Discretionary Fiscal Policies over the Cycle: New Evidence Based on the ESCB Disaggregated Approach*

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This paper explores how discretionary fiscal policies on the revenue side of the government budget have reacted to economic fluctuations in European Union countries. For this purpose, it uses data on legislated revenue changes and structural indicators provided twice per year by national central banks of European Union countries in the ESCB framework for analyzing fiscal policy. Results suggest that, overall, legislated changes in taxes and social security contributions have responded in a strongly procyclical way to the business cycle, while commonly used cyclical-adjustment methods point to acyclicality.

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1. Introduction

This paper provides new evidence on the cyclical stance of fiscal policy in European Union (EU) countries, over the period 1998 through 2008. In particular, it explores whether EU governments have adopted countercyclical revenue-based fiscal policies that helped to smooth the business cycle, or whether they have acted in a procyclical way, for instance, by raising taxes during slowdowns while implementing expansionary policies in booming times, thereby exacerbating swings of the cycle.

The paper focuses on *legislated changes* in taxes and social security contributions, as defined by the European System of Central Banks (ESCB) disaggregated approach (see Kremer et. al 2006). In fact, as stressed in this framework, changes in laws that have a budgetary impact should reflect the discretionary component of fiscal policy more effectively than commonly used cyclically adjusted fiscal indicators. The latter might be affected by a number of limitations, mostly related to the filtering techniques applied to net out the automatic impact of the cycle from headline fiscal figures (see, e.g., Canova 1998; Jaeger and Schuknecht 2004; Darby and Melitz 2008; Larch and Turrini 2009).

Measures of legislated changes in taxes and social security contributions used in this paper are based on information collected within the ESCB. In detail, a database consisting of legislative changes affecting government revenues is based on estimates by the national central banks (NCBs) of the twenty-seven European Union countries compiled at a biannual frequency. This database comprises *qualitative* information on fiscal measures judged to have an impact of a relevant magnitude on government finances, including the estimated duration of these measures. The database also reports *quantitative* information, which relates to the budgetary impact of measures. In most cases this is based on official government estimates (if existing), but ESCB fiscal experts' judgment may deviate from official estimates in some cases, e.g., if there is reason to believe that the official estimates are overly optimistic or pessimistic.[1]

While information concerning the estimated impact of legislative changes is typically provided in budget documents, long time-series

[1] In section 3, some specific examples of changes in legislation, and of cases in which the NCBs' assessment deviates from the official one, are provided.

and harmonized cross-country data are generally not available from other sources. The European Commission, in its yearly publication *Public Finances in EMU*, reports estimates on discretionary legislated measures for EU-27 countries.[2] However, this has only been done since 2004, and quantitative impacts are only reported for the most important measures. Moreover, there is generally no distinction between the (permanent vs. temporary) nature of measures. These features clearly limit the scope for using the information provided in the Commission's reports for a panel regression analysis, as proposed in this paper. At the same time, we have carried out an analysis which confirms that ESCB data and the information provided by the Commission in its reports—when overlapping in terms of country and time coverage—are highly correlated.[3] A data set of legislative changes has been also collected by Romer and Romer (2009a, 2009b, 2010), but only for the United States.[4]

In sum, for what concerns changes in legislation on the revenue side, the ESCB data set is—to our knowledge—unique in its kind for EU countries, given its (relatively) large country and time coverage and the amount of descriptive information provided. At the same time, like for example for the measurement of the output gap, the actual impact of legislative changes is unobservable and any estimates thereof are subject to a certain degree of uncertainty.

The ESCB data set of legislated changes is used to estimate the *cyclical sensitivity* of revenue-based discretionary fiscal measures, based on the estimation of fiscal policy rules linking these measures of legislated changes to the output gap and other control variables.

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[2]This report has been published since 2000. However, estimates for discretionary measures are available only as of the 2004 edition. Past editions of *Public Finances in EMU* are available at http://ec.europa.eu/economy_finance/publications/european_economy/public_finances_emu_en.htm.

[3]This is also explained by the fact that both approaches are primarily based on the same underlying source, i.e., official budget documents.

[4]The authors use a "narrative record" of presidential speeches, executive-branch documents, Congressional reports, and budget laws to identify the size, timing, and principal motivation for all major post-war tax policy actions. Based on this data, the authors uncover that tax increases have strong contractionary effects on output in the United States. The data reported in tables from the ESCB disaggregated approach also provide a description of the size, timing, and nature of legislated revenue changes that took place in EU countries. However, at the current juncture, these data do not allow to identify also the motivation behind each policy decision (e.g., cyclical stabilization, deficit control, or other "exogenous" reasons) as in the data set of Romer and Romer.

In particular, the cyclical reaction of discretionary changes in overall taxes and social security contributions is analyzed, together with the cyclical behavior of four subcategories of government revenues: direct taxes paid by households, direct taxes paid by enterprises, indirect taxes, and social security contributions. Finally, results from these baseline regressions are compared with what is obtained using fiscal indicators that are cyclically adjusted according to the ESCB disaggregated approach.

Based on this analysis, it emerges that, in line with existing studies, changes in cyclically adjusted taxes and social security contributions seem to be disconnected from the economic cycle in EU countries over the last ten years. However, when legislated measures are used instead of cyclically adjusted indicators, it is found that, overall, revenue changes have responded in a *strongly procyclical* way to the business cycle. In particular, this result appears to be the outcome of a significant procyclical reaction of direct taxes payable by households and of social security contributions. More specifically, there is evidence that direct taxes paid by households have been significantly reduced during economic expansions. As for indirect taxes, while estimates based on cyclically adjusted indicators suggest procyclicality, changes in indirect tax legislation seem to be acyclical. In addition, indirect taxes are the only revenue subcomponent that appears to have been used to stabilize the government debt-to-GDP ratio.

The rest of this paper is organized as follows. In section 2, a review of the empirical literature that explores the cyclical sensitivity of discretionary fiscal policies, based on cyclically adjusted indicators, is provided. Section 3 describes how the data set used in this analysis is constructed using information provided by NCBs. In section 4, the fiscal policy reaction functions used in the analysis are described. In section 5, the main results from the analysis are shown and discussed. Section 6 is devoted to a series of robustness checks, and section 7 concludes.

2. Review of the Literature Based on Cyclically Adjusted Indicators

The bulk of the macroeconomic literature typically employs "cyclically adjusted" indicators as a proxy for the discretionary component of fiscal policy. Based on cyclically adjusted indicators regularly published by the main international institutions, a number of policy and academic papers have investigated issues related to discretionary fiscal policies (see, for example, Alesina and Perotti 1995; Giavazzi and Pagano 1996).

