven' tax changes comprise only tax hikes. A prime example is the value-added tax increase (the VAT rate rose from 16% to 19%) of 2006 with a prospected rise in public revenues of roughly €24 billion annually.

Fourth, some policy measures were taken in response to 'macro-shocks', such as the German reunification and the introduction of the euro as a common currency in Europe. In 2000, for example, the German government issued a bill converting and rounding amounts denoted in the German tax law in *Deutsche Mark* (such as allowances or income thresholds important for the determination of tax rates) to *euro* amounts.

The fifth category includes tax changes adopted in an attempt to steer the behavior of the taxpayers into the desired direction. The intention behind this type of taxes typically is to force taxpayers to internalize some sort of inherited externality, especially environmental taxes.

Our sixth category is for tax measures that were implemented for 'structural reasons'. This label applies to tax instruments intended to improve the long-term economic conditions but, at the same time, are unrelated to the contemporaneous economic situation. Examples include tax measures that aim at reducing the bureaucratic burden of taxation for firms or improving conditions for private investments.

Seventh, some tax changes reflect EU law being introduced into national legislation or they are passed because of the ruling of the European Court of Justice. For instance, in 2010, a bill was introduced extending the possibility to deduct donations to Germany-based charitable organizations from the taxable income to donations directed to charitable organizations based in other EU countries. The introduction of these tax bills into national legislation is compulsory and the German government typically has only little – if any – leeway with regard to the details of the law's content. Those tax bills are typically intended to harmonize tax legislation across EU member states.

In a second step, we classify each tax category as either endogenous or exogenous. Discretionary tax changes that can be unambiguously labeled as exogenous should not be correlated with factors that might affect government spending and revenues at the same time. Due to that, we consider counter-cyclical tax measures as endogenous. Tax cuts (tax hikes) implemented during recessions (booms) may be accompanied by spending hikes

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2. Cloyne (2013) explicitly distinguishes between demand and supply-driven tax policy reactions within this broader category of 'counter-cyclical' tax policy measures. This distinction is not important for our purpose, as we are only concerned about the identification of exogenous tax measures.

(cuts) in order to amplify the fiscal stimulus (contraction). Also, automatic stabilizers mechanically trigger expenditure adjustments in the presence of business cycle fluctuations. These, however, are not caused by tax changes.

In addition, exogenous tax changes must not automatically involve decisions about public expenditure or be triggered by them. Consequently, tax changes that are spending-driven must be considered as endogenous, since, by definition, they are a consequence rather than a cause of changes in public spending. Deficit-driven tax changes, on the other hand, may be inversely related to spending changes. Thus, an inclusion of these tax changes would most certainly induce a downward bias in our coefficient estimates. All remaining tax changes are labeled as exogenous for two reasons. First, they are neither the results of changes in public expenditure nor related to economic or fiscal variables that affect tax revenues and public expenditure at the same time. Second, as they reflect decisions made at the federal government level and are, thus, ‘externally’ imposed, they are unrelated to the political situation in the state in which the revenue ‘shock’ occurs.

Finally, for each year during the period under consideration, we compute the aggregated revenue impact of past and present tax changes. For each tax measure, the *Finanzbericht* reports the prospected annual revenue impact for  $k$  consecutive years, with  $k$  varying across publications and tax changes. Consequently, we compute the aggregate change in tax revenues in year  $t$  by adding up the projected changes in tax revenues for year  $t$  of all tax measures adopted between  $t$  and  $t - k$ . Thus, our exogenous (indicated with  $x$ ) tax shock measure is equal to

$$\Delta\tau_t^x = \sum_{j=0}^k \Delta\tau_{t|t-j}^x,$$

where  $\Delta\tau_{t|t-j}$  is the sum of tax revenue changes projected for year  $t$  across all tax measures introduced in year  $t - j$ .

Note that, in contrast to [Hayo and Uhl \(2014\)](#), who omit tax measures with a prospected revenue impact of less than 0.1% of GDP from their analysis, our analysis includes all pieces of tax legislation that are passed during our sample period. The reason is that several tax changes are introduced each year and we are interested in their cumulative impact. Even if each single tax measure implemented in a particular year has a rather modest impact on tax revenues, the cumulative effect of all tax changes introduced that year may be large enough to exert a significant influence on the public budget. In total, our dataset covers 129 pieces of legislated tax changes, of which we consider 93 to be exogenous and 36 as endogenous.

