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Abstract

We study the effect of tax policy on stock market returns in the US, Germany, and the UK using GARCH models and a unique daily dataset of legislative tax changes during the period 1978 to 2018. We find that days of discretionary tax legislation during all stages of the process often matter for returns, both in terms of statistical significance as well as economic relevance. Further disaggregating the tax shocks shows that news about personal income tax cuts affects stock market returns positively, whereas business tax legislation is rarely influential. We find evidence of stock market spillovers, mainly from US tax changes to European stock markets. In several cases, we measure significant effects of changes in tax legislation on the days the changes are implemented. The US House Committee Report appears to be the most influential legislative stage. During the financial crisis, stock markets were more responsive to tax legislation. Finally, S&P500 returns tend to react at earlier legislative stages than do DAX returns, whereas FT30 returns barely react on days of domestic legislative action.

Keywords: Fiscal policy, legislative tax changes, stock markets, income tax, business tax, indirect tax, United States, Germany, United Kingdom

JEL codes: E62, F65, G18, H24, H25

1 Introduction

During the Great Recession, policymakers and academics once more became interested in the macroeconomic effects of fiscal policy. Focussing on the revenue side of fiscal policy, the effects of tax shocks—measured as changes in tax liabilities—on macroeconomic variables has been estimated using either structural vector autoregression (SVAR) or the narrative approach introduced by Romer and Romer for the USA (2010). The narrative approach has also been used to estimate the impact of government revenue shocks for other countries, including, for instance, the United Kingdom (Cloyne, 2013) and Germany (Hayo & Uhl, 2014).

Identification in these models typically rests on expected revenue changes when the tax change comes into force. Put differently, the influences of tax shocks are timed to commence at their implementation date and are then allowed to work their way through the economy in a dynamic fashion using lags. This type of identification makes the crucial assumption that the economy does not react before actual implementation of the tax. However, a tax change does not occur overnight. In fact, it tends to be the outcome of a fairly long legislative process. In the extreme case of a world populated by rational expectation agents, the implementation date may even be irrelevant. While the assumption of rational expectation consumers seems questionable, there is a great deal of evidence suggesting that financial markets are forward-looking and react very quickly to new information about economic policy. For instance, many studies report that financial markets adjust swiftly to monetary policy communications (see Blinder et al., 2008).

However, the extant literature on financial market reaction to a variety of tax changes takes only very few aspects of the legislative process into account (see, e.g., Afonso & Strauch, 2004; Ardagna, 2009; Arin et al., 2009; Afonso & Sousa, 2011, 2012). To the best of our knowledge, only Wagner et al. (2018), Gaertner et al. (2020), and Overesch and Pflitsch (2021) study stock market returns on various days of legislative action in the context of one specific tax change, the US Tax Cuts and Jobs Act (TCJA) of 2017. Wagner et al. find significant stock market reactions, especially for the group of high tax firms, and conclude 'that taxes are a very important component of firm value' (2018, p. 596); the other two studies discover significant spillover effects to non-US markets.

In our view, there are four noteworthy weaknesses in the literature that estimates the effects of tax changes on financial markets. First, the identification of the average effects of tax policy changes on financial markets generally does not take into account the full legislative process. Second, if the stages of the legislative process are explicitly considered, as in Wagner et al. (2018), Gaertner et al. (2020), and Overesch and Pflitsch (2021), this is only done for the case of one particular form of tax change. Arguably, therefore, the results cannot be interpreted as estimates of an average tax shock, which is often the focus of the macroeconomic literature. Moreover, it is unclear whether these results can be generalised to other forms of tax shocks, for instance, tax hikes, changes in different types of taxes, and so forth. Third, if only one tax change is considered, it is not possible to study differences in the size of tax shocks, which is a serious drawback because conditioning the effects of tax shocks on the magnitude of the tax change is an important feature of macroeconomic studies. Fourth, only US tax legislation has been investigated in some detail, and it is unclear whether these findings have external reliability for legislated tax changes in other countries.

We study the effect of legislated tax changes on stock market returns based on a new dataset that allows addressing these shortcomings. The dataset makes it possible to consider all potentially relevant phases of the tax legislation process for all tax changes over a period of almost 40 years. Given the length of the dataset, we can also analyse subperiods, such as the Great Recession. Furthermore, it allows identifying the influence of different tax types as well as increases and decreases separately. Our dataset comprises three of the five largest economies, the United States, Germany, and the United Kingdom, which makes it possible to compare the effects of tax changes in different legal frameworks. In our analysis, we use daily data from December 1978 to January 2018 and our research method relies on various forms of GARCH models.

After testing a number of hypotheses, we find, first and foremost, that days of discretionary tax legislation matter for returns, both in terms of statistical significance as well as economic relevance. Second, further disaggregating the tax shocks shows that it is mostly news about personal income tax cuts that affects stock market returns positively, whereas business tax legislation is rarely influential. Third, we find evidence of stock market spillovers, mainly from US tax changes to European stock markets, but, albeit less pronounced, also the other way round. Fourth, in several cases, we measure significant effects on the days changes in tax legislation are implemented, which contradicts the efficient market hypothesis. Fifth, all in all, publication of the US House Committee report appears to be the most important legislative stage. It causes higher returns in all three stock markets when it contains information about personal income tax decreases. Sixth, during the financial crisis, we estimate many more significant reactions compared to the full sample. During this period, we find business tax cuts to influence daily returns positively, whereas income tax cuts cause stock market declines. Finally, S&P500 returns tend to react at earlier legislative stages than do DAX returns, whereas FT30 returns barely react at all on days of domestic legislative action. In the next section, we discuss the extant literature and formulate testable hypotheses. Section 3 describes our dataset and research method. The outcome of our empirical analysis is provided in Section 4. Section 5 contains robustness checks and Section 6 concludes.

2 Literature and Hypotheses

Only a few studies look at the connection between financial markets and tax policy. Tavares and Valkanov (2003) use quarterly US data from 1960 to 2000 and show that an increase in the aggregate tax rate (measured as net tax receipts as a share of GDP) significantly lowers stock market returns, as well as government and corporate bond returns. The authors suggest that fiscal policy shocks should be considered in asset pricing.

Using a yearly panel of several OECD countries, Ardagna (2009) shows that interest rates of 10-year government bonds decrease in periods of fiscal consolidation and increase in periods of loose fiscal policy. Moreover, an improvement (deterioration) in the budgetary position increases (decreases) stock prices. Based on Romer and Romer’s (2010) and Mertens and Ravn's (2013), narratively identified exogenous quarterly tax shocks, Kraus and Winter (2016) show a link between an increase in federal tax liabilities and higher risk premia for corporate bonds. They argue that an increase in tax liabilities increases financial frictions, making bond market financing more expensive for firms.

In an event study, Wagner et al. (2018) track individual stock movements of US firms between the introduction of the Tax Cuts and Jobs Act of 2017 (TCJA) on 2 November 2017 and its signature into law on 22 December 2017. Focusing on abnormal returns on the days the Act was being legislated, the authors find significant hikes, especially for high tax firms. Specifically, higher returns resulted on the day the bill was introduced in the House and on the day it was passed by the Senate.

Overesch and Pflitsch (2021) analyse the TCJA's spill-over effects on European stock markets. They consider two transmission channels. The first is a lower tax burden for firms active in the United States, as the TCJA includes a cut in the corporate tax rate. The second is the lower tax rate for US firms worsens the competitive position of European firms. The effect through the first channel should be a positive one for firms operating in the United States; the second predicts a negative effect on stock prices of firms competing with US firms. In their analysis, the authors focus on the reaction after the result of the mediation committee was published and report, on average, positive returns of European stocks. Also, stocks of firms operating in an industry in which US firms play a dominant role yielded smaller returns, whereas European firms doing business in the United States experienced higher returns. No reaction was found with regard to other salient dates of the US legislative process.

Gaertner et al. (2020) use a similar approach to investigate foreign firm stock returns during the legislative stages of the TCJA of 2017. Employing Google Trends data, they discover increased search activity for the term 'tax reform' on days corresponding to the legislative stages of the bill, that is, (1) release of the first framework for tax reform on 27 September, (2) its introduction in the House, (3) its passage by the House, (4) its passage by the Senate, (5) when reported by the Joint Committee on Taxation (JCT), and (6) when House and Senate mutually agreed to the final version. In their sample, the authors find positive abnormal returns on those days in 33 out of 38 markets. Negative effects were found for stocks of foreign firms exporting heavily to the United States. The authors also consider the price of US long-term treasury notes and the dollar-yuan exchange rate, but find no significant reaction.

Kalcheva et al.'s (2020) work might be the closest to our approach as the authors allow for heterogeneous reactions to the most important components of the TCJA of 2017, and also take into account whether the measure increased or decreased tax liabilities. Moreover, they thoroughly identify several salient legislative steps and consider changes in the bill's likelihood of passing. They find the TCJA to have benefitted the returns of highly taxed firms on days when legislative action occurs, as well as causing negative effects on internationally operating firms due to the tax hike related to foreign incomes. However, Kalcheva et al. (2020) do not find that firms engage in increased investment.

Our unique dataset allows us to investigate several hypotheses regarding timing, sign, spill-over effects, and relative size of the coefficients. In their study of the impact of government deficits on long-term interest rates, Knot and de Haan (1999) assume efficient financial markets that incorporate any news immediately. Adjusting their approach to our focus on the legislative tax process, two opposite hypotheses emerge:

H1a: Stock market returns react the first time information about tax changes is available.

H1b: There is no reaction at the implementation of tax changes.

Chatziantoniou et al. (2013) contrast different potential effects of fiscal policy on stock markets, depending on the theoretical point of view. They argue that in the Keynesian view, fiscal policy works through economic aggregates, such as consumption and investment. Since tax decreases encourage private consumption and investment, this effect should be reflected in today's stock prices. In the classical view, loose fiscal policy raises interest rates through a decrease in public saving, which reduces private investment. Since investment should be relevant for future cash flows and, hence, stock prices, they expect a negative reaction.