In particular, as regards the issue of the policy responsiveness to economic fluctuations—which is often referred to as "cyclical sensitivity"—the standard approach in the fiscal policy literature is to estimate fiscal policy rules linking (levels or changes of) cyclically adjusted fiscal variables, as measures of the discretionary component of fiscal policy, to business-cycle indicators (generally, the output gap) and other explanatory variables, such as, in particular, the public debt (see, e.g., Taylor 2000; Auerbach 2002).[5]

While the empirical evidence from this literature is quite mixed, a relatively large consensus has emerged on the fact that discretionary fiscal policies seem to be substantially *acyclical* in EU countries, especially as far as *government revenues* are concerned. In particular, Galí and Perotti (2003) estimate fiscal policy rules for a panel of euro-area countries and find that cyclically adjusted budget balances have not reacted to the business cycle in the period that followed the entry into force of the Maastricht Treaty in 1992. When they focus on the breakdown between (cyclically adjusted) spending and revenue, they show that both these components seem to have been acyclical over the period considered. Similar results are found by Turrini (2008), who, however, highlights that the substantial neutrality of the cyclically adjusted budget balance over the cycle is likely to stem

[5]Within this literature, most papers employ "ex post" data—i.e., observations in a revised form taken from the latest available vintage—to study "actual" or "realized" policies. Recently, a new strand of literature focuses on fiscal policy plans, or "intentions," rather than actual policies. In particular, Cimadomo (2011) proposes to estimate fiscal policy rules based on an information set which closely mimics the one available to fiscal policymakers at the time of budgeting. Budget plans reported at the time of budgetary decisions, and other real-time macro indicators, are used in this framework. It is found that ex ante fiscal plans are countercyclical, especially in expansions, whereas ex post data point to acyclicality (for related studies, see Giuliodori and Beetsma 2008; Beetsma and Giuliodori 2010). At the same time, other papers focus on actual policies and incorporate revised information as regards fiscal indicators and real-time data for the output gap and other explanatory variables (see Forni and Momigliano 2005; Golinelli and Momigliano 2006).

from the combined effect of a significant countercyclical response of revenue compensated by a procyclical reaction of expenditure. More recently, Fatás and Mihov (2009) have shown that cyclically adjusted spending has become more procyclical in euro-area countries, after the adoption of the single currency, whereas cyclically adjusted taxes have become more countercyclical. Many other studies employing cyclically adjusted budget balances, and revised data, tend to confirm that discretionary fiscal policies are acyclical in EU and euro-area countries (see, e.g., Ballabriga and Martinez-Mongay 2002; OECD 2003; European Commission 2006; Wyplosz 2006).

While structural indicators represent a useful benchmark to evaluate the fiscal policy stance, especially in the absence of more detailed information on changes in legislation passed by parliaments, they are clearly subject to a number of limitations.[6] These latter are notably related to the substantial uncertainty inherent in the cyclical-adjustment procedure. In particular, there is a certain degree of arbitrariness in the selection of the statistical smoothing technique used to extract the cyclical component from the unadjusted level of the budget and budgetary categories. In addition, while standard methods imply that elasticities of budgetary components with respect to output are treated as constant, empirical evidence suggests that they can vary over time and that they might be characterized by high volatility (see Eschenbach and Schuknecht 2004; Jaeger and Schuknecht 2004). Moreover, additional difficulties may stem from the (unconsensual) definition of temporary measures, as long as structural indicators are considered. Finally, it cannot be excluded that not only do unemployment benefits react to the cycle (as generally assumed), but other categories of social spending (such as, for example, age- and health-related expenditure as well as incapacity and sick benefits) also move in response to cyclical fluctuations (on this point, see in particular Darby and Melitz 2008). Therefore, as discussed by some authors (see, for example, Chalk 2002; Larch and Salto 2005), commonly used cyclically adjusted fiscal indicators may provide inaccurate measures of discretionary policies, and empirical results based on these indicators should be interpreted cautiously. Against this background, as also suggested

[6] See in particular Larch and Turrini (2009) for an extensive account of downsides of cyclically adjusted indicators.

by Kremer et. al (2006), data on legislated policy changes should reflect better the discretionary stance of fiscal policy.

3. A Data Set for Discretionary Fiscal Policies in the EU

The starting point of this study is the identification of legislated revenue changes as measures of the discretionary component of fiscal policy. To that aim, data from the ESCB's disaggregated approach are used. Data include discretionary measures that have been approved by the respective national parliament and that are assessed to have a sizable impact on government finances. Both qualitative information (i.e., the description of each measure) and quantitative information (i.e., the estimated budgetary impact and its duration) is provided. While the data regularly collected within the ESCB is confidential, in Kremer et al. (2006) the disaggregated approach is documented and explained, and information on the impact of measures over the period 1998–2004 for some countries is reported. Here, two examples from that earlier paper are briefly discussed as illustrative cases. The first is a major tax reform implemented in the Netherlands in 2001.[7] That tax reform (named "Wet inkomstenbelasting 2001"[8]) implied a shift from direct to indirect tax revenues and, according to ESCB calculations, had a significant negative impact on government revenues. Revenues from social contributions and direct taxes were estimated to be reduced by about 2.4 percent of GDP in the year of the reform. At the same time, the VAT rate was increased from 17.5 percent to 19 percent, and energy taxes were also increased. This elicited additional revenues from indirect taxation amounting to around 0.6 percent of GDP. Thus, overall, the impact on tax revenues of these changes was assessed as amounting to 1.8 percent of GDP in 2001.

In most cases the ESCB data concerning legislative changes is based on official government estimates provided during the legislative process. However, ESCB fiscal experts' judgment may deviate

[7] See Kremer et al. (2006, p. 34).

[8] The reform was approved by the Dutch parliament on May 22, 2000 through the State law number BWBR0011353, which came into force on January 1, 2001.

from official estimates in some cases (e.g., if there is reason to believe that the official estimate is overly optimistic or pessimistic). For example, again citing Kremer et al. (2006), revenue developments in Italy in the years 1998–2004 were influenced by the 1998 tax reform which, inter alia, introduced a new regional tax on productive activities (the "IRAP" tax). While according to official estimates released when the reform was introduced, the IRAP tax was expected to have a neutral effect on total revenue, ESCB fiscal experts assessed that the reform induced a negative budgetary impact close to 0.5 percent of GDP, cumulatively over the considered period. Overall, the tax reform was assessed as having implied reductions in social security contributions (estimated at 2.1 percent of GDP) and direct taxes payable by corporations (0.9 percent of GDP), only partly offset by the increase in indirect taxes (2.5 percent of GDP), where the new tax was classified.[9]

All in all, information on legislated changes has been combined to compile two complementary data sets. The first one, based on the so-called disaggregated approach (DA) tables, as described below, incorporates data on legislated revenue changes and cyclically adjusted indicators for nineteen EU countries. The second—compiled on the basis of DA tables and on further complementary information from NCBs—comprises only legislated revenue changes, but for the larger set of twenty-seven EU countries.[10]

Two facts should be stressed. First, while structural indicators for government expenditure are also reported in DA tables, estimates

[9]See Kremer et al. (2006, pp. 29–31). See also this paper for other examples of changes in legislation.