Revenue projections are provided by the tax projection experts of the Ministry of Finance but with no further information on how and on which basis they are obtained. In order to assess their accurateness, we simply regress actual total revenues on our tax shock series that is assembled on the basis on the projections (Table 1). We find a regression coefficient of 0.81 in our baseline regression and a coefficient that is very close to 1 when also controlling for several co-variables. Political control variables include dummy variables for whether the government is a left-wing party, a coalition or whether a state-level elections take place in the same year. Economic control variables include information about the first differences in the state-level unemployment rate, income per capita and debt as well as the dependency ratio.



Given that the contemporaneous effect of the tax shock series is as expected in terms of magnitude and highly statistically significant, also when controlling for various other political and economic variables, we have no reason to believe that they are systematically biased and are confident that the projections are sufficiently precise for our purpose.

Table 1: Effect of Tax Changes on Total Public Revenues

	Regr. (1)		Regr. (2)	
$\Delta\tau_t^x$	0.806***	(0.002)	1.036***	(0.007)
$\Delta\tau_{t-1}^x$	0.243	(0.498)	0.324	(0.465)
$\Delta\tau_{t-2}^x$	-0.420	(0.309)	-0.087	(0.854)
$\Delta\tau_{t-3}^x$	-0.195	(0.558)	0.721	(0.192)
$\Delta\tau_{t-4}^x$	0.092	(0.799)	-0.103	(0.786)
Political controls	<b>x</b>		✓	
Economic controls	<b>x</b>		✓	
$R^2$	0.05		0.13	
Obs.	224		208	

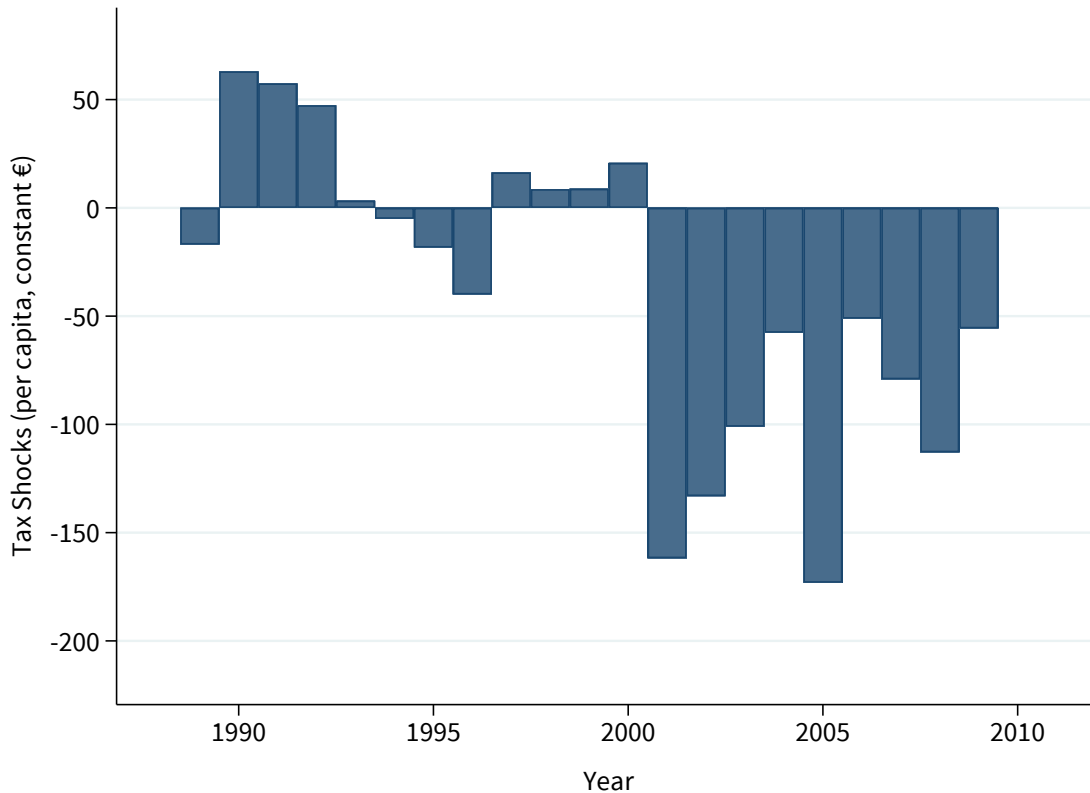
*Notes:* Results are based on OLS estimation. We use heteroskedasticity robust standard errors. \* and \*\* and \*\*\* indicate statistical significance at the 10%, 5% and 1% level, respectively. Corresponding p-values are given in brackets.