H2a: News about tax decreases lowers stock market returns.

H2b: News about tax decreases raises stock market returns.

Tavares and Valkanov (2003) consider Ricardian equivalence and argue that there might not be an obvious relationship between taxes and financial market returns. If households anticipate that the present value of future tax decreases equals the current tax increase, their net wealth remains unaffected and private saving decreases as much as public saving increases.

H2c: Information about tax changes does not affect stock markets.

Consequently, one could interpret the hypotheses subsumed under H2 as testing the Keynesian, classical, and Ricardian view of stock markets (see Bernheim, 1989).

What are our hypotheses when disaggregating the tax types? Regarding domestic business taxation, Croce et al. (2012) identify three channels through which a firm's decisions could be influenced: (1) distorting profits and investment, (2) reducing the cost of debt through a tax shield, and (3) depressing productivity growth. While channels (1) and (3) should have negative effects on firm profits and stock prices, channel (2) could be beneficial for firms. Hence, we cannot say a priori what signs to expect for the coefficients. Arguing via macroeconomic effects, Mertens and Ravn (2013) claim that a cut in business tax liabilities could increase investment but decrease private consumption. Measuring the effects of disaggregated tax types, Arin et al. (2009) argue that corporate tax shocks do not have an effect on financial markets in the United States, Japan, or Germany.

H3a: Stock market returns do not react to news about business taxation.

H3b: Stock market returns increase with news about lower business taxes.

Mertens and Ravn (2013) find that a cut in personal income taxes causes an increase in employment, consumption, and investment. Hence, we would expect stock markets to anticipate this outcome and react positively to such news and negatively to increases in personal income taxation. Arin et al. (2009) argue that indirect taxes have a larger effect than labour taxes. For the United States, Japan, and Germany, they report negative stock market reactions for unanticipated hikes in either type of tax.

H4: Stock market returns increase with news about cuts in personal income taxes.

H5: Stock market returns increase with news about cuts in indirect taxes.

H6: The coefficient of indirect tax changes has a greater magnitude than the one for personal income changes.

As discussed above, US business tax cuts could cause either a positive or a negative spillover on foreign stock market indices. As noted by Gaertner et al. (2020) and Overesch and Pflitsch (2021), competition in international markets as well as tax liabilities arising from foreign activity might play a role when looking at firm value. Hence, our hypotheses are:

H7a: News about domestic business tax cuts reduces foreign stock market returns.

H7b: News about domestic business tax cuts increases foreign stock market returns**.**

Finally, international spill-over effects could arise from individual income taxation via the trade channel, at least when the countries of interest are important trade partners, which is the case here. For example, a US income tax reduction increases US disposable income and, thereby, import demand, which raises profits of British or German exporting firms.

H8: News about foreign income tax decreases increases domestic stock market returns.

3 Data and Methodology

We expanded the legislative tax datasets of Romer and Romer (2009) for the United States, Cloyne (2012) for the United Kingdom, and Uhl (2013) for Germany along two dimensions. First, we extended them up to the end of 2017. Second, we moved the datasets to a daily frequency, so as to precisely identify each step of the legislative tax process. At each stage, we use the revenue effect as stated in the respective report or bill associated with the respective legislative stage. This should reflect the quantitative and qualitative information available to agents on that specific day. Romer and Romer (2010) create a variable, which they call ‘news about tax changes’, to control for anticipation effects in their robustness section by simply discounting the revenue effect back to the quarter when the bill was passed. A potential problem with this procedure is that it does not take into account changes in the composition of the bill. Instead, we keep information about the extensions of existing measures throughout the legislative process and only exclude their effect at the implementation stage, as they do not change tax liabilities, as the announcement of temporary extensions could send signals to agents and financial markets (in the robustness section, we also exclude them to see whether results hold). By collecting Committee Reports, we are able to monitor the development of the important tax bills using estimations of quantitative effects at that particular stage. As bills often change from one stage to the next, our procedure allows covering these changes (see Table 4 and A2), thereby mapping the development of the tax bills over time.[1]

Here, we provide just a rough sketch of the legislative processes in the three countries; for a more detailed explanation, see the above papers and the references therein. The US and German legislative procedures are similar. Tax laws must be introduced in the House of Representatives and Federal Parliament (Bundestag), respectively. From there, they are passed on to the relevant committee, in most cases, the Committee on Ways and Means and the Federal Financial Committee (Bundesfinanzausschuss), respectively, which publish a detailed report on the planned tax measures. Then the bill is sent back to the House/Parliament, where it is put to a vote. At this point, the two countries’ procedures begin to differ slightly. If the law is passed by the House, the US Senate must agree too, before it can be

[1] We rely on the official dates of Committee Meetings, Reports, and Budget Days. It would be interesting to check the public interest in tax bills around these dates, as do Gaertner et al. (2020), using Google Trends search data. However, this is impossible, as our tax shock series go back to the late 1970s. Instead, in the robustness section, we use Google Trends data to rule out that our results are driven by confounding events.

signed. Usually, the US Senate passes the bill to the Committee on Finance, which then presents an altered version. A meeting of a mediation committee composed of members of both chambers is then held (Joint Committee on Taxation, JCT) to find a compromise. A compromise between the two chambers' versions must be found, either in the JCT or by sending bills back and forth until both chambers agree. In Germany, only some tax bills need to be confirmed by the Bundesrat, which represents the states. If the two legislative chambers cannot agree on whether a bill needs to be passed by the Bundesrat too, the Federal President (Bundespräsident) or even the Federal Constitutional Court (Bundesverfassungsgericht) have to settle the disagreement. In both countries, the mediation committee presents the final version of the bill, which is signed into law by the US President and the Federal President, respectively. Hence, new information about tax changes emerges at various dates, and as the bill passes each of the stages listed above, the likelihood of implementation increases.

Tax legislation in the United Kingdom goes through fewer steps. In the House of Commons on Budget Day of every fiscal year, the Chancellor of the Exchequer announces the new tax measures. Some of the measures become effective on Budget Day and most of them are implemented within six months. When the Finance Bill is signed (Royal Assent), it becomes the Finance Act and its provisions are often backdated. Long implementation lags, as in Germany and the United States, are rather uncommon, and almost every tax measure presented becomes law. The communication strategy around Budget Day has changed over the years, becoming more transparent from the 1990s onward.

On the one hand, the differences between the three countries allow for a comparison of results between different legislative regimes. On the other hand, these differences make it more difficult to date the legislative stages. We focus on those dates on which *new* information about tax changes materialises, that is, when detailed revenue estimates are published. For the United States, these days are when the House committee, the Senate committee,[2] and the mediation committee[3] publish their reports. We also include the days when the individual tax measures are implemented. We do not consider the House introduction date in our baseline estimations, as the quantitative impact is yet unknown. However, in the robustness section, we check whether this decision influences our results. In Germany, the draft of a tax bill is already accompanied by detailed revenue estimates. Hence, we include the days of the introduction in Parliament, the Parliament committee report, the mediation committee report, and the implementation date. For the United Kingdom, we use the Budget Days and implementation days.

We include both permanent and temporary tax changes, but we do not consider the phasing-out date of the latter. Following the literature, we exclude the implementation effects of extensions of existing tax legislation, as they are conceptionally different from discretionary changes to tax liabilities. However, as in Uhl (2013), we keep these changes when they occur at previous legislative steps, as the announcement that a tax measure will be extended could be relevant information for investors. Note that removing the temporary and permanent extensions from the tax shock series does not change the results (see Section 5). To quantify the magnitude of the tax shock, we take the full year revenue effects

[2] In several cases, we could not recover the precise publication date of the Senate Committee Report. In these cases, we chose the date of passage in the Senate as the publication date.

[3] In some cases, there was no meeting of the mediation committee but, instead, mutual agreement in both chambers.

as stated in the legislative documents in per cent of current nominal GDP. This makes the shocks comparable across the three countries and we can also compare the relative size of reactions to different tax types and at different legislative stages.

In many cases, the tax shocks as defined above occur on a weekend or public holiday. In those cases, we shift the shock to the next stock market trading day. To take time-zone differences into account, US tax shocks enter the German and British stock markets on the following trading day, while German and British tax shocks enter the US market on the same trading day. In the macroeconomic literature, the narrative tax shocks are classified as either exogenous or endogenous to the business cycle. However, the long inside lag of tax legislation makes it unlikely that discretionary tax actions are endogenous to stock market returns on the specific date they are published or implemented. Kraus and Winter (2016, p.1) employ the tax shocks identified by Romer and Romer (2010) and find that 'any tax change can potentially spill over to financial market conditions …'. Reflecting the reasoning of Cornell (1983), Knot and de Haan (1999, p. 560) state that '[o]ne of the advantages of the announcement effect approach is that it precludes the necessity of specifying a structural model for interest rates.' In light of these statements, we believe we have properly identified the respective tax shocks at each point in time.

As stock market indicators, we use daily closing prices of the S&P500 for the United States, DAX for Germany, and FT30 for the United Kingdom. The indices are log-differenced and multiplied by 100 to obtain growth rates in per cent as well as to ensure stationarity. All data are from Datastream.

Visual inspection of daily stock market returns indicates volatility clustering and testing for ARCH effects after estimating the models via OLS confirms this characteristic. For several reasons, we opt against employing the event-study approach. First, we are interested in the temporal development of tax laws and, therefore, want to utilise a time perspective. Second, the event-study approach uses impulse dummies to identify important tax reform dates. However, analysing trading days that are close in time to single large tax reforms might provide little external validity. Instead, we are interested in the average effect of tax legislation over a 40-year period. Third, dummies cannot incorporate information about the composition and size of the bill at each legislative step.