[10]While cyclically adjusted indicators are produced by different international institutions, only the European Commission produces comparable data on the budgetary impact of the main changes in legislation, for each of the EU-27 countries. These data are reported in the yearly publication *Public Finances in EMU*. However, the coverage of the Commission's data set is significantly smaller than that of the ESCB's data set, given that discretionary measures started to be reported only as of 2004 and that for some measures the budgetary impact is not reported. Nevertheless, we have manually collected the Commission's data from past editions of *Public Finances in EMU*, from 2004 to 2008. Data had to be collected from PDF files for each country, as they are not included in any Commission's electronic database. The estimated correlation coefficient between the Commission's and the ESCB's data on legislative changes is high (0.87) and statistically significant, indicating that the two institutions tend to adopt a broadly similar assessment regarding the budgetary impact of revenue measures.

for the budgetary impact of legislative measures on the spending side are not assessed. This reflects the very different nature of most government spending to most revenues. In fact, a benchmark path that would be followed by revenue items in the absence of discretionary measures can be identified in a (relatively) easy way, on the basis of growth assumptions on the relevant tax bases. By contrast, there is no predetermined path for most (especially non-social) government spending, which instead has to be set annually in the budget. In addition, discretionary spending actions taken at the administrative level are often even more important than parliamentary decisions, and keeping track of all of them is virtually impossible (see also Kremer et al. 2006).

Second, this paper focuses on *permanent* (legislated) discretionary measures on the revenue side of the government budget. An analysis of temporary measures would also be interesting, given that these measures are often used for countercyclical actions. Unfortunately, however, the ESCB data concerning temporary measures is (partly) aggregated to the level of total revenues, rather than being reported for individual tax categories) (see also table 12 in the appendix for an example of a DA table for Italy, as reported in Kremer et al. 2006). This clearly limits the scope for such type of analysis.

In the following, an overview of the information provided in DA tables, and the construction of the data set, is described in more detail.

3.1 The "Disaggregated Approach" Tables

DA tables are compiled in a standardized form according to the ESCB disaggregated approach.[11] These tables report changes in cyclically adjusted total expenditure and revenue, along with the breakdown of the latter into its four main categories (see table 12 in the appendix). In particular, structural ratios are computed for (i) *direct taxes payable by corporations* (ΔR^{dte}); (ii) *direct taxes payable by households* (ΔR^{dth}); (iii) *indirect taxes* (ΔR^{itx}); and (iv) *social contributions* (ΔR^{sct}). The sum of these four categories is defined as

[11] See Kremer et al. (2006) for a detailed description of this methodology.

overall taxes and social contributions, simply labeled *overall revenue* (ΔR^{txs}) in this paper.[12]

As regards the cyclical-adjustment procedure, the approach developed by Bouthevillain et al. (2001) is followed. In particular, cyclically adjusted revenue and expenditure categories are adjusted individually by applying specific elasticities to the deviation of their respective macroeconomic bases from an estimated trend. Specifically, for each budgetary category considered, labeled as j, the structural level X^j is computed as

$$X^j = x_u^j - x_c^j - x_T^j, \tag{1}$$

where x_u^j is the unadjusted level of the budget item j, x_c^j is its cyclical component, and x_T^j is the temporary measures.[13] In this context, all variables are expressed as ratios of nominal trend GDP, as estimated through the Hodrick-Prescott methodology. DA tables span a period typically ranging from $t-8$ until $t+2$. For example, the spring 2008 vintage includes data from 2000 through 2010.

Importantly, DA tables also incorporate data on legislated changes, defined as $\Delta\ell^j$ hereafter, for each budgetary category j.[14] The impact of legislated changes in DA tables is expressed as a ratio of trend GDP. To be noted, in this context the difference between changes in cyclically adjusted indicators and legislated changes for

[12]Overall taxes and social contributions might differ from total revenue, as the former do not include non-tax-related revenue—as, for example, revenue from EU funds.

[13]Standard approaches for cyclical adjustment typically assume that the relevant tax base is proxied by the output gap. By contrast, the cyclical-adjustment approach developed by Bouthevillain et al. (2001) allows to take into account "composition effects" arising from unbalanced growth. This implies that various macroeconomic bases for government revenue and expenditure might vary in different phases of the cycle or exhibit fluctuations of different magnitude. At the same time, this approach is subject to limitations similar to the alternative methods. In particular, tax bases are defined as deviations from trends, which are estimated based on statistical filtering tecniques (Hodrick-Prescott filter). In addition, elasticities of budgetary categories to the tax bases are assumed to be constant over time (see also Larch and Turrini 2009).

[14]The "first-difference" notation $\Delta\ell^j$ to indicate the fiscal impact of legislated changes is a simple convention, as in reality "levels" of legislation (and their implied budgetary effects) are unobserved. On the other hand, the budgetary impact of a change in legislation can be estimated.

each revenue category j is accounted for by three separate factors: (i) fiscal drag (fd^j), (ii) decoupling of the tax base from GDP (de^j), and (iii) a residual component (re^j).[15]

3.2 Data Availability and Data Construction

Two complementary data sets have been constructed, based on DA tables and on other information from NCBs:

(i) The first data set incorporates an unbalanced panel for nineteen EU countries, over the period 1998–2008, including changes in *both* structural indicators (ΔR^j) and legislated measures ($\Delta \ell^j$). Sources of this data set are only DA tables.

(ii) The second data set comprises an (unbalanced) panel covering twenty-seven EU countries, where only data on legislated measures are incorporated. This data set is constructed based on DA tables and other complementary information from NCBs.

The analysis is based on the spring 2008 vintage of DA tables, but information from earlier vintages has also been used, in case of missing values. Table 13 in the appendix reports the time and country coverage of these two data sets. To be noted, the first data set does not include eight EU countries (Bulgaria, Denmark, Estonia, Hungary, Romania, Slovakia, Sweden, and the United Kingdom)

[15] These three factors, which account for changes in structural revenue ratios (ΔR) beyond the ones explained by legislation changes, are defined as follows: (i) The *fiscal drag* refers to the increase in average tax rates in a progressive income tax scheme that stems from an increase in nominal income, due to inflation or real growth. As such, the fiscal drag may affect structural revenues, even in the absence of legislation changes. (ii) The so-called *decoupling of the tax base from GDP* refers to the possibility that (structural) revenue ratios to nominal (trend) GDP might change even when the elasticity with respect to the macroeconomic base amounts to unity, and even when legislation is unmodified. This may occur when the (trend) growth rate of the tax base deviates from the (trend) growth rate of nominal GDP. (iii) Changes in the structural revenue ratios not explained by the two factors decribed above, and by legislation changes, are denoted as *residuals*. A more thorough description of these components and details concerning their computation can be found in Kremer et al. (2006).

Table 1. Correlation Matrix of Overall Taxes and Social Contributions, and Four Subcomponents Computed According to the ESCB's Disaggregated Approach

	ΔR^{txs}	fd^{txs}	de^{txs}	$\Delta\ell^{txs}$	rs^{txs}
ΔR^{txs}	1.00				
fd^{txs}	−0.10	1.00			
de^{txs}	0.12	0.26	1.00		
$\Delta\ell^{txs}$	0.37	−0.23	−0.32	1.00	
rs^{txs}	0.75	−0.19	−0.06	−0.05	1.00

Notes: Variables refer to overall taxes and social security contributions, net of temporary measures (txs). ΔR are changes in cyclically adjusted values, net of temporary measures. These changes are explained by four components, namely fd: fiscal drag, de: decoupling of the tax base from GDP, legislated changes, and rs: residual component. Values reported are the simple averages of single countries' correlations, for the panel EU-19 over the period 1998–2008.

based on the fact that only legislated changes, but not cyclically adjusted revenue indicators, are available for these countries.