The resulting exogenous tax shock series is depicted in Figure 1 below with the per-capita tax revenue changes at the state-level in constant prices on the vertical axis. We see that in only eight out of 21 years the overall revenue change is positive. This is due to the fact that the majority of tax changes in the list of exogenous tax changes – around two thirds – have a negative revenue impact and they are also larger in the size of the corresponding revenue effect. Some years stand out in this context: Substantial drops in tax revenues in our exogenous tax shock series in the early and mid 2000s are driven mostly by structural changes in labor as well as corporate profit taxation in order to spur domestic demand and private investment activities in the longer-run. The economy was at that time on a solid economic expansion path with annual Gross Domestic Growth (GDP) growth rates of around 1.9% in 2001 and up to 4.5% in 2004, clearly indicating that the intention was not to implement anti-cyclical measures. Similarly, negative tax revenue shocks in 2007/08 are not driven by the onset of the recent financial and economic crisis but reflect an accumulation of smaller tax changes aiming at changing the long-run conditions. For example, the largest tax change in terms of revenue impact at that time was to tax-incentivize private pension plans in light of the projected demographic change over the next decades. Obviously, these changes are not driven by contemporaneous economic conditions but focus on solving longer-run challenges.

For establishing a causal link between tax revenues and expenditure adjustments it is important for our identification strategy to have a purely exogenous tax shock series, that



Figure 1: The Exogenous Tax Shock Series at the State-Level



is fluctuations in tax revenues for states that are not related to other contemporaneous economic developments which could affect spending at the same time. This is primarily true for income growth and, closely related, to unemployment dynamics. By comparing the path of the tax shock series to GDP growth rates over the same time horizon, it is evident that both series follow different patterns that are not correlated with each other: Income growth has been modest in the early 1990s and 2000s with growth rates of around 1.5% in 1991 and 1.9% in 2001, respectively, while it was particularly strong in the mid 2000s – 3.8% in 2005 – and particularly low during the financial crisis with -1.7% in 2009. It can be seen immediately that the pattern of the exogenous tax shock is not in line with these dynamics.

#### 4. Empirical Approach

Our aim is to evaluate the influence of legislated tax changes on fiscal policy outcomes. To this end, we utilize panel data from the German states covering the years from 1992 to 2011.<sup>3</sup> In our baseline estimation, we employ a panel finite distributed lag (FDL) model of the following form:

3. Note that state-level forecasts of the revenue impact of tax changes are reported from 1988 onwards. In the *Finanzbericht* of 1988, revenue forecasts are provided for the years from 1988 to 1992. Thus, if

$$y_{it} = \alpha + \sum_{j=0}^n \beta_j \Delta \tau_{t-j}^x + X_{it} \beta + \delta_1 t + \delta_2 t^2. \quad (1)$$

To account for gradual budget adjustments, we also estimate a panel autoregressive distributed lag (ADL) model:

$$y_{it} = \tilde{\alpha} + \sum_{j=0}^n \tilde{\beta}_j \Delta \tau_{t-j}^x + \sum_{j=1}^n \gamma_j y_{t-j} + X_{it} \tilde{\beta} + \tilde{\delta}_1 t + \tilde{\delta}_2 t^2. \quad (2)$$

The index  $t$  refers to the year,  $i$  to the state. The dependent variables employed in our analysis are (i) total public expenditures and (ii) specific expenditure categories. The data is provided by the German Statistical Office ('Statistisches Bundesamt').  $\Delta \tau^x$  is our exogenous tax shock variable and  $X_{it}$  is the matrix of control variables included. All variables are adjusted for inflation using the national CPI.<sup>4</sup> Our models include a linear time trend  $t$  as well as a second order polynomial for time. We estimate Equations 1 and 2 using ordinary least squares (OLS).