Reflecting these considerations, our baseline model is a GARCH(1,1):

$$r_{it} = \gamma + \delta\Delta\tau_t + \varepsilon_t \tag{1}$$

with:

$$\varepsilon_t = e_t h_t \tag{2}$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1}^2 \tag{3}$$

r_{it} depicts the daily returns of the stock indices, where subscript *i* stands for S&P500, DAX, and FT30, respectively, γ is the constant, and δ is a vector of parameters. $\Delta\tau_t$ is a vector of domestic and foreign tax shocks (hence no subscript *i*) at the different legislative stages, scaled to 1% of current nominal GDP. Error ε_t is t-distributed with v degrees of freedom, as the residuals exhibit excess kurtosis. Standard errors are heteroscedasticity robust. To reduce the size of the model in a consistent way, as well as to improve estimation efficiency, we apply a consistent general-to-specific testing down procedure (e.g., Hendry, 1993), i.e. we start with a general model including all domestic and foreign tax shocks at all stages and remove insignificant coefficients based on a joint test of significance. Taking into account the large sample size, we employ a 1% significance level to reduce the likelihood of Type I errors.

4 Empirical Analysis

4.1 Effects of Aggregated Tax Shocks

We commence our analysis by testing whether stock markets react to the various stages of the legislative process, and if they do, at which particular stage.

Table 1 sets out the results for the reduced models. Note that we had to restrict the sum of the ARCH and GARCH coefficients to be smaller than unity in the S&P500 regression, as testing could not rule out an IGARCH process. None of the exclusion restrictions is significant and there is no evidence of autocorrelation. However, there are still some traces of ARCH present in the model for the FT30.

Table 1: Effect of Aggregated Tax Shocks on Stock Market Returns (values in italics give the effects for average-size tax changes)

Shocks	**Indices**			
	(I) **S&P 500**	**(II)** **DAX**	**(III)** **FT 30**	**Number of Events**
US				
Committee on Ways and Means	0.15***** *0.07*	0.14***** *0.07*		32
Senate Committee				30
Mediation Committee	0.25			29
Implementation				78
Germany				
Draft				55
Federal Financial Committee			0.66***** *0.04*	60
Mediation Committee				23
Implementation				97
UK				
Draft				151
Implementation				441
Number of observations	9858	9854	9844	
Student-t degrees of freedom	6	9	11	
Portmanteau Q test	$\chi^2(40) = 41$	$\chi^2(40) = 20$	$\chi^2(40) = 51$	
Test for ARCH effects	$\chi^2(10) = 11$	$\chi^2(10) = 4$	$\chi^2(10) = 23$	
Exclusion restriction	$\chi^2(8) = 16$	$\chi^2(9) = 9$	$\chi^2(9) = 14$	

Notes: Coefficients are in percentage points. * and ** indicate significance at the 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

We find no significant reactions to domestic tax shocks by either the British FT30 (Column III of Table 1) or the German DAX (Column II) returns on any of the key dates when using the aggregated tax shocks. The S&P500 index (Column I), however, shows significant reactions on days when the important reports are published, which rejects H2c. A tax decrease equal to 1% of GDP announced by the House

Committee raises S&P500 returns by 15 base points (bp). When the tax change is confirmed by the JCT, returns increase by 25 bp, but this effect could not be estimated precisely. The cumulative effect across the various legislative stages is significant at the 1% level and amounts to a decrease of 39 bp in S&P500 returns. Note that the magnitude of tax shocks rarely reaches 1% of GDP and, therefore, we think that rescaling the effects to reflect normal tax changes proxied by sample averages is helpful in interpreting estimation results. In Table 1 and the following output tables, we provide the effects for average-size tax changes in italics after the 1% of GDP shocks (for individually significant estimates only). Hence, when considering the average size of tax changes at each relevant legislative stage, the cumulated effect on S&P500 returns is approximately 23 bp.

According to H1a, we would expect reactions only at the earliest stages of the bills and not when they are signed into law or implemented. Our results for the United States are broadly in line with this expectation, as we do not measure a reaction on the day of implementation. However, since we do not discover any significant stock market reactions to domestic tax legislation in Germany or the United Kingdom, we cannot support H1a more generally.

Studying the effects on DAX returns in Table 1 shows that there is support for H2c, at least when concentrating on domestic tax shocks. When we consider spill-over effects from US tax legislation, we can reject H2c, as DAX returns increase by 14 bp when the US House Committee presents a tax cut. There are significant spill-over effects from the US legislative process to German stock markets but not the other way around, which reflects the relative importance as trading partners for the two economies.

The UK stock market appears to be sensitive to news from the early stages of tax legislation in Germany. FT30 returns increase 66 bp when the Federal Financial Committee announces a tax decrease equal to 1% of GDP. While our results generally support H2b, when scaled by the average size of shocks, this effect shrinks to 4 bp.

4.2 Effects of Disaggregated Tax Shocks

Mertens and Ravn (2013) demonstrate that the composition of tax shocks in the United States matters for their macroeconomic effects. To discover whether that is the case for stock market reactions too, we disaggregate our tax shock series into three types of taxes: personal income taxes, business income taxes, and indirect taxes.[4] In the United States, sales taxes are legislated at the state level and, therefore, are not part of our sample. Consequently, we include only indirect tax shocks in the case of Germany and the United Kingdom.

Starting with S&P500 returns, Table 2 shows that reactions to domestic tax shocks are driven by changes in individual income tax legislation, whereas business taxation does not trigger significant reactions. These findings support H3a and reject H3b. Over the course of the legislative process of a US income tax decrease, S&P500 returns increase by 34 bp. Although the magnitudes of our coefficients are similar to those reported in event studies using impulse dummies for the legislative dates of the

[4] We use a broad measure of business and income taxes and include capital taxes and social security contributions, respectively. This leaves us with more cases per tax category and approximates the overall tax liabilities borne by businesses and individuals. Using a narrow definition of tax categories does not affect the results in a noteworthy way.

TCJA (Wagner et al., 2018; Overesch & Pflitsch, 2021), our cumulated effect is much smaller, as we find a negative coefficient at the Senate's committee stage.

In the case of Germany, we find an increase of 170 bp in DAX returns after decreasing income taxes by 1% of GDP. Legislative changes in German business taxation do not seem to matter, which means we reject H3b, but not H3a. We also discover that a decrease in indirect tax liabilities lowers DAX returns by 135 bp. The negative effect is unexpected, but we are not the first to report counterintuitive results after tax changes (see, e.g., Blanchard, 1981; Mumtaz & Theodoridis, 2017). A possible explanation for this result is that companies engage in a price war following an indirect tax cut. Note that the full impact of both individual income tax and indirect tax changes arises at the implementation stage. As legislative news about domestic personal income taxation has the biggest impact in Germany, we reject H5 and H6.

Considering disaggregated domestic tax shocks in the United Kingdom, we again fail to find a significant effect caused by domestic tax changes. Hence, for FT30 returns, we reject H1a and H3b and find evidence supporting H1b and H3a.

Table 2: Effect of Disaggregated Tax Shocks on Stock Market Returns (values in italics give the effects for average-size tax changes)

Shocks		**Indices**			
		(I) S&P 500	**(II) DAX**	**(III) FT 30**	**Number of Events**
US Tax Shocks					
Committee on Ways and Means	Business				28
	Individual	0.17***** _0.07_	0.16****** _0.07_	0.29****** _0.13_	31
Senate Committee	Business				27
	Individual	-0.30			30
Mediation Committee	Business				26
	Individual	0.46****** _0.25_			29
Implementation	Business				68
	Individual				58
German Tax Shocks					
Draft	Business				32
	Individual				45
	Indirect				29
Federal Financial Committee	Business				36
	Individual			0.71****** _0.12_	50
	Indirect				35
Mediation Committee	Business				15
	Individual				19
	Indirect				13
Implementation	Business				54
	Individual		1.73****** _0.17_		78
	Indirect		-1.35****** _-0.13_	-2.08****** _-0.21_	50
UK Tax Shocks					
Draft	Business				97
	Individual	0.53** _0.02_			78
	Indirect		-0.38***** _-0.03_		99
Implementation	Business				204
	Individual				147
	Indirect				317
Number. of observations		9858	9854	9844	
Student-t degrees of freedom		6	8	10	
Portmanteau Q test		$\chi^2(40) = 41$	$\chi^2(40) = 20$	$\chi^2(40) = 49$	
Test for ARCH effects		$\chi^2(10) = 11$	$\chi^2(10) = 4$	$\chi^2(10) = 21$	
Exclusion restriction		$\chi^2(22) = 27$	$\chi^2(22) = 32$	$\chi^2(23) = 29$	

Notes: Coefficients are in percentage points. * and ** indicate significance at the 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Regarding spill-over effects of tax shocks between the three countries' stock markets, Table 2 shows that S&P500 returns increase by about 50 bp when UK personal income tax cuts are presented on Budget Days, which supports H8. No S&P500 spillovers are measured with regard to changes in German legislation. Studying spill-over effects on DAX returns, we observe that returns decrease by 38 bp when a drop in British indirect taxes is presented on Budget Day. As discussed below, indirect tax cuts cause negative spill-over effects between the European countries too.

DAX returns react to US personal income tax legislation. We observe a significant coefficient at the Committee on Ways and Means stage, raising returns by 16 bp. The rise in FT30 returns by about 30 bp when the US Committee on Ways and Means and by 70 bp when the German Federal Financial Committee present an individual income tax decrease equal to 1% of GDP is in line with H8. UK stocks are not affected by German business tax changes. As noted above, we find a negative UK stock market response to decreasing indirect taxes in Germany, which declines by 208 bp on days of implementation.

However, in all cases, the mean of these tax shocks is below 1% of GDP Thus, to facilitate interpretation, Table 3 sets out the cumulated coefficients scaled by the average size of tax shocks at each legislative stage. With effect sizes roughly between 2 and 25 bp, the magnitudes of the various estimated effects in absolute terms look much more similar after this adjustment. We believe that this discovery has important implications over and above the current study, as it underlines that the actual magnitude of tax shocks matters. Therefore, the event study approach, which is based on tax change dummies, might be misleading when assessing the actual impact of policy changes.