The sample used in the empirical analysis ends in 2008, given that in projection years actual output tends to converge to the potential one for the majority of countries considered (as it typically occurs at the end of the forecast horizon of projection exercises). Therefore, an analysis which focuses on the cyclical stance of fiscal policy for these projection years would not make much sense, given that the output gap tends to shrink over these years.

From a preliminary descriptive analysis of data on legislated changes collected as documented above, some interesting evidence emerges. In particular, focusing on observations averaged over all countries considered, table 1 presents the correlation matrix of cyclically adjusted changes of total taxes and social contributions (ΔR^{txs}) and its driving factors as defined by the disaggregated approach. We note that unsystematic events, as captured by the residual component rs^{txs}, seem to have been important in explaining structural developments of taxes and social contributions. Looking at the impact of the other three factors, it turns out that legislated changes display a positive and relatively high correlation with changes in structural revenues, although such correlation is lower than the one between residuals and structural revenues.[16] Focusing on each revenue category j (see table 2), it emerges that the correlation of legislated changes with structural indicators is higher for social security contributions (0.72), followed by direct taxes paid by households (0.48), indirect taxes (0.41), and direct taxes paid by enterprises (0.33). Except for social security contributions, most of the variation in structural indicators is explained by the residual component.[17]

Table 3 reports the variance-covariance matrix of legislated changes across each revenue category j. As shown, legislated changes display low cross-covariances, suggesting that revenue decisions seem to have been made independently from each other. The variance-covariance matrix also allows to derive the variance decomposition of overall taxes and social contributions. This is equal to the sum of variances of the four components, plus two times all the cross-covariances (these are, however, low, and are ignored for simplicity). It emerges that the bulk of the variability of the total change in legislation is mainly due to changes of direct taxes payable by households, social security contributions, and indirect taxes, whereas changes in

[16] A variance-decomposition analysis suggests that legislated measures explain a rather sizable share of variation in total cyclically adjusted revenues. This is in particular driven by legislated changes for direct taxes by households and social security contributions (results are not reported but are available from the authors).

[17] There are two main possible causes of residuals. One possible cause is that the impact of legislative changes is misestimated. In this case, however, we would expect to observe particularly large residuals in years in which the impact of tax reforms is particularly large. In general, this is not observed in the data. In addition, we would have a large and negative correlation between the estimated impact of legislative changes and residuals. However, table 2 shows that such correlation is negligible. The other cause—and in our view the main cause—is that the residual reflects differences between the underlying cyclical-adjustment model (i.e., tax bases and elasticities), which underpins the estimated impact of fiscal drag and decoupling, and the true (more complex) tax base. In this case, we would expect that the role of the residual in explaining structural changes in tax revenues would be more important for those tax categories for which we are less able to model the true tax base. This indeed seems to be the case. As can be seen in table 2, for example, the correlation between residuals and changes in structural revenues is highest for direct taxes payable by enterprises, the tax base for which is notoriously difficult to proxy given the complex nature of business taxation. It is lowest for social contributions, the base for which is much easier to proxy. For a more in-depth discussion of the "residual," see Morris et al. (2009).

Table 2. Correlation Matrices of Each Revenue Category, and Four Subcomponents Computed According to the ESCB's Disaggregated Approach

	ΔR^{dte}	fd^{dte}	de^{dte}	$\Delta\ell^{dte}$	rs^{dte}
ΔR^{dte}	1.00				
fd^{dte}	0.13	1.00			
de^{dte}	0.07	0.00	1.00		
$\Delta\ell^{dte}$	0.33	0.20	−0.04	1.00	
rs^{dte}	0.89	−0.07	−0.03	−0.10	1.00
	ΔR^{dth}	fd^{dth}	de^{dth}	$\Delta\ell^{dth}$	rs^{dth}
ΔR^{dth}	1.00				
fd^{dth}	−0.14	1.00			
de^{dth}	0.10	0.19	1.00		
$\Delta\ell^{dth}$	0.48	−0.28	−0.14	1.00	
rs^{dth}	0.72	−0.21	−0.13	−0.14	1.00
	ΔR^{itx}	fd^{itx}	de^{itx}	$\Delta\ell^{itx}$	rs^{itx}
ΔR^{itx}	1.00				
fd^{itx}	0.00	1.00			
de^{itx}	0.17	0.02	1.00		
$\Delta\ell^{itx}$	0.41	0.32	−0.14	1.00	
rs^{itx}	0.79	−0.32	−0.01	−0.16	1.00
	ΔR^{sct}	fd^{sct}	de^{sct}	$\Delta\ell^{sct}$	rs^{sct}
ΔR^{sct}	1.00				
fd^{sct}	0.08	1.00			
de^{sct}	0.17	−0.03	1.00		
$\Delta\ell^{sct}$	0.72	0.01	−0.06	1.00	
rs^{sct}	0.61	−0.11	−0.32	0.10	1.00

Notes: Variables refer to direct taxes payable by enterprises (dte), direct taxes by households (dth), indirect taxes (itx), and social security contributions (sct). ΔR are changes in cyclically adjusted values, net of temporary measures. These changes are explained by four components, namely fd: fiscal drag, de: decoupling of the tax base from GDP, legislated changes, and rs: residual component. Values reported are the simple averages of single countries' correlations, for the panel EU-19 over the period 1998–2008.

Table 3. Variance-Covariance Matrix of Legislated Changes

	$\Delta\ell^{txs}$	$\Delta\ell^{dth}$	$\Delta\ell^{dte}$	$\Delta\ell^{itx}$	$\Delta\ell^{sct}$
$\Delta\ell^{txs}$	0.261				
$\Delta\ell^{dth}$	0.109	0.102			
$\Delta\ell^{dte}$	0.033	0.013	0.034		
$\Delta\ell^{itx}$	0.051	−0.001	−0.021	0.107	
$\Delta\ell^{sct}$	0.067	−0.005	0.007	−0.034	0.099

Notes: Variables refer to legislated changes $\Delta\ell$ in overall taxes and social security contributions (txs); direct taxes paid by households (dth); direct taxes paid by enterprises (dte); indirect taxes (itx); and social security contributions (sct). Sample: 27-EU countries over the period 1998–2008.

direct taxes payable by corporations explain less. This suggests that the former three policy instruments seem to have been predominantly used by European fiscal policymakers in setting their revenue policies.

4. Empirical Strategy

In order to assess the cyclical sensitivity of legislated changes in the EU during the period 1998–2008, and to compare results from regressions based on cyclically adjusted indicators as obtained from the disaggregated approach (for the restricted set of nineteen EU countries), we run separately the following panel regressions:

$$\Delta R^j_{i,t} = \beta Y_{i,t} + \gamma \widetilde{R}^j_{i,t-1} + \phi B_{i,t-1} + \mathbf{Z}'_{i,t}\boldsymbol{\delta} + \alpha_i + \varepsilon_{i,t} \qquad (2)$$

$$\Delta \ell^j_{i,t} = \beta Y_{i,t} + \gamma \widetilde{R}^j_{i,t-1} + \phi B_{i,t-1} + \mathbf{Z}'_{i,t}\boldsymbol{\delta} + \alpha_i + \varepsilon_{i,t} \qquad (3)$$

for $i = 1, \ldots . N$ and $t = 1, \ldots .., T_i$, where N is the number of countries included in our sample and T_i is the number of observations available for each country.