As described in section 3,  $\Delta \tau_t^x$  is equal to the sum of the tax revenue effects projected for year  $t$  of all tax changes adopted between  $t$  and  $t - k$ . Since for most volumes of the *Finanzbericht*  $k$  is equal to four (and never smaller), we include four lags of the tax shock variable and the dependent variables as regressors in our finite and autoregressive distributed-lag model.

Because the *Finanzbericht* only reports forecasts of the aggregate tax revenue effect for all German states combined, we need to make an assumption about how the aggregate effect affects the budgets of the individual states. Since, in general, the allocation of tax revenues across states is primarily determined by the number of citizens residing in a specific state  $j$ , we divide our tax shock variable by national population figures and our dependent variables by state population figures. That way, we implicitly assume that the change in tax revenues in each state resulting from a legislated tax change is proportional to its number of inhabitants.

Out of the 16 German states, three are so-called city states ('Stadtstaaten'), namely Berlin, Bremen, and Hamburg. These states assume functions of both the state and municipal government level. Due to that, for them, the impact of legislated tax changes on the state and the municipal budget is relevant. Consequently, the tax shock series for the city states includes the prospected change in tax revenues on the state level and the municipal level together.

As a third specification we include an interaction term of the exogenous tax shock series with an indicator variable that is equal to one when the government of state  $i$  in period  $t$  is left-wing. This is interesting not only because it allows us to distinguish between responses of parties of different couleur over time. In terms of our identification, we can exploit further variation across the 16 states that we have not used before. Specifically, given that the sum of funds out of the redistribution scheme for each state is mainly a function of the number of inhabitants, it is reasonable to assume that the state-specific tax shock series are

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we would utilize data from before 1992 in our analysis, we would not take into account the estimated state-level revenue impact of tax measures introduced before 1988.

4. The base year is 2000; the data is also retrieved from the German Statistical Office.

highly correlated with each other which implies that variation across states is possibly small. There is, however, substantial variation across states when it comes to the political colour of the governing party – both across states and within states over time. We exploit this by including an additional interaction term with an indicator variable that is one when the main party is left-wing, i.e. the Social Democratic Party (SPD). The corresponding causal effect of a revenue shock on aggregate spending as well as specific spending categories is then given as the sum of the coefficients  $\tilde{\beta}_j + \tilde{\mu}_j$ ,  $\forall j = 0, \dots, n$ .

$$y_{it} = \tilde{\alpha} + \sum_{j=0}^n \tilde{\beta}_j \Delta \tau_{t-j}^x + \sum_{j=0}^n \tilde{\mu}_j \Delta \tau_{t-j}^x \times \mathbb{1}_{left} + \sum_{j=1}^n \tilde{\gamma}_j y_{t-j} + X_{it} \tilde{\beta} + \tilde{\delta}_1 t + \tilde{\delta}_2 t^2. \quad (3)$$

## 5. Results

Table 2 below presents the states’ marginal propensity to spend an additional Euro. The first column displays the results of the FDL model (equation 1) while columns 2 as well as 3 and 4 display the estimation results for the ADL model without and with left-wing interaction term, respectively (equations 2 and 3). All values are in per-capita values. Our results suggest a strong and statistically significant impact of legislated tax changes on states’ aggregate spending. Specifically, the estimates suggest that a €1 increase in taxes is associated with an average per-annum increase of €0.50 to around €0.60 after two to three years, depending on the specification. Thus, tax changes do have notable spending effects. Arguably, the delayed reaction of public spending in the event of a tax change is indicative of the inside lag in political decision making. It takes time for the government to adapt to the revenue change and to agree on fiscal measures to be taken in response to it.

Considering left-wing and right-wing parties separately reveals interesting differences both in terms of magnitude of the response as well as the timing of measures initiated. While left-wing parties appear to increase spending already after two instead of three years, they also seem to smooth out additional expenditures, despite not being statistically significant anymore in years four and five after the revenue shock, though. The estimation results suggest that expenditures among right-wing parties, are relatively more concentrated in the fourth year.