In Table 3, we observe cumulated positive returns of all three indices along the legislative process of US personal income tax cuts, ranging between 7 and 18 bp. In addition, we find similarly-sized cumulated positive returns for DAX and FT30 on days of German personal income tax legislation. The spill-over effects from UK legislation onto the German stock market are much smaller after the adjustment. Overall, we would interpret our findings for the three stock markets as supporting hypotheses H3a and H4, and rejecting H3b, and H5.

Table 3: Cumulative Effect of Disaggregated Tax Shocks Scaled by Average Size of Fiscal Shocks

Shocks		**Indices**	
	(I) S&P 500	**(II) DAX**	**(III) FT 30**
US Tax Shocks			
Business Income			
Individual Income	0.18**	0.07**	0.13**
German Tax Shocks			
Business Income			
Individual Income		0.17**	0.12**
Indirect Taxes		-0.13**	-0.21**
UK Tax Shocks			
Business Income			
Individual Income	0.02**		
Indirect Taxes		-0.03*	

Notes: Coefficients are in percentage points. * and ** indicate significance at the 1% and the 0.1% level, respectively.

4.3 Effect of Tax Revenue Changes

To this point, we have measured stock market reactions to tax shocks as the full-year revenue effect given in the respective documents divided by nominal GDP in per cent. The assumption underlying that coding is that each stage of the legislative process constitutes news. However, it could be that investors only update their expectations at every stage of the legislative process, conditional on the quantitative information given in the previous stage. Therefore, we construct a new tax shock series that measures the difference in the stated revenue in per cent of GDP of the respective bill from one legislative stage to the next. This means that when the value for expected revenues was not altered in a legislative step, this shock is coded as zero. Due to the different legislative process in the United Kingdom, we can construct these series only for Germany and United States. While interpretation of the coefficients remains the same, the constructed shocks are now relatively smaller. Moreover, in many cases, we have only a few nonzero observations for each type of shock.

Starting with the S&P500 returns, Table 4 summarises the cumulative effects across all legislative stages (detailed results can be found in Appendix Table A2). At the joint committee stage, we discover significant stock market reactions to lower US business tax revenue shocks but not to lower personal income tax revenues.

Table 4: Cumulative Effect of Tax Revenue Shocks on Stock Market Indices (values in italics give the effects for average-size tax changes)

Shocks		**Indices**		
		(I) **S&P 500**	**(II)** **DAX**	**(III)** **FT 30**
US				
Business Tax Shocks				
Cumulative Effect	Increase		-1.44	-4.96
	Decrease	7.47** *0.37*	-2.35	9.32** *0.47*
Income Tax Shocks				
Cumulative Effect	Increase			
	Decrease	1.38	5.61** *1.14*	
Germany				
Business Tax Shocks				
Cumulative Effect	Increase	28.67** *0.91*	-7.79** *-0.10*	16.70** *0.20*
	Decrease			-12.67** *-0.54*
Income Tax Shocks				
Cumulative Effect	Increase	-20.96* *-0.73*	-2.38	-5.49** *-0.19*
	Decrease			3.42* *0.27*
Indirect Tax Shocks				
Cumulative Effect	Increase	-65.03** *-0.18*	474.1** *1.24*	447.7** *1.15*
	Decrease			

Notes: Coefficients are in percentage points. * and ** indicate significance at the 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP.

We observe significant spill-over effects onto the US stock market. When considering tax shocks equal to 1% of GDP, we find that indirect tax shocks cause the largest spillovers to the US stock market. Scaling by average-size changes reverses this situation, though, as upward revisions of German business tax liabilities raise S&P500 returns by about 90 bp, whereas upward revisions of German income and indirect tax liabilities reduce S&P500 returns by almost 75 bp and 20 bp, respectively.

When the German mediation committee passes an average-size business tax hike, DAX returns decrease by 10 bp. In total, DAX returns increase by more than 120 bp when both the Federal Financial Committee and the mediation committee propose higher indirect tax revenues. Average-sized downward revisions of US personal income taxes increase DAX returns by 116 bp. As noted above, given the differences in tax legislation processes, we cannot consider UK revenue shocks, but we can study spillovers from the United States or Germany. As in the US case, lower business tax revenues boost FT30 returns. Even though we cannot excluded them without violating the exclusion restriction, we do not obtain significant estimates of the reaction of FT30 returns to US business tax revenue increases.

Spill-over effects from German legislation are more precisely estimated and we find a symmetric pattern in the reaction of FT30 returns to revisions in German business as well as income tax liabilities: Returns are higher (lower) on days of higher (lower) business tax figures. The reverse outcome is found for reactions to German personal income tax revenue changes, where FT30 returns decrease (increase) on days of higher (lower) income tax figures. In either case, downward revisions cause larger effects in absolute terms. Similar to the reaction of the DAX, FT30 returns react positively to higher German indirect tax revenue figures. The estimated effects of average-size tax changes range from a drop in DAX returns of 10 bp after a business tax hike to an increase in DAX returns of more than 115 bp following an indirect tax hike.

4.4 Financial Crisis

Our large sample reduces the probability that the estimates are driven by outliers. The drawback of long sample periods, however, is that they are potentially subject to structural breaks. Of particular interest in that respect is the financial crisis period. According to the Bank for International Settlements (BIS, 2009, Chapter II), the turmoil started in mid 2007 and spread to interbank markets in August 2007. The last key event was in mid-2009 and we add about a quarter of a year to ensure that financial markets had clearly left the crisis behind. Thus, we define the crisis period from August 2007 to the end of 2009. Since there are almost no tax increases during that period, we focus our attention on tax cuts. Note that to achieve convergence, we had to estimate all three regressions without t-distributed errors and, to rule out IGARCH processes, restrict the sum of the ARCH and GARCH coefficients to be smaller than unity. The cumulative effects of tax reductions on stock market returns are presented in Table 5 (see Table A3 for details). We now identify many more significant tax shocks for all three markets, some of which are only jointly significant.

For the S&P 500, we find a cumulated increase of more than 800 bp after a US business tax cut. The S&P500 is even more strongly affected by spillovers from business tax decreases in the United Kingdom and Germany, at more than 2300 bp and 8000 bp, respectively. This suggests that during the financial crisis period, business tax cuts massively bolstered US stock markets. Quite the reverse is found for decreases in income taxation or indirect taxes in the three countries, which are not only much more moderate in size but also mostly cause stock market losses. However, note that the negative S&P500 reaction to a reduction in German indirect taxes is driven by only one event at the draft stage. Cumulated effects for the DAX are in line with these findings, too. We discover that the largest estimated cumulated coefficient of about 3200 bp is associated with business tax cuts. Again, reactions to decreases in income tax have negative effects, which are of a much smaller magnitude. As before, US business tax changes do not spill over onto German stock markets.

Table 5: Financial Crisis: Cumulative Effects of Tax Decreases on Stock Market Indices (values in italics give the effects for average-size tax changes)

Shocks		**Indices**		
		(I) **S&P 500**	**(II)** **DAX**	**(III)** **FT 30**
US Tax Cuts				
Cumulative Effect	Business	8.05** *1.81*		5.93* *1.20*
	Individual	-1.82** *-1.08*		-3.25
German Tax Cuts				
	Business	80.48** *6.58*	32.05** *2.26*	24.98** *1.68*
Cumulative Effect	Individual	-10.65** *-0.96*	-5.50** *-0.50*	7.14** *-0.36*
	Indirect	-98.98** *-4.25*	8.95	39.92** *1.95*
UK Tax Cuts				
	Business	23.33** *0.62*		9.00* *0.24*
Cumulative Effect	Individual	-1.93		-5.47** *-0.23*
	Indirect	-13.58** -0.03	2.32	1.58

Notes: Coefficients are in percentage points. * and ** indicate significance at the 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

In the case of the FT30, similar effects can be found for business tax cuts, although it is the spill-over effect from Germany that dominates in terms of magnitude (about 2500 bp). Decreases in individual taxes cause stock market losses too, but note that the cumulated effect of German income tax cuts only becomes negative after scaling the coefficients by average-size tax changes (see Table A3 in the Appendix). In contrast, cuts in German indirect taxes lead to increases in FT30 returns of 4000 bp, which, again, is caused by just two events.

When scaled by their average size, the effects become smaller, now ranging roughly between 0.3 bp and 660 bp, which reflects the effects of indirect tax cuts in the UK on S&P 500 returns and German business taxes on the S&P500, respectively. As noted above, the large effect of German indirect tax legislation on S&P500 returns could be an outlier. More generally, the reactions to UK tax legislation during the financial crisis are the lowest on all three stock markets, whereas German legislation had the most influence on the three markets. SP500 and DAX returns are mainly affected by business taxation.

Results regarding the influence of the various stages of the legislative process in the three countries on stock market returns cannot always be interpreted straightforwardly. This is likely due to the small number of cases in each of the tax categories. However, we can discern some general tendencies. First, during times of crisis, markets react much more strongly to the various stages of the legislative tax process than they do during non-crisis times. Second, drafting business tax cuts causes stock market hikes. Third, income tax cuts depress domestic stock markets in the middle of the legislative process. Fourth, we see notable variations in the sign of the effects for cuts in indirect taxes. Fifth, spillovers from almost all stages of tax legislation take place when these originate in Germany or the United Kingdom, but much less so when they originate in the United States.