We estimate model (2) and (3) for the aggregate series of overall taxes and social contributions, and for each individual revenue-side budgetary category j. As discussed above, both of the discretionary fiscal policy indicators considered, $\Delta R^j_{i,t}$ and $\Delta \ell^j_{i,t}$, are expressed as a percentage of nominal trend GDP.

The explanatory variable $\widetilde{R}^j_{i,t-1}$ measures the level of the *cyclically adjusted* component of each budgetary category j. It is computed as the difference between the unadjusted volume of each budgetary item j and its cyclical component divided by the nominal trend GDP (as estimated by NCBs). To be noted, $\widetilde{R}^j_{i,t-1}$ includes temporary measures, while $R^j_{i,t-1}$ does not.[18] The regressor $\widetilde{R}^j_{i,t-1}$ captures persistence of budgetary policy decisions. In fact, it is reasonable to assume that the initial level of each revenue category affects the way discretionary policies for that item are set for the following year. For example, it can be expected that the higher the initial level of taxation (in structural terms), the higher the size of the downward adjustment implemented. According to this hypothesis, we expect that the coefficient γ ranges between -1 and 0 (i.e., $-1 < \gamma < 0$). $\widetilde{R}^j_{i,t-1}$ is also used as a proxy to capture persistence in equation (3) since, clearly, it is not possible to reconstruct levels of "legislation."[19] In addition, the inclusion of $\widetilde{R}^j_{i,t-1}$ in equation (3) facilitates comparisons with model (2), as the set of control variables is exactly the same in the two equations.

The economic cycle is represented by the output gap, labeled $Y_{i,t}$. This is the key variable used to measure the systematic response of fiscal discretionary measures to cyclical conditions. $Y_{i,t}$ is computed by NCBs as the difference between nominal GDP and nominal trend GDP (estimated through the Hodrick-Prescott filter), over trend GDP. A positive value of β indicates countercyclicality; i.e., taxes or social contributions increase during economic booms and decrease during slowdowns. On the other hand, a negative value of β points to

[18]In principle, levels of the structural ratio indicators as computed in equation (1) should be used as regressors. Unfortunately, the lack of information concerning temporary measures adopted by national governments and impacting on each budgetary item makes it impossible to reconstruct levels of the variable $R^j_{i,t}$. For this reason, the variable $\widetilde{R}^j_{i,t}$ is used as a proxy. This variable is computed without netting out the temporary measures.

[19]An experiment based on the inclusion of lagged values of $\Delta\ell$ has also been carried out. Unfortunately, however, these controls enter insignificantly in the regression equations. In addition, empirical fiscal policy rules are generally specified such that the initial state of public finances, as represented by fiscal variables included on the right-hand side of the regression equation, are expressed in levels rather than in differences (see, e.g., Galí and Perotti 2003). This is consistent with the idea that fiscal policymakers are more concerned about levels of deficits, revenues, and expenditure, rather than their growth rates.

procyclicality, given that discretionary fiscal policies become looser during expansions and tighter during downturns.

Following several other papers (see, e.g., Bohn 1998; Ballabriga and Martinez-Mongay 2002; Wyplosz 2002; Favero 2003), we also incorporate a "debt stabilization" motive by adding as a regressor the general government debt (relative to nominal trend GDP) outstanding at the time of the budget decision, denoted as $B_{i,t-1}$.[20] A positive sign of ϕ is expected because more indebtedness may lead to more concern about fiscal sustainability and induce the governments to adopt more stringent discretionary measures.

The vector $\mathbf{Z}_{i,t}$ includes the following set of additional variables:

- $NONACTIVE_{i,t}$ accounts for "*population aging*" effects on the fiscal policymaking process (see, e.g., Beetsma and Giuliodori 2010). This variable is computed as the share of the population that is not of working age (i.e., the number of fifteen-year or younger plus the number of sixty-five or older).[21]
- $ELECT_{i,t}$ acts as a control for the possible influence of the electoral cycle, and takes a value of one (zero) if year t is (not) an election year.[22]
- $EMU15_i$ is a dummy variable that equals one for years in which EMU countries have joined the European Monetary Union, and zero otherwise. The idea is to check whether the fiscal policy stance differs between countries belonging to the EMU area and other EU countries. In particular, we expect that accession countries have incentives to pursue tighter fiscal policies in order to consolidate public finances, meet the convergence criteria, and benefit from joining the single currency.

[20] Data on nominal debt are taken from World Economic Outlook (WEO).

[21] Source: AMECO data set.

[22] Recent work shows that elections may play a role in explaining the fiscal stance in euro-area countries in the past decades (see, e.g., Debrun et al. 2008; Golinelli and Momigliano 2009). Data on election years are taken from the web site of the International Institute for Democracy and Electoral Assistance (www.idea.int) and from the Election Resources on the Internet web site http://electionresources.org.

- T_i, is a linear trend that is intended to capture common third factors driving discretionary fiscal behavior of all countries that are unlikely due to common economic circumstances. In practice, we account for the possibility that both $\Delta R_{i,t}$ and $\Delta \ell_{i,t}$ might evolve according to a deterministic trend (see, e.g., Fatàs and Mihov 2003; Afonso, Agnello, and Furceri 2010). Finally, α_i denote the country-specific effects, and $\varepsilon_{i,t}$ are the error terms.

A problem related to estimation of model (2)–(3) concerns the potential reverse causality between $Y_{i,t}$ and our dependent variables. Therefore, this issue is tackled by estimating the panel regressions through the instrumental variables (IV/2SLS) method (see, e.g., Jaimovich and Panizza 2007). In particular, we instrument $Y_{i,t}$ by using its lagged value, $Y_{i,t-1}$—or its second and third lag, depending on the Hansen's J-test for overidentifying restrictions—and the lagged value of the output gap of the United States (see, e.g., Galí and Perotti 2003).[23] In addition, we will estimate our models also using the fixed-effects OLS estimator. In fact, although OLS estimates are in principle biased if the output gap reacts to fiscal policy actions, it cannot be discarded that the reversal causality is weak given that we are considering subcomponents of the budget balance, whose influence on the economic activity might be feeble. In addition, OLS estimates serve as a useful benchmark, given that they are not affected by the choice of instruments.

5. Baseline Results

First, results for the aggregate indicator, as represented by overall taxes and social contributions, and panel regressions (2)–(3), are reported in table 4. In estimates reported in table 4, and in all the following tables, standard errors have been corrected for heteroskedasticity and autocorrelation in residuals. Columns 1 and 2 of that table present the IV/2SLS and OLS estimates of regression

[23]The U.S. output gap is used as instrument, given that a business-cycle variable which is likely to be correlated (for reasons other than the existence of coordinated fiscal policies) with the EU-countries-specific output gap is needed.