Table 3 below differentiates between different expenditure categories in which states hold major competencies. Generally speaking, as our estimations illustrate, results at the aggregate spending level are hardly representative for the more disaggregate spending level where substantial differences in terms of timing and magnitude arise across specific spending categories. The first – and one of the largest expenditure item – is ‘Administrative spending’, i.e. mostly state employees’ salaries and the provision of administration-related facilities and buildings. The results suggest throughout all specifications a pronounced contemporaneous increase in the first and the second period following the tax revenue shock of around €0.20 and €0.46, respectively. There seem to be no statistically significant long-run adjustments in terms of administrative spending. This is different for health-related spending which appears to be relatively more back-loaded with smaller spending increases shortly following the tax hike and more pronounced increases after two years.

Aggregate spending on infrastructure appears to follow the same pattern with smaller spending increases in the beginning and more generous spending in the longer run – not

Table 2: Effect of Tax Changes on Public Expenditures

	FDL (1)	ADL (2)	Interacted ADL (3)	
			Left	Right
$\Delta\tau_t^x$	0.261	0.315	0.325	0.409
$\Delta\tau_{t-1}^x$	0.078	-0.086	0.079	-0.170
$\Delta\tau_{t-2}^x$	0.412	0.564**	0.776**	0.422
$\Delta\tau_{t-3}^x$	0.590**	0.629**	0.457	0.788**
$\Delta\tau_{t-4}^x$	0.224	0.339	0.607	0.175
AR(4)	✘	✓	✓	✓
Political controls	✓	✓	✓	✓
Economic controls	✓	✓	✓	✓
$R^2$	0.19	0.29	0.31	0.31
Obs.	208	202	202	202

*Notes:* Results are based on OLS estimation. We use heteroskedasticity robust standard errors. \* and \*\* and \*\*\* indicate statistical significance at the 10%, 5% and 1% level, respectively. Corresponding p-values are omitted to ease readability. The coefficient of the constant is also omitted.

surprisingly since many construction projects require considerable time for planning. However, by differentiating between left and right-wing parties, we can see that initially smaller increases in aggregate figures are due to differences in the timing between both political groups: While left-wing parties increase spending immediately and after two years, right-wing parties adjust their spending only after one year in the same direction as the tax shock. Both parties increase spending in the longer run after four years by €0.10 to €0.14 per-capita.

German states are also (partly) responsible for the provision of ‘Public Safety’, in particular the financing of the police as well as fire and other emergency services. This expenditure category is comparably small which could explain why there is no visible effect both in the aggregate and the party-specific expenditures, except for a marginal increase of around €0.04 for right-wing parties after three years. Similarly, there is only a small effect to be observed for spending on ‘Legal Protection’ which mostly refers to the financing of the judiciary system.

Turning to ‘Social Security’ expenditures, we can observe an increase in aggregate figures after three years which is exclusively driven by left-wing parties as revealed by differentiating between both parties. The estimation results suggest that right-wing parties, on the other hand side, cut expenditures immediately in response to tax hikes. The effect is statistically significant at the 5% level and very large in magnitude with around €0.30. To the best of our knowledge, the unexpected estimate of this coefficient cannot be explained by specific outlier values or other extraordinary one-time effects. One reason could lie in the nature

Table 3: Effect of Tax Changes on Specific Public Expenditure Categories

	Administration		Health		Infrastructure				
	ADL (2)	Interacted ADL (3) Left	ADL (3) Right	ADL (2)	Interacted ADL (3) Left	ADL (2)	Interacted ADL (3) Left	Interacted ADL (3) Right	
$\Delta\tau_t^x$	0.221***	0.216***	0.214***	0.096**	0.087**	0.095**	0.100*	0.138**	0.057
$\Delta\tau_{t-1}^x$	0.417***	0.461***	0.364***	0.067*	0.061	0.059	0.091*	0.046	0.120*
$\Delta\tau_{t-2}^x$	0.125	0.090	0.121	0.150***	0.169***	0.126***	0.078	0.129**	0.041
$\Delta\tau_{t-3}^x$	-0.053	-0.094	-0.033	0.117***	0.108***	0.118***	0.062	0.021	0.088
$\Delta\tau_{t-4}^x$	0.020	0.045	0.023	0.044*	0.055*	0.035	0.109***	0.127*	0.099*
AR(4)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Political controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Economic controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
$R^2$	0.62	0.63	0.63	0.32	0.34	0.34	0.20	0.23	0.23
Obs.	144	144	144	144	144	144	144	144	144