5 Robustness

So far, we have relied on the news approach combined with daily data to solve the identification problem. For instance, we found announcements about future personal income tax cuts by the US House Committee to have an effect on all three stock market indices. This effect could be driven be confounding events, though, and other economic information may be revealed when the Committee on Ways and Means meets. However the Committee only meets when legislative issues are to be considered[5] and there is no indication of other regular release of information around Committee meeting dates. We further analyse for this possibility using daily Google Trends data for the period 2004-2018 and check the search activity of Internet users involving the keywords ‘unemployment’, ‘inflation’, ‘forecast’, and ‘growth’.[6] Results are given in Figure A1 of the Appendix and do not indicate any increased interest in macroeconomic forecasts in any of the three economies around the dates when the US House Committee presents an estimation of future personal income tax changes. Similar results can be found when checking the dates for the main legislative stages in Germany and the UK.[7]

In our baseline estimations, we do not include the date of introduction to the US legislative process, as revenue figures are yet unknown at this stage. However, we check whether this drives our results: assuming perfect foresight of revenue figures, we include the draft date, quantified by the House Committee’s revenue figures, and re-estimate our models. We can exclude the introduction date in all models but one: during the financial crisis (Section 4.4), the introduction seems to matter in the US and UK. The coefficients, however, bear the same sign and are of the same magnitude as those for the other legislative steps (see Table A5 in the Appendix). Hence, the effect only becomes larger during the financial crisis.

To take time zone differences into account when focusing on DAX and FT30 returns, we shifted US tax shocks to the next trading day. However, since tax changes legislated early in morning could still be digested by European markets, we check the robustness of this approach. Results for revenue shocks and during the financial crisis are affected (see Tables A6 & A7) but results remain quantitatively and qualitatively similar.

Another potential issue is a lack of control variables. Therefore, we re-estimate our baseline GARCH(1,1) model with control variables. In each stock market regression, we include the stock market

[5] See Jurisdiction & Rules: https://waysandmeans.house.gov/about/jurisdiction-and-rules.

[6] The data were retrieved using the gtrendsR package (Massicotte & Eddelbuettel, 2021) and we rescaled the daily observations using monthly hits.

[7] All omitted results are available on request.

returns of the other two countries, returns of the bilateral exchange rate (euro/dollar and pound/dollar),[8] a measure of the interbank interest rate, and the first difference of the interest rates of 10-year government bond yields[9]. Each financial control variable initially enters with five lags, whereas contemporaneous financial variables are not included so as to avoid simultaneity issues. Furthermore, we include impulse dummies for days with abnormal returns, that is, for the stock market crashes on 19 October 1987 (Black Friday), 16 October 1989, and 11 September 2001, the Lehman collapse on 15 September 2008, Mario Draghi's *whatever-it-takes* speech (26 June 2012), and the day after the Brexit referendum in the UK on 23 June 2016, as well as for day-of-the-week effects[10]. The model thus becomes:

$$r_{it} = \gamma + \sum_{j=1}^{5} \lambda C_{t-j} + \theta D + \delta \Delta\tau + \varepsilon_t \quad (4)$$

with:

$$\varepsilon_t = e_t h_t$$
$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1}^2$$

r_{it} depicts the daily returns of the stock market indices. Parameter γ is the intercept and λ, θ, and δ are parameters and vectors of parameters, respectively. C is the vector of financial control variables and D is the vector of dummy variables as described above. As before, $\Delta\tau_t$ is the series of tax shocks under investigation, scaled to 1 per cent of current nominal GDP. ε_t is t-distributed with v degrees of freedom, as the errors exhibit fatter tails when compared to the normal distribution. Errors are heteroscedasticity consistent. We estimated the model described in Equation (4) and removed statistically insignificant lags of our control variables in a consistent procedure. The results of the stock market regressions are presented in Tables A8–A11 in the Appendix. In some cases, we need to restrict the ARCH and GARCH coefficients when modelling S&P500 and DAX returns so as to rule out an IGARCH processes. We find that all the previously identified coefficients have the same sign, are of comparable magnitude, and remain significant (at least at the 5% level).

Thus far we have assumed that the errors of our GARCH equations were independently distributed from each other. However, in a globalised world, that may not be the case. Thus, we study the co-movements among US, German, and UK stock markets using a multivariate GARCH diagonal-BEKK model (Engle & Kroner, 1995) and check whether the results of our GARCH(1,1) from Equation (1) hold when allowing for correlated errors. As Tables A12–A15 of the Appendix demonstrate, most of the coefficients have the same size and remain significant at least at the 5% level. Considering the similarity of results and the computationally much more demanding estimation of BEKK models, we do not believe that the increase in estimation efficiency justifies the additional effort.

We also look at excess returns as our dependent variable, rather than log-growth rates. We compute excess returns based on the difference between daily growth rates and the average growth rate of the whole trading week. Again, the results are robust (see Tables A16–A19 in the Appendix).

[8] The deutschmark/dollar rate was used before 1999 and transformed into euros by employing the convergence rate.
[9] As 10-year government bond yields were found to be I(1).
[10] Day-of-the-week effects could not be considered in the financial crisis subsample, as they prevent convergence.

Finally, and as previously mentioned, we remove the tax extension measures from the series. Again, the results are robust, as can be seen in Tables A20–A23.

6 Conclusion

In this paper, we use various GARCH models to study the effect of the legislative tax process on daily stock market returns in the United States, Germany, and the United Kingdom. The legislative tax data covering the period December 1978 to January 2018 at a daily frequency are the result of an extensive coding effort built upon the work of Romer and Romer (2009), Uhl (2013), and Cloyne (2012) for the respective countries.

We find that days of discretionary tax legislation often matter for returns, both in terms of statistical significance as well as economic relevance. This conclusion applies to the various stages of the legislated process, from the early stage of drafting a law over the various committee stages to the implementation stage. Thus, concentrating the analysis on one particular stage of the legislative process or on aggregated tax changes, as is often done in the extant literature, does not seem warranted. Table A4 in the Appendix provides a qualitative summary of the estimated effects of tax cuts across the three countries, various levels of aggregation, and different legislative stages. By disaggregating the tax shock series, we find that it is especially personal income taxation that affects stock market returns on legislative dates.

Our analysis has an advantage over a pure event study approach in that we can consider the magnitude of the tax shock on legislative days instead of relying on identification via impulse dummies. It also allows considering different shock sizes. In the macroeconomic literature on the effects of tax changes, it is common to study tax shocks equal to 1% of GDP. While we provide results for that type of standardisation, we also investigate average-size tax shocks. Given that in many cases normal tax changes are much smaller than 1% of GDP, it is not surprising that we obtain notably smaller effect sizes when taking that perspective. Arguably, the outcome based on average-size tax changes is more useful for assessing the impact of typical tax changes.

We find that S&P500 returns tend to react at earlier legislative stages than do DAX returns, whereas FT30 returns barely react on days of domestic legislative action. We discover spill-over effects from foreign tax legislation and observe increases in stock market returns on days when US income tax decreases are published by the House Committee in all three stock markets. Looking at spill-over effects of US corporate taxation, we do not find a result as clear cut as that of Overesch and Pflitsch (2021) for the TCJA, which suggests that we should be wary of generalising the findings from one specific tax change.

Furthermore, we measure many more significant reactions during the financial crisis, with higher coefficients during that period, too. We would argue that, while over the full sample, news about legislated tax changes had a moderate to small impact on stock returns, the impact was considerable during the financial crisis. This conclusion applies to international spillovers too, especially from the United States to the European countries but also from German tax legislation to the other two stock markets. During this period, income tax cuts caused drops in all three markets, while business tax cuts bolstered the three indices. In light of the strong reactions of financial markets to various legislative tax stages, we recommend that governments adopt a ‘forward guidance’-type of communication strategy during times of crisis.

We also conclude that individual investors are well-advised to not only monitor changes in the monetary stance but tax policy too. Better understanding stock market behaviour around legislative steps of tax changes could help investors reduce portfolio risk. This implies not only keeping up to date with the legislative process of domestic tax changes, but also with those taking place in economically important foreign countries, especially the United States.

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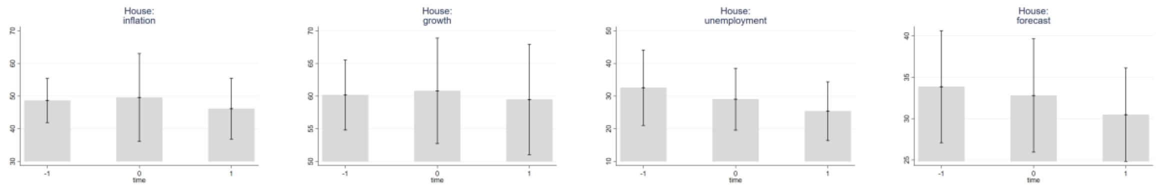
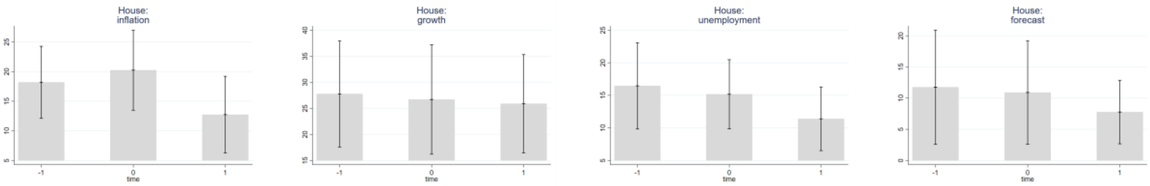
Appendix

Figure A1: Google Trends around Days of Tax Changes reported by the US House Committee

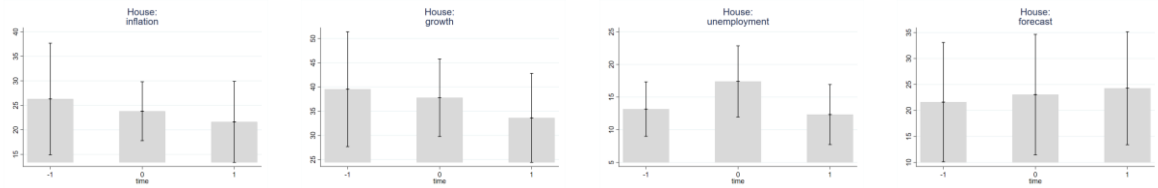
USA



Germany



UK



Notes: Figures represent Google Trends search for the macroeconomic keywords 'inflation', 'growth', 'unemployment', 'forecast' in the US, Germany, and UK on days of, before, and after the Committee on Ways and Means reported future changes to personal income tax. The whiskers represent 2.58 standard errors.