Table 4. Estimates for Overall Taxes and Social Contributions (txs): EU-19 and EU-27

Dependent Variable	ΔR^{txs}		$\Delta \ell^{txs}$		$\Delta \ell^{txs27}$	
	(1)	(2)	(3)	(4)	(5)	(6)
	IV/2SLS	*OLS*	*IV/2SLS*	*OLS*	*IV/2SLS*	*OLS*
$Output\ gap_t$	−0.086	0.036	−0.118***	−0.107***	−0.156***	−0.094***
	[0.076]	[0.049]	[0.033]	[0.023]	[0.041]	[0.021]
$\widetilde{R}^{txs}_{t-1}$	−0.271***	−0.294***	−0.056	−0.058*	−0.054	−0.064**
	[0.041]	[0.072]	[0.037]	[0.030]	[0.034]	[0.029]
$Debt_{t-1}$	0.007	0.009	0.002	0.002	−0.001	0.000
	[0.010]	[0.010]	[0.005]	[0.006]	[0.005]	[0.005]
$EMU15$	−1.379*	−1.451***	−0.486*	−0.492**	−0.458*	−0.496**
	[0.716]	[0.541]	[0.256]	[0.222]	[0.257]	[0.229]
T	0.062**	0.068***	0.014	0.015	0.012	0.015
	[0.025]	[0.023]	[0.014]	[0.014]	[0.014]	[0.013]
$NONACTIVE_t$	−0.310***	−0.288**	0.044	0.046	0.026	0.042
	[0.113]	[0.130]	[0.073]	[0.062]	[0.076]	[0.062]
$ELECT_t$	−0.021	−0.012	0.087	0.088	0.079	0.082
	[0.146]	[0.135]	[0.065]	[0.070]	[0.059]	[0.064]
Obs.	189	189	189	189	222	222
Number of Countries	19	19	19	19	27	27
R-squared	0.23	0.26	0.22	0.22	0.17	0.20
Hansen Statistic[a]	2.93		2.87		0.04	
(P-value)	(0.09)		(0.24)		(0.85)	

Notes: *, ***, and *** are significant at 10, 5, and 1 percent, respectively. Robust HAC standard error is in square brackets.
[a]Overidentifying restrictions test and p-value are in parentheses.

(2), which include as dependent variables structural taxes and social contribution, for the panel of nineteen EU countries. For this regression and the following ones, the Hansen's test fails to reject the null hypothesis of overidentifying restrictions, indicating the validity of the chosen instruments. The estimated coefficient on output gap, $\hat{\beta}$, is not statistically significant, suggesting that changes in revenue items have behaved in an acyclical way. When legislated changes are considered, results on cyclical sensitivity turn out to be remarkably different. In fact, as shown in columns 3 and 4 (for the EU-19 sample) and columns 5 and 6 (for the EU-27 sample), it is found that changes in taxes and social contribution laws are highly responsive to cyclical conditions. In particular, the negative sign of the parameter $\hat{\beta}$ indicates that changes in legislation have been implemented in a *procyclical way; i.e., governments have tended to reduce tax pressure and cut social contributions during booms while increase revenues in recessions.* The effects are sizable: an increase (decrease) of 1 percentage point in $Y_{i,t}$ induces policymakers to cut (raise) taxes and social contributions by about 0.12 to 0.16 percent (of nominal trend GDP), thereby contributing to a further overheating (contraction) of the economic activity.[24]

Regarding the other parameters, the estimated coefficients $\hat{\gamma}$ tend to be significant and have the expected negative sign. This implies that regardless of the measure considered, discretionary fiscal policy actions show a certain degree of persistence. The coefficients on debt, $\hat{\phi}$, are not statistically significant. Nevertheless, this result does not necessarily imply that fiscal decisions are not sensitive to debt developments, as it cannot be excluded that debt stabilization is achieved mainly through expenditure-based policies. Analyzing the significance of controls $\mathbf{Z}_{i,t}$, it is found that the variable *EMU15* is always significant and has a negative sign, in line with the possible interpretation proposed above. In particular, it is likely that the incentives to join the monetary union have induced accession

[24]In addition to these effects, procyclicality of fiscal policies may also affect the size of fiscal multipliers. For example, based on a fully fledged open-economy DSGE model and focusing on government spending, Corsetti, Meier, and Müller (2010) show that procyclicality in government expenditure tends to reduce both domestic and cross-border multipliers.

Table 5. Estimates for Overall Taxes and Social Contributions: EMU Countries

	ΔR^{txs}		$\Delta \ell^{txs}$	
Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**
	IV/2SLS	*OLS*	*IV/2SLS*	*OLS*
$Output\ gap_t$	0.049	0.072	−0.178**	−0.093**
	[0.100]	[0.079]	[0.078]	[0.046]
$\widetilde{R}^{txs}_{t-1}$	−0.288***	−0.281***	−0.111*	−0.143***
	[0.069]	[0.070]	[0.066]	[0.051]
$Debt_{t-1}$	0.006	0.004	−0.002	0.002
	[0.015]	[0.013]	[0.007]	[0.009]
T	0.057*	0.064**	0.008	0.023
	[0.031]	[0.031]	[0.020]	[0.023]
$NONACTIVE_t$	−0.064	−0.085	−0.004	−0.077
	[0.235]	[0.214]	[0.175]	[0.159]
$ELECT_t$	−0.209**	−0.196	−0.007	0.001
	[0.090]	[0.140]	[0.054]	[0.089]
Obs.	124	127	125	127
Number of Countries	13	15	13	15
R-squared	0.19	0.19	0.19	0.22
Hansen Statistic[a]	5.60		0.74	
(P-value)	(0.13)		(0.39)	

Notes: *, ***, and *** are significant at 10, 5, and 1 percent, respectively. Robust HAC standard error is in square brackets.
[a]Overidentifying restrictions test and p-value are in parentheses.

countries to increase taxation and consolidate public finances with a view of joining the EMU. The demographic variable *NONACTIVE* seems to play a role only for $\Delta R^{txs}_{i,t}$, while it is never statistically significant when legislated changes are considered. Finally, it is found that the electoral cycle does not seem to be relevant in determining discretionary fiscal decisions.[25]

As an additional set of results, table 5 presents estimates for EMU countries. By comparing results with those obtained using the

[25]See also Turrini (2008) for similar results on the electoral cycle.

full sample (and reported in table 4), previous conclusions remain quantitatively and qualitatively unaltered. In fact, there seem to be no sizable differences between EU-19, EU-27, and EMU countries in the responsiveness of legislated changes to the economic cycle.

5.1 *Estimating the Cyclical Sensitivity of Revenue-Side Categories*

This section is devoted to examining whether the cyclical sensitivity varies across revenue categories and investigating to what extent each of these budgetary items determines the procyclical nature of revenue-side discretionary fiscal policies. To that end, panel regressions (2)–(3) are reestimated for each of the four revenue budgetary items considered. Results are reported in tables 6–9. As in tables 4 and 5, both IV and OLS estimates are provided.