Notes: Results are based on OLS estimation. We use heteroskedasticity robust standard errors. \* and \*\* and \*\*\* indicate statistical significance at the 10%, 5% and 1% level, respectively. Corresponding p-values are omitted to ease readability. The coefficient of the constant is also omitted.

Table 3: Effect of Tax Changes on Specific Public Expenditure Categories (cont'd)

	Public Safety			Legal Protection			Social Security		
	ADL (2)	Interacted ADL (3) Left	Right	ADL (2)	Interacted ADL (3) Left	Right	ADL (2)	Interacted ADL (3) Left	Right
$\Delta\tau_t^x$	-0.010	-0.025	0.010	0.017	0.014	0.018	-0.183	-0.098	-0.316**
$\Delta\tau_{t-1}^x$	0.009	0.027	0.004	0.030*	0.028	0.032*	-0.141	-0.218	-0.098
$\Delta\tau_{t-2}^x$	0.035*	0.029	0.037*	0.037***	0.025	0.043***	-0.037	-0.035	-0.055
$\Delta\tau_{t-3}^x$	0.014	0.025	0.012	0.029**	0.044***	0.016	0.217*	0.247**	0.154
$\Delta\tau_{t-4}^x$	0.008	0.005	0.011	0.004	-0.002	0.004	0.066	0.006	-0P.039
AR(4)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Political controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Economic controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
$R^2$	0.43	0.46	0.46	0.30	0.34	0.34	0.37	0.42	0.42
Obs.	144	144	144	144	144	144	144	144	144

Notes: Results are based on OLS estimation. We use heteroskedasticity robust standard errors. \* and \*\* and \*\*\* indicate statistical significance at the 10%, 5% and 1% level, respectively. Corresponding p-values are omitted to ease readability. The coefficient of the constant is also omitted.

of the tax shock series which mainly comprises tax cuts. This suggests that, given the coefficient estimates for the other spending categories, state expenditures on those items are declining, too. As an offsetting effect, governments could be tempted to increase spending on other visible categories in order not to lose political support among the population. Verifying this hypothesis is beyond the scope of our data, though.

We conducted the same exercise for a range of additional expenditure categories. These include ‘Education’, ‘Science’, and ‘Culture’. Our regression results show that spending on these categories does not respond statistically significantly to the exogenous tax shock series or, if it does at least at the 10% level, with marginal effects smaller than €0.02 in annual spending changes.

## 6. Extensions and Robustness Checks

### 6.1 Asymmetric Tax-Shock Adjustments

It would be reasonable to assume state governments to respond differently when considering tax hikes and tax cuts separately, i.e. allowing for asymmetric tax shock adjustments. In fact, the previous analysis was rather suggestive of referring to tax hikes only. The second column in Table 4 displays the regression results when the exogenous tax shock series is restricted to tax cuts only. As can be seen by comparing the results to the previous coefficient estimates in the first column that includes both tax cuts and tax hikes, the adjustment process is closely mirroring the previous results with differences in the magnitude of the coefficient estimates. The expenditure change is about 20 cents larger when focusing on tax cuts only in the second and third period after the shock. This is to say that a marginal decline in tax revenues due to an exogenous tax change is accompanied by a decline in overall expenditures by around 80 cents in the mid-run. The overall pattern remains unchanged, though.

### 6.2 Deficit-Driven Spending Adjustments

Economic intuition suggests that the degree of flexibility for governments when adjusting to changes in their fiscal situation is largely determined by the amount of public debt held by the government. Higher debt levels increase naturally pressure on the financial debt markets, therefore tightening the room for maneuver for governments with respect to the magnitude of the response. The results in Table 4 support the hypothesis: Those states that hold above median per-capita public debt respond more strongly and more persistently to fiscal shocks as compared to those states that have only below median debt levels and are therefore less financially constrained.