Table A1: Size, Variation, and Frequency of Tax Shocks

	Mean	Standard Deviation	Observations
USA			
Business Tax Shocks			
Committee on Ways and Means	0.072	0.318	28
Implementation	-0.007	0.139	68
Income Tax Shocks			
Committee on Ways and Means	0.439	0.987	31
Implementation	0.152	0.394	58
Germany			
Business Tax Shocks			
Draft	0.027	0.146	32
Implementation	0.012	0.125	54
Income Tax Shocks			
Draft	0.176	0.379	45
Implementation	0.101	0.239	78
Indirect Tax Shocks			
Draft	-0.196	0.266	29
Implementation	-0.100	0.203	50
UK			
Business Tax Shocks			
Draft	0.002	0.120	96
Implementation	-0.001	0.078	204
Income Tax Shocks			
Draft	0.043	0.319	78
Implementation	0.023	0.195	174
Indirect Tax Shocks			
Draft	-0.077	0.290	99
Implementation	-0.024	0.142	317

Notes: Summary statistics of (a subset of) tax shocks, in per cent of current nominal GDP.

Table A2: Tax Revenue Shocks on Stock Market Indices (values in italics give the effects for average-size tax changes)

		Indices			
		(I) **S&P 500**	**(II)** **DAX**	**(III)** **FT30**	**Number of Events**
US					
Business Tax Shocks					
Senate Committee	Increase		-1.44		11
	Decrease		-2.35		12
Mediation Committee	Increase			-4.96	8
	Decrease	7.47** *0.34*		9.32** *0.47*	9
Income Tax Shocks					
Senate Committee	Increase				9
	Decrease		2.00		15
Mediation Committee	Increase				10
	Decrease	1.38	3.60** *0.83*		8
German					
Business Tax Shocks					
Federal Financial Committee	Increase	11.5* *0.70*			8
	Decrease				13
Mediation Committee	Increase	17.2** *0.21*	-7.79** *-0.10*	16.7** *0.20*	3
	Decrease			-12.7** *-0.54*	8
Income Tax Shocks					
Federal Financial Committee	Increase	-21.0* *-0.73*	-2.38	-5.49** *-0.19*	6
	Decrease				25
Mediation Committee	Increase				5
	Decrease			3.42** *0.27*	10
Indirect Tax Shocks					
Federal Financial Committee	Increase		178	224** *0.52*	5
	Decrease				17
Mediation Committee	Increase	-65.0** *-0.18*	296** *0.83*	224** *0.63*	3
	Decrease				4
Number of observations		9858	9854	9844	
Student-t degrees of freedom		6	9	11	
Portmanteau Q test		$\chi^2(40) = 41$	$\chi^2(40) = 20$	$\chi^2(40) = 50$	
ARCH effects		$\chi^2(10) = 11$	$\chi^2(10) = 4$	$\chi^2(10) = 22$	
Exclusion restriction		$\chi^2(14) = 20$	$\chi^2(12) = 21$	$\chi^2(12) = 16$	

Notes: Coefficients are in percentage points. * and ** indicate significance at the 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A3: Effects of Disaggregated Tax Shocks on Stock Market Returns, Financial Crisis Subsample (values in italics give the effects for average-size tax changes)

Shocks		**Indices**			
		(I) **S&P 500**	**(II)** **DAX**	**(III)** **FT30**	**Number of Events**
US					
Tax Shocks					
Committee on Ways	Business				7
and Means	Individual			-3.25	7
Senate Committee	Business			5.93** *1.20*	5
	Individual				6
Mediation Committee	Business	8.05** *1,81*			4
	Individual	-1.82** *-1.08*			5
Implementation	Business				6
	Individual				5
German					
Tax Shocks					
	Business	80.5** *6.58*	6.98** *0.57*		2
Draft	Individual				6
	Indirect	-99.0** *-4.25*	41.2** *1.77*	31.0** *1.33*	1
Federal Financial	Business		25.1** *1.69*	25.0** *1.68*	3
Committee	Individual			-6.65** *-1.60*	5
	Indirect		-39.5** *-2.43*		2
	Business				0
Mediation Committee	Individual	-10.6** *-0.96*	-5.50** *-0.50*	13.8** *1.24*	1
	Indirect				0
	Business				6
Implementation	Individual				10
	Indirect		7.27** *0.50*	8.93** *0.62*	1
UK					
Tax Shocks					
	Business	23.3** *0.62*		9.00* *0.24*	8
Draft	Individual	-22.6** *-0.95*		-5.47** *-0.23*	8
	Indirect	7.39** *0.22*	15.4	13.3	8
	Business				17
Implementation	Individual	20.7** *0.41*			13
	Indirect	-21.0** *-0.25*	-13.0** *-0.16*	-11.7** *-0.14*	25
Number of observations		610	613	610	
Student-t degrees of freedom		-	-	-	
Portmanteau Q test		$\chi^2(40) = 0.1$	$\chi^2(40) = 1$	$\chi^2(40) = 1$	
ARCH effects		$\chi^2(10) = 0.02$	$\chi^2(10) = 0.3$	$\chi^2(10) = 0.2$	
Exclusion restriction		$\chi^2(14) = 21$	$\chi^2(16) = 23$	$\chi^2(13) = 25$	

Notes: Coefficients are in percentage points. * and ** indicate significance at the 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A4: Qualitative Summary of the Estimated Effects of Tax Cuts Across the Three Countries, Various Levels of Aggregation, and Different Legislative Stages (stock market index: increases: +; decreases: −; otherwise: no significant effect)

Legislative Stages and Shocks		**Indices**		
		(I)	**(II)**	**(III)**
		S&P500	**DAX**	**FT30**
US Tax Shocks				
Committee on Ways and Means	Aggregated	+	+	
	Business			
	Personal	+	+	+
Senate Committee	Aggregated			
	Business			
	Personal			
Mediation Committee	Aggregated			
	Business			
	Personal	+		
Implementation	Aggregated			
	Business			
	Personal			
German Tax Shocks				
Draft	Aggregated			
	Business			
	Personal			
	Indirect			
Federal Financial Committee	Aggregated			+
	Business			
	Personal			+
	Indirect			
Mediation Committee	Aggregated			
	Business			
	Personal			
	Indirect			
Implementation	Aggregated			
	Business			
	Personal		+	
	Indirect		−	−
UK Tax Shocks				
Draft	Aggregated			
	Business			
	Personal	+		
	Indirect		−	
Implementation	Aggregated			
	Business			
	Personal			
	Indirect			

Table A5: Crisis Period, US Draft included

Shocks		Indices		
		(I)	(II)	(III)
		S&P 500	DAX	FT 30
US Tax Cuts				
Cumulative Effect	Business	16.82** *2.68*		5.83* *1.18*
	Individual	-3.56** *-1.68*		0.00
German Tax Cuts				
	Business	80.51** *6.58*	40.80** *2.98*	37.10** *2.67*
Cumulative Effect	Individual	-10.62** *-0.96*	-13.67* *-2.11*	-2.82
	Indirect	-98.98** *-4.25*	33.42	67.91** *3.15*
UK Tax Cuts				
	Business	23.26** *0.62*		8.96
Cumulative Effect	Individual	-1.94		-5.47** *-0.23*
	Indirect	-13.59** *-0.03*	2.32	1.55

Table A6: Revenue Shocks, without shift of US time zone

Shocks		Indices		
		(I)	(II)	(III)
		S&P 500	DAX	FT 30
US				
Business Tax Shocks				
Cumulative Effect	Increase	-	-8.65* *-0.55*	-4.96
	Decrease	-		9.32** *0.47*
Income Tax Shocks				
Cumulative Effect	Increase	-		
	Decrease	-	2.41** *0.55*	
Germany				
Business Tax Shocks				
Cumulative Effect	Increase	-	-7.80** *-0.10*	16.70** *0.20*
	Decrease	-		-12.67** *-0.54*
Income Tax Shocks				
Cumulative Effect	Increase	-	-2.39	-5.49** *-0.19*
	Decrease	-		3.42* *0.27*
Indirect Tax Shocks				
Cumulative Effect	Increase	-	473.81** *1.24*	447.7** *1.15*
	Decrease	-		

Table A7: Revenue Shocks, without shift of US time zone

Shocks		(I) S&P 500	(II) DAX	(III) FT 30
US Tax Cuts				
Cumulative Effect	Business	-	2.36	12.67* *1.50*
	Individual	-		-2.82
German Tax Cuts				
	Business	-	32.13** *2.27*	25.33** *1.71*
Cumulative Effect	Individual	-	-5.49** *-0.49*	7.12** *-0.38*
	Indirect	-	8.89	40.11** *1.96*
UK Tax Cuts				
	Business	-		9.00
Cumulative Effect	Individual	-		-5.49** *-0.23*
	Indirect	-	2.37	1.61

Table A8: Aggregated Tax Shocks, estimated with Control Variables:

Tax Shocks	(I) S&P 500	(II) DAX	(III) FT 30
US			
Committee on Ways and Means	0.12^	0.048	
Senate Committee			
Mediation Committee	0.25		
Implementation			
German			
Draft			
Federal Financial Committee			0.55*
Mediation Committee			
Implementation			
UK			
Draft			
Implementation			
No. of Observations	9858	9854	9844
Student-t degrees of freedom.	6	9	11
Portmanteau Test	$\chi^2(40) = 44$	$\chi^2(40) = 21$	$\chi^2(40) = 66$*
ARCH Effects	$\chi^2(10) = 7$	$\chi^2(10) = 3$	$\chi^2(10) = 20$^

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A9: Disaggregated Tax Shocks, estimated with Control Variables:

Shock		**Indices**		
		(I) **S&P 500**	**(II)** **DAX**	**(III)** **FT30**
US				
Tax Shocks				
Committee on Ways and Means	Business			
	Individual	0.14*	0.075^	0.25**
Senate Committee	Business			
	Individual	-0.28^		
Mediation Committee	Business			
	Individual	0.46**		
Implementation	Business			
	Individual			
German				
Tax Shocks				
Draft	Business			
	Individual			
	Indirect			
Federal Financial Committee	Business			
	Individual			0.60*
	Indirect			
Mediation Committee	Business			
	Individual			
	Indirect			
Implementation	Business			
	Individual		1.68**	
	Indirect		-1.47**	-2.29**
UK				
Tax Shocks				
Draft	Business			
	Individual	0.53**		
	Indirect		-0.24^	
Implementation	Business			
	Individual			
	Indirect			
Number of observations		9858	9854	9844
Student-t degrees of freedom		6	8	11
Portmanteau Q Test		$\chi^2(40) = 44$	$\chi^2(40) = 21$	$\chi^2(40) = 65$*
ARCH Effects		$\chi^2(10) = 7$	$\chi^2(10) = 3$	$\chi^2(10) = 21$^

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A10: Revenue Shocks, estimated with Control Variables:

Shocks		(I) S&P500	(II) DAX	(III) FT30
US				
Business Tax Shocks				
Senate Committee	Increase		-2.31**	
	Decrease		-2.53	
Mediation Committee	Increase			-5.53
	Decrease	7.34*		7.06**
Income Tax Shocks				
Senate Committee	Increase			
	Decrease		2.43^	
Mediation Committee	Increase			
	Decrease	1.38	3.66**	
German				
Business Tax Shocks				
Federal Financial Committee	Increase	11.1**		
	Decrease			
Mediation Committee	Increase	17.9**	--1.50*	24.8**
	Decrease			-12.3**
Income Tax Shocks				
Federal Financial Committee	Increase	-20.5**	-1.14	-5.50**
	Decrease			
Mediation Committee	Increase			
	Decrease			3.36*
Indirect Tax Shocks				
Federal Financial Committee	Increase		94.7	190**
	Decrease			
Mediation Committee	Increase	-51.6*	309**	250**
	Decrease			
Number of observations		9858	9854	9844
Student-t degrees of freedom		6	9	-
Portmanteau Q Test		$\chi^2(40) = 44$	$\chi^2(40) = 21$	$\chi^2(40) = 66$*
ARCH Effects		$\chi^2(10) = 7$	$\chi^2(10) = 3$	$\chi^2(10) = 16$

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A11: Financial Crisis Subsample, estimated with Control Variables:

Shock		Indices		
		(I)	**(II)**	**(III)**
		S&P 500	**DAX**	**FT30**
US				
Tax Shocks				
Committee on Ways and Means	Business			
	Individual			-2.96
Senate Committee	Business			5.26**
	Individual			
Mediation Committee	Business	7.91**		
	Individual	-1.77^		
Implementation	Business			
	Individual			-
German				
Tax Shocks				
Draft	Business	72.0**	22.5**	
	Individual			
	Indirect	-82.6**	4.65	29.4**
Federal Financial Committee	Business		35.1**	31.6*
	Individual			-5.39**
	Indirect		-39.6*	
Mediation Committee	Business			
	Individual	-3.46	-19.0**	-6.47
	Indirect			
Implementation	Business			
	Individual			
	Indirect		7.97**	13.5**
UK				
Tax Shocks				
Draft	Business	22.6**		14.2**
	Individual	-21.4**		-8.36**
	Indirect	8.41*	12.4*	7.54^
Implementation	Business			
	Individual	20.2**		
	Indirect	-20.4**	-13.4**	-12.8**
Number of observations		610	613	610
Student-t degrees of freedom		-	-	-
Portmanteau Q Test		$\chi^2(40) = 0.1$	$\chi^2(40) = 1$	$\chi^2(40) = 1$
ARCH Effects		$\chi^2(10) = 0.02$	$\chi^2(10) = 0.4$	$\chi^2(10) = 0.3$

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A12: Aggregated Tax Shocks, estimated as Diagonal BEKK:

Tax Shocks	**(I)** **S&P 500**	**(II)** **DAX**	**(III)** **FT 30**
US			
Committee on Ways and Means	0.14*	0.15**	
Senate Committee			
Mediation Committee	0.24^		
Implementation			
German			
Draft			
Federal Financial Committee			0.51*
Mediation Committee			
Implementation			
UK			
Draft			
Implementation			
No. of Observations	9858	9854	9844
Student-t degrees of freedom.	8	8	10
Portmanteau Test	$\chi^2(40)_{SP500} = 412$**	$\chi^2(40)_{SP500} = 414$**	$\chi^2(40)_{SP500} = 302$**
	$\chi^2(40)_{DAX} = 23$	$\chi^2(40)_{DAX} = 28$	$\chi^2(40)_{DAX} = 24$
	$\chi^2(40)_{FT30} = 533$**	$\chi^2(40)_{FT30} = 539$**	$\chi^2(40)_{FT30} = 362$**

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A13: Effects of Disaggregated Tax Shocks on Stock Market Returns, estimated as diagonal BEKK

Shock		**Indices**		
		(I) **S&P 500**	**(II)** **DAX**	**(III)** **FT30**
US Tax Shocks				
Committee on Ways and Means	Business			
	Individual	0.15*	0.16**	0.31**
Senate Committee	Business			
	Individual	-0.28		
Mediation Committee	Business			
	Individual	0.46*		
Implementation	Business			
	Individual			
German Tax Shocks				
Draft	Business			
	Individual			
	Indirect			
Federal Financial Committee	Business			
	Individual			0.51**
	Indirect			
Mediation Committee	Business			
	Individual			
	Indirect			
Implementation	Business			
	Individual		1.64*	
	Indirect		-1.11*	-2.36**
UK Tax Shocks				
Draft	Business			
	Individual	0.49*		
	Indirect		-0.36*	
Implementation	Business			
	Individual			
	Indirect			
Number of observations		9858	9854	9844
Student-t degrees of freedom		8	8	8
Portmanteau Q Test		$\chi^2(40)_{SP500} = 410$**	$\chi^2(40)_{SP500} = 414$**	$\chi^2(40)_{SP500} = 302$**
		$\chi^2(40)_{DAX} = 24$	$\chi^2(40)_{DAX} = 27$	$\chi^2(40)_{DAX} = 24$
		$\chi^2(40)_{FT30} = 533$**	$\chi^2(40)_{FT30} = 526$**	$\chi^2(40)_{FT30} = 352$**

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A14: Revenue Shocks, estimated as diagonal BEKK

Shocks		**Indices**		
		(I)	**(II)**	**(III)**
		S&P500	**DAX**	**FT30**
US				
Business Tax Shocks				
Senate Committee	Increase		-1.19	
	Decrease		-1.80*	
Mediation Committee	Increase			-4.75^
	Decrease	8.93		9.21**
Income Tax Shocks				
Senate Committee	Increase			
	Decrease		1.58*	
Mediation Committee	Increase			
	Decrease	0.71	2.74*	
German				
Business Tax Shocks				
Federal Financial Commit-	Increase	12.6		
tee	Decrease			
Mediation Committee	Increase	17.4**	-8.23**	16.5
	Decrease			--13.2*
Income Tax Shocks				
Federal Financial Commit-	Increase	-23.3**	-0.78	-5.61**
tee	Decrease			
Mediation Committee	Increase			
	Decrease			3.75
Indirect Tax Shocks				
Federal Financial Commit-	Increase		43.3**	233**
tee	Decrease			
Mediation Committee	Increase	-64.2*	84.6**	213**
	Decrease			
Number of observations		9858	9854	9844
Student-t degrees of freedom		8	8	8
Portmanteau Q Test		$\chi^2_{SP500}(40) = 410$**	$\chi^2_{SP500}(40)=416$**	$\chi^2_{SP500}(40) = 301$**
		$\chi^2_{DAX}(40) = 24$	$\chi^2_{DAX}(40)=27$	$\chi^2_{DAX}(40) = 24$
		$\chi^2_{FT30}(40) = 534$**	$\chi^2_{FT30}(40)=539$**	$\chi^2_{FT30}(40) = 361$**

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A15: Financial Crisis Subsample, estimated as diagonal BEKK

Shock		Indices (I) S&P 500	(II) DAX	(III) FT30
US Tax Shocks				
Committee on Ways and Means	Business			
	Individual			-2.28
Senate Committee	Business			4.77
	Individual			
Mediation Committee	Business	7.56**		
	Individual	-1.66**		
Implementation	Business			
	Individual			
German Tax Shocks				
Draft	Business	49.1	1.53	
	Individual			
	Indirect	-41.1	50.7**	30.2**
Federal Financial Committee	Business		31.5*	27.7
	Individual			-6.71^
	Indirect		-41.5**	
Mediation Committee	Business			
	Individual	13.5	-1.51	16.0**
	Indirect			
Implementation	Business			
	Individual			
	Indirect		6.57**	8.20**
UK Tax Shocks				
Draft	Business	25.0^		9.69^
	Individual	-24.4*		-5.58^
	Indirect	7.72**	21.7**	18.7**
Implementation	Business			
	Individual	21.9^		
	Indirect	-20.6**	-13.5**	-11.5**
Number of observations		610	613	
Student-t degrees of freedom		4	5	5
Portmanteau Q Test		$\chi^2_{SP500}(40) = 469^{**}$	$\chi^2_{SP500}(40) = 420^{**}$	$\chi^2_{SP500}(40) = 401^{**}$
		$\chi^2_{DAX}(40) = 95^{**}$	$\chi^2_{DAX}(40) = 65^{*}$	$\chi^2_{DAX}(40) = 64^{*}$
		$\chi^2_{FT30}(40) = 289^{**}$	$\chi^2_{FT30}(40) = 259^{**}$	$\chi^2_{FT30}(40) = 253^{**}$

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A16: Aggregated Tax Shocks, estimated with Excess Returns:

6Tax Shocks	**(I)**	**(II)**	**(III)**
	S&P 500	**DAX**	**FT 30**
US			
Committee on Ways and Means	0.12^	0.15**	
Senate Committee			
Mediation Committee	0.18		
Implementation			
German			
Draft			
Federal Financial Committee			0.60*
Mediation Committee			
Implementation			
UK			
Draft			
Implementation			
No. of Observations	9858	9854	9844
Student-t degrees of freedom.	10	11	15
Portmanteau Test	$\chi^2(40) = 33$	$\chi^2(40) = 23$	$\chi^2(40) = 99$**
ARCH Effects	$\chi^2(10) = 14$	$\chi^2(10) = 11$	$\chi^2(10) = 49$**

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A17: Disaggregated Tax Shocks, estimated with Excess Returns:

Shock		**Indices** (I) **S&P 500**	(II) **DAX**	(III) **FT30**
US Tax Shocks				
Committee on Ways and Means	Business			
	Individual	0.12^	0.17**	0.27**
Senate Committee	Business			
	Individual	-0.31**		
Mediation Committee	Business			
	Individual	0.38**		
Implementation	Business			
	Individual			
German Tax Shocks				
Draft	Business			
	Individual			
	Indirect			
Federal Financial Committee	Business			
	Individual			0.76**
	Indirect			
Mediation Committee	Business			
	Individual			
	Indirect			
Implementation	Business			
	Individual		1.21^	
	Indirect		-1.34**	-1.39^
UK Tax Shocks				
Draft	Business			
	Individual	0.45*		
	Indirect		-0.33*	
Implementation	Business			
	Individual			
	Indirect			
Number of observations		9858	9854	9844
Student-t degrees of freedom		10	11	15
Portmanteau Q Test		$\chi^2(40) = 33$	$\chi^2(40) = 23$	$\chi^2(40) = 97$**
ARCH Effetcs		$\chi^2(10) = 13$	$\chi^2(10) = 11$	$\chi^2(10) = 47$**

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A18: Revenue Shocks, estimated with Excess Returns:

Shocks		Indices		
		(I)	(II)	(III)
		S&P500	DAX	FT30
US				
Business Tax Shocks				
Senate Committee	Increase		-2.39**	
	Decrease		-1.37	
Mediation Committee	Increase			-3.12
	Decrease	6.80**		7.18**
Income Tax Shocks				
Senate Committee	Increase	-18.9*		-2.58*
	Decrease		1.34	
Mediation Committee	Increase			
	Decrease	0.90	3.26**	
German				
Business Tax Shocks				
Federal Financial Committee	Increase	8.78*		
	Decrease			
Mediation Committee	Increase	18.9**	-8.39**	22.9**
	Decrease			-13.8**
Income Tax Shocks				
Federal Financial Committee	Increase	-18.9*		-2.58*
	Decrease			
Mediation Committee	Increase			
	Decrease			2.77*
Indirect Tax Shocks				
Federal Financial Committee	Increase		98.5	183**
	Decrease			
Mediation Committee	Increase	-38.0^	256**	232**
	Decrease			
Number of observations		9858	9854	9844
Student-t degrees of freedom		10	11	15
Portmanteau Q Test		$\chi^2(40) = 33$	$\chi^2(40) = 23$	$\chi^2(40) = 99$**
ARCH Effects		$\chi^2(10) = 14$	$\chi^2(10) = 11$	$\chi^2(10) = 48$**

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A19: Financial Crisis Subsample, estimated with Excess Returns:

Shock		**Indices** (I) S&P 500	(II) DAX	(III) FT30
US				
Tax Shocks				
Committee on Ways and Means	Business			
	Individual			-2.25
Senate Committee	Business			3.96^
	Individual			
Mediation Committee	Business	4.83**		
	Individual	-0.19		
Implementation	Business			
	Individual			
German				
Tax Shocks				
Draft	Business	99.3**	30.9**	
	Individual			
	Indirect	-156**	-21.5**	19.5**
Federal Financial Committee	Business		14.3**	22.3**
	Individual			-5.50**
	Indirect		-19.3**	
Mediation Committee	Business			
	Individual	-11.2**	-4.40**	12.1**
	Indirect			
Implementation	Business			
	Individual			
	Indirect		-3.44**	-2.91**
UK				
Tax Shocks				
Draft	Business	21.2**		4.54
	Individual	-22.2**		-5.26**
	Indirect	7.44**	15.3	10.3
Implementation	Business			
	Individual	19.4**		
	Indirect	-18.4**	-12.2**	-11.1**
Number of observations		610	613	610
Student-t degrees of freedom		16	9	-
Portmanteau Q Test		$\chi^2(40) = 0.05$	$\chi^2(40) = 1$	$\chi^2(40) = 2$
ARCH Effects		$\chi^2(10) = 0.01$	$\chi^2(10) = 0.3$	$\chi^2(10) = 0.5$

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A20: Aggregated Tax Shocks, estimated without Tax Extensions:

Tax Shocks	(I) S&P 500	(II) DAX	(III) FT 30
US			
Committee on Ways and Means	0.11^	0.11^	
Senate Committee			
Mediation Committee	0.20		
Implementation			
German			
Draft			
Federal Financial Committee			0.69**
Mediation Committee			
Implementation			
UK			
Draft			
Implementation			
No. of Observations	9858	9854	9844
Student-t degrees of freedom.	6	9	11
Portmanteau Test	$\chi^2(40) = 41$	$\chi^2(40) = 20$	$\chi^2(40) = 51$
ARCH Effects	$\chi^2(10) = 11$	$\chi^2(10) = 4$	$\chi^2(10) = 23$^

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A21: Disaggregated Tax Shocks, estimated without Tax Extensions:

Shock		**Indices** (I) **S&P 500**	(II) **DAX**	(III) **FT30**
US Tax Shocks				
Committee on Ways and Means	Business			
	Individual	0.15**	0.14**	0.22^
Senate Committee	Business			
	Individual	-0.53**		
Mediation Committee	Business			
	Individual	0.66**		
Implementation	Business			
	Individual			
German Tax Shocks				
Draft	Business			
	Individual			
	Indirect			
Federal Financial Committee	Business			
	Individual			0.72**
	Indirect			
Mediation Committee	Business			
	Individual			
	Indirect			
Implementation	Business			
	Individual		1.73**	
	Indirect		-1.35**	-2.08**
UK Tax Shocks				
Draft	Business			
	Individual	0.54**		
	Indirect		-0.40*	
Implementation	Business			
	Individual			
	Indirect			
Number of observations		9858	9854	9844
Student-t degrees of freedom		6	8	10
Portmanteau Q Test		$\chi^2(40) = 41$	$\chi^2(40) = 20$	$\chi^2(40) = 49$
ARCH Effects		$\chi^2(10) = 11$	$\chi^2(10) = 4$	$\chi^2(10) = 21$^

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A22: Revenue Shocks, estimated without Tax Extensions:

Shocks		**Indices**		
		(I) **S&P500**	**(II)** **DAX**	**(III)** **FT30**
US				
Business Tax Shocks				
Senate Committee	Increase		-1.48	
	Decrease		-2.12	
Mediation Committee	Increase			
	Decrease	11.4**		8.65**
Income Tax Shocks				
Senate Committee	Increase			
	Decrease		2.14	
Mediation Committee	Increase			-5.36^
	Decrease	1.25	5.11	
German				
Business Tax Shocks				
Federal Financial Committee	Increase	11.3**		
	Decrease			
Mediation Committee	Increase	17.2**	-7.79**	16.7**
	Decrease			-12.7**
Income Tax Shocks				
Federal Financial Committee	Increase	-20.6*		-5.71**
	Decrease			
Mediation Committee	Increase			
	Decrease			3.42**
Indirect Tax Shocks				
Federal Financial Committee	Increase		208^	247**
	Decrease			
Mediation Committee	Increase	-65.0**	296**	224**
	Decrease			
Number of observations		9858	9854	9844
Student-t degrees of freedom		6	9	10
Portmanteau Q Test		$\chi^2(40) = 41$	$\chi^2(40) = 20$	$\chi^2(40) = 50$
ARCH Effects		$\chi^2(10) = 11$	$\chi^2(10) = 4$	$\chi^2(10) = 22$^

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.

Table A23: Financial Crisis Subsample, estimated without Tax Extensions:

Shock		Indices (I) S&P 500	(II) DAX	(III) FT30
US Tax Shocks				
Committee on Ways and Means	Business			
	Individual			-2.99^
Senate Committee	Business			8.17**
	Individual			
Mediation Committee	Business	7.61**		
	Individual	0.54		
Implementation	Business			
	Individual			
German Tax Shocks				
Draft	Business	80.0**	7.18**	
	Individual			
	Indirect	-95.3**	41.5**	31.1**
Federal Financial Committee	Business		29.7**	26.1**
	Individual			-6.81**
	Indirect		-46.8**	
Mediation Committee	Business			
	Individual	-11.1**	-5.31**	13.8**
	Indirect			
Implementation	Business			
	Individual			
	Indirect		7.52**	8.99**
UK Tax Shocks				
Draft	Business	-5.22*		4.81
	Individual	2.11		-1.66
	Indirect	9.08**	14.5	12.8
Implementation	Business			
	Individual	1.45		
	Indirect	-20.8**	-13.8**	-11.8**
Number of observations		610	613	610
Student-t degrees of freedom		9	-	-
Portmanteau Q Test		$\chi^2(40) = 0.04$	$\chi^2(40) = 1$	$\chi^2(40) = 1$
ARCH Effects		$\chi^2(10) = 0.01$	$\chi^2(10) = 0.3$	$\chi^2(10) = 0.2$

Notes: Coefficients are in percentage points. ^, *, and ** indicate significance at the 5%, 1% and the 0.1% level, respectively. Empty cells indicate no significant reaction. The number of observations differs, as different business calendars are used. Standard errors are heteroscedasticity consistent. The tax shocks are scaled to 1% of current GDP. Portmanteau test applies to standardised squared residuals.