Focusing on the cyclical sensitivity parameter, it is found that results for direct taxes payable by households and social contributions are qualitatively the same as those obtained for overall taxes and social contributions. In fact, from tables 6 and 9, it can be noticed that while their cyclically adjusted components ($\Delta R_{i,t}^{dth}$ and $\Delta R_{i,t}^{sct}$) are not responsive to the economic cycle, legislation changes ($\Delta \ell_{i,t}^{dth}$ and $\Delta \ell_{i,t}^{sct}$) behave in a *procyclical way*. However, some differences emerge as regards the size of the coefficients $\hat{\beta}$. As shown in columns 3 through 6 of table 6, it seems that legislated changes impacting on *taxes payable by households are highly procyclical*. In particular, an increase of 1 percentage point in the output gap induces policymakers to cut these taxes by about 0.10 to 0.11 percent of nominal trend GDP. On the other side, the degree of procyclicality of legislated changes associated to social contributions is lower, as suggested by results in columns 3 through 6 of table 9). In fact, an increase of 1 percentage point in the output gap reduces social contributions by around 0.04 percent. This effect, although rather small, is still statistically significant.

Results from regression estimated based on taxes by corporations and indirect taxes point to different conclusions. In particular, while results on fiscal rules estimated using $\Delta R_{i,t}^{dte}$ point clearly towards countercyclicality (see columns 1 and 2 of table 7), estimates based

Table 6. Estimates for Direct Taxes Payable by Households (dth)

Dependent Variable	ΔR^{dth} (1)	ΔR^{dth} (2)	$\Delta \ell^{dth}$ (3)	$\Delta \ell^{dth}$ (4)	$\Delta \ell^{dth27}$ (5)	$\Delta \ell^{dth27}$ (6)
	IV/2SLS	*OLS*	*IV/2SLS*	*OLS*	*IV/2SLS*	*OLS*
$Output\ gap_t$	0.036	−0.025	−0.115***	−0.060***	−0.107***	−0.050***
	[0.031]	[0.023]	[0.032]	[0.013]	[0.030]	[0.012]
$\widetilde{R}^{dth}_{t-1}$	−0.405***	−0.372***	−0.106	−0.136	−0.116	−0.142*
	[0.114]	[0.124]	[0.096]	[0.088]	[0.089]	[0.081]
$Debt_{t-1}$	−0.001	−0.002	−0.004	−0.003	−0.005	−0.003
	[0.007]	[0.006]	[0.005]	[0.004]	[0.005]	[0.004]
$EMU15$	−0.444*	−0.402*	0.020	−0.018	0.017	−0.023
	[0.246]	[0.239]	[0.111]	[0.131]	[0.113]	[0.134]
T	0.007	0.005	−0.017	−0.016	−0.017	−0.015
	[0.020]	[0.014]	[0.014]	[0.013]	[0.014]	[0.013]
$NONACTIVE_t$	−0.084	−0.102	−0.014	0.003	−0.017	0.003
	[0.081]	[0.068]	[0.053]	[0.039]	[0.052]	[0.039]
$ELECT_t$	−0.009	−0.010	−0.014	−0.012	0.001	0.002
	[0.065]	[0.058]	[0.046]	[0.045]	[0.043]	[0.041]
Obs.	189	189	190	190	222	222
Number of Countries	19	19	19	19	27	27
R-squared	0.17	0.21	0.10	0.16	0.07	0.14
Hansen Statistic[a]	7.89		1.40		1.21	
(P-value)	(0.10)		(0.24)		(0.27)	

Notes: *, ***, and *** are significant at 10, 5, and 1 percent, respectively. Robust HAC standard error is in square brackets.
[a]Overidentifying restrictions test and p-value are in parentheses.

Table 7. Estimates for Direct Taxes Payable by Corporations (*dte*)

Dependent Variable	ΔR^{dte} (1)	ΔR^{dte} (2)	$\Delta \ell^{dte}$ (3)	$\Delta \ell^{dte}$ (4)	$\Delta \ell^{dte27}$ (5)	$\Delta \ell^{dte27}$ (6)
	IV/2SLS	*OLS*	*IV/2SLS*	*OLS*	*IV/2SLS*	*OLS*
$Output\ gap_t$	0.095**	0.111***	0.005	0.008	0.005	0.008
	[0.044]	[0.024]	[0.016]	[0.010]	[0.017]	[0.009]
$\widetilde{R}^{dte}_{t-1}$	−0.327***	−0.339***	−0.085***	−0.087***	−0.085**	−0.086***
	[0.073]	[0.078]	[0.032]	[0.032]	[0.035]	[0.030]
$Debt_{t-1}$	0.000	0.000	−0.004	−0.004	−0.004	−0.004
	[0.006]	[0.006]	[0.003]	[0.003]	[0.002]	[0.002]
EMU15	−0.144	−0.15	−0.108	−0.109	−0.111	−0.111
	[0.238]	[0.254]	[0.104]	[0.081]	[0.107]	[0.082]
T	0.029**	0.030**	0.004	0.004	0.004	0.004
	[0.013]	[0.012]	[0.006]	[0.006]	[0.007]	[0.006]
$NONACTIVE_t$	−0.053	−0.05	0.005	0.006	0.006	0.006
	[0.063]	[0.052]	[0.022]	[0.023]	[0.025]	[0.023]
$ELECT_t$	−0.066	−0.064	0.000	0.000	−0.004	−0.004
	[0.059]	[0.065]	[0.029]	[0.030]	[0.027]	[0.027]
Obs.	189	189	190	190	222	222
Number of Countries	19	19	19	19	27	27
R-squared	0.22	0.22	0.10	0.10	0.10	0.10
Hansen Statistic[a]	1.69		0.22		0.26	
(P-value)	(0.19)		(0.64)		(0.61)	

Notes: *, ***, and *** are significant at 0, 5, and 1 percent, respectively. Robust HAC standard error is in square brackets.
[a]Overidentifying restrictions test and p-value are in parentheses.

Table 8. Estimates for Indirect Taxes (*itx*)

Dependent Variable	ΔR^{itx}		$\Delta \ell^{itx}$		$\Delta \ell^{itx27}$	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	IV/2SLS	*OLS*	*IV/2SLS*	*OLS*	*IV/2SLS*	*OLS*
$Output\ gap_t$	−0.122***	−0.049	−0.014	−0.012	−0.016	−0.014
	[0.035]	[0.032]	[0.016]	[0.014]	[0.015]	[0.013]
$\widetilde{R}^{itx}_{t-1}$	−0.301***	−0.289***	−0.037*	−0.035**	−0.039*	−0.036**
	[0.033]	[0.077]	[0.020]	[0.015]	[0.020]	[0.015]
$Debt_{t-1}$	0.008	0.009	0.009**	0.009**	0.008**	0.008**
	[0.005]	[0.006]	[0.004]	[0.004]	[0.004]	[0.003]
$EMU15$	−0.639	−0.720**	−0.347**	−0.350**	−0.344**	−0.346**
	[0.388]	[0.316]	[0.137]	[0.144]	[0.145]	[0.145]
T	0.007	0.011	0.009	0.009	0.008	0.008
	[0.014]	[0.017]	[0.010]	[0.013]	[0.011]	[0.013]
$NONACTIVE_t$	−0.234***	−0.204*	−0.058	−0.054	−0.059	−0.056
	[0.078]	[0.109]	[0.047]	[0.064]	[0.048]	[0.064]
$ELECT_t$	−0.041	−0.035	−0.013	−0.01	−0.018	−0.016
	[0.085]	[0.087]	[0.036]	[0.040]	[0.034]	[0.037]
Obs.	189	189	188	190	220	222
Number of Countries	19	19	19	19	27	27
R-squared	0.22	0.25	0.08	0.08	0.08	0.08
Hansen Statistic[a]	0.14		8.43		6.83	
(P-value)	(0.71)		(0.08)		(0.15)	

Notes: *, ***, and *** are significant at 10, 5, and 1 percent, respectively. Robust HAC standard error is in square brackets.
[a]Overidentifying restrictions test and p-value are in parentheses.