### 6.3 Coalition-Driven Spending Adjustments

Another potentially important factor when it comes to budget adjustments to exogenous, negative fiscal shocks is a phenomenon which is referred to as the ‘war of attrition’ and which has featured greater prominence in early theoretical contributions to the determinants of budget deficits, e.g. in [Poterba and von Hagen \(1999\)](#) and [Persson and Tabellini \(1999\)](#). It is usually argued in these types of models that coalition governments have an incentive to delay the stabilization and adjustment process in response to fiscal shocks because “each



member of the coalition seeks to transfer on the others the political costs of the adjustment” (Padovano and Venturi, 2001, p. 16). Despite leaving the economy in an unstable and fiscally unsustainable mode after the negative revenue shock, both parties will not give in until the first player, i.e. the ‘loser’ of the game, accepts to bear a disproportionately large share of the fiscal burden.

The theoretical argument implies that the adjustment process kicks in later in coalition governments and, potentially, is also smaller in size. The empirical support is largely inconsistent (see Padovano and Venturi (2001) for a discussion of the empirical evidence), possibly also due to the previous exogeneity issue. Our results – the last column of Table 4 – do not provide empirical support for the phenomenon. Despite some minor differences in the absolute magnitudes of the adjustment process (which are not statistically significantly different from each other), the timing of the responses in the case with and without a coalition government follows exactly the same pattern.

Table 4: Effect of Tax Changes on Public Expenditure: Extensions

	ADL (2)	Only tax cuts included in $\Delta\tau^x$	Debt Level (Median)		Coalition Gov't	
			Below	Above	no	yes
$\Delta\tau_t^x$	0.315	0.626	0.266	0.342	0.494	0.223
$\Delta\tau_{t-1}^x$	-0.086	0.296	-0.103	-0.081	-0.409	0.084
$\Delta\tau_{t-2}^x$	0.564**	0.770**	0.517*	0.590*	0.529*	0.576*
$\Delta\tau_{t-3}^x$	0.629**	0.854**	0.468	0.680**	0.725**	0.612*
$\Delta\tau_{t-4}^x$	0.339	0.298	0.442	0.305	0.275	0.380
AR(4)	✓	✓	✓	✓	✓	✓
Political contr.	✓	✓	✓	✓	✓	✓
Economic contr.	✓	✓	✓	✓	✓	✓
$R^2$	0.29	0.30	0.29	0.29	0.30	0.30
Obs.	202	202	202	202	202	202

*Notes:* Results are based on OLS estimation. We use heteroskedasticity robust standard errors. \* and \*\* and \*\*\* indicate statistical significance at the 10%, 5% and 1% level, respectively. Corresponding p-values are omitted to ease readability. The coefficient of the constant is also omitted.

## 7. Conclusion

Persistent fiscal imbalances in most OECD countries have urged the need to better understand the causal link between tax revenue changes and government expenditures. This paper contributes to the longstanding debate by following a narrative approach, pioneered by Romer and Romer (2010). We use official governmental publications to compile a list of nearly 130 legislated tax changes in Germany – each of them carefully classified by motivation in order to identify those that are unambiguously exogenous with respect to other

economic or political fluctuations – together with the corresponding expected tax revenue changes for the states.

We find a strong and positive impact of legislated tax changes on state governments' aggregate expenditures. The results suggest that an extra *euro* of revenues for local states turns into an increase in spending of about €0.50 to €0.60 after two to three years, depending on the specification. Our results are robust to the inclusion of a range of important state-level control variables. Our findings support the 'starving the beast' hypothesis according to which drops in public revenues are followed by a reduction in government size. This result contradicts the conclusion of Romer and Romer (2010) which could be potentially driven by the econometric challenge of identifying exogenous tax shock series that we account for more properly.

At the disaggregate level, we find substantial differences across spending categories and, to some minor extent, between the political colour of the governing party. While administrative spending increases immediately and substantially in magnitude (up to almost €0.50 in extra annual spending per capita), health and infrastructure-related expenditures appear to materialize only in the longer run and are substantially smaller in size (around €0.10). Spending on 'Public Safety' is only marginally affected and only among right-wing parties. Other categories, such as 'Education' and 'Science' are not affected, as our results suggest.

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