Table 9. Social Contribution (*sct*)

Dependent Variable	ΔR^{sct}		$\Delta \ell^{sct}$		$\Delta \ell^{sct27}$	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	IV/2SLS	*OLS*	*IV/2SLS*	*OLS*	*IV/2SLS*	*OLS*
$Output\ gap_t$	−0.002	0.012	−0.043*	−0.030*	−0.041**	−0.028*
	[0.036]	[0.027]	[0.022]	[0.016]	[0.020]	[0.015]
$\widetilde{R}^{sct}_{t-1}$	−0.518***	−0.519***	−0.270**	−0.272**	−0.269**	−0.269**
	[0.109]	[0.157]	[0.133]	[0.118]	[0.126]	[0.110]
$Debt_{t-1}$	0.006	0.006	0.003	0.003	0.003	0.003
	[0.010]	[0.006]	[0.007]	[0.005]	[0.007]	[0.004]
EMU15	−0.041	−0.055	0.087	0.074	0.083	0.071
	[0.113]	[0.120]	[0.085]	[0.076]	[0.084]	[0.075]
T	0.016	0.017	0.013	0.014	0.013	0.014
	[0.020]	[0.014]	[0.015]	[0.011]	[0.016]	[0.011]
$NONACTIVE_t$	0.017	0.022	0.054	0.058	0.054	0.059
	[0.096]	[0.066]	[0.063]	[0.045]	[0.064]	[0.045]
$ELECT_t$	0.083*	0.084	0.097***	0.098**	0.086***	0.087**
	[0.046]	[0.064]	[0.032]	[0.041]	[0.029]	[0.037]
Obs.	189	189	190	190	222	222
Number of Countries	19	19	19	19	27	27
R-squared	0.27	0.27	0.24	0.25	0.23	0.23
Hansen Statistic[a]	0.73		2.73		2.31	
(P-value)	(0.39)		(0.44)		(0.51)	

Notes: *, ***, and *** are significant at 10, 5, and 1 percent, respectively. Robust HAC standard error is in square brackets.
[a]Overidentifying restrictions test and p-value are in parentheses.

on legislated changes on taxes payable by enterprises always indicate acyclicality.

Turning to indirect taxes, results from table 8 show that changes in cyclically adjusted indirect taxes respond in a procyclical way to the cycle, while when legislated changes are considered, results indicate that they are not responsive to economic developments.

Overall, these findings suggest that the observed acyclicality of the changes in the cyclically adjusted overall taxes and social contributions seems to be explained by acyclicality of both taxes payable by households and social contributions and, on the other hand, by the possibility that the countercyclicality found for taxes payable by corporations offsets the procyclical behavior of changes in indirect taxes. At the same time, as regards legislated revenue changes, *their procyclical behavior can be interpreted as driven by a significant procyclicality of changes in taxes payable by households and (though to a minor extent) social contributions.*

Finally, by analyzing the statistical significance of the other explanatory variables in each specification, it emerges that, with the exception of legislated changes in direct taxes payable by households, the coefficient $\hat{\gamma}$ is always significant and with the expected negative sign. On the contrary, the parameter $\hat{\phi}$ has been found to be significant and with the expected positive sign only in the regressions of legislated changes on indirect taxes. This suggests that *indirect taxes are the only revenue subcomponent that seems to have been used to stabilize the debt-output ratio.* One possible interpretation of this is that increases in indirect taxes can be phased in rapidly. In addition, they are generally perceived to be less problematic, from a "social" point of view, than, for instance, increases in direct taxes on households or corporations. For these reasons, in situations in which the sustainability of public finances is perceived to be at risk, governments might decide to rely primarily on these measures for urgent consolidation interventions. For the same reasons, as a response to the severe deterioration of public finances that followed the 2008–09 crisis, many governments adopted consolidation packages in which increases in indirect taxation had a prominent role.

Regarding the importance of control variables, $\mathbf{Z}_{i,t}$, it is found that only for indirect taxes, and in the equation of cyclically adjusted taxes payable by households, the dummy *EMU15* is statistically significant.

5.2 Testing for Asymmetries

In this section the possible presence of non-linearity in the way discretionary fiscal policies react to the evolution of the economic cycle and to debt accumulation is explored.

In order to test whether there is a significant difference in the policymaker's response along the business cycle, the notion of "*good times*" as periods of positive output gap and "*bad times*" as years in which the output gap is negative, is used.[26] Asymmetries in the discretionary fiscal response may also be at play as regards the level of government debt. In the framework of the European Monetary Union (EMU) and the Stability Growth Pact (SGP), for instance, fiscal authorities may pursue more sustainable policies, attempting to reduce government debt, when the 60 percent ceiling is approached or exceeded. More generally, it can be expected that governments are more concerned about the sustainability of public finances when the government debt is high rather than when it is low.

In order to account for asymmetric effects, the following panel regressions are estimated:

$$\Delta R^{j}_{i,t} = \beta^{+} Y_{i,t} d_1 + \beta^{-} Y_{i,t}(1-d_1) + \gamma \widetilde{R}^{j}_{i,t-1} + \phi^{+} B_{i,t-1} d_2 + \phi^{-} B_{i,t-1}(1-d_2) + \mathbf{Z}'_{i,t}\boldsymbol{\delta} + \alpha_i + \varepsilon_{i,t} \tag{4}$$

$$\Delta \ell^{j}_{i,t} = \beta^{+} Y_{i,t} d_1 + \beta^{-} Y_{i,t}(1-d_1) + \gamma \widetilde{R}^{j}_{i,t-1} + \phi^{+} B_{i,t-1} d_2 + \phi^{-} B_{i,t-1}(1-d_2) + \mathbf{Z}'_{i,t}\boldsymbol{\delta} + \alpha_i + \varepsilon_{i,t}, \tag{5}$$

where

$$d_1 = \begin{cases} 1 & \text{if } Y_{i,t} > 0 \\ 0 & \text{if } Y_{i,t} \leq 0 \end{cases} \quad d_2 = \begin{cases} 1 & \text{if } B_{i,t} > 60 \\ 0 & \text{if } B_{i,t} \leq 60. \end{cases}$$

The variables $Y_{i,t}$ and $B_{i,t-1}$ from the baseline model (3) have been replaced in equations (4)–(5) with two sets of regressors. The first set

[26]The same approach is followed by many other papers on fiscal policy rules (see, e.g., Gavin and Perotti 1997; OECD 2003; European Commission 2004; Turrini 2008).

of regressors is constructed by interacting $Y_{i,t}$ with a dummy indicator which equals one (zero) if the output gap is positive (negative) and their associated coefficients are β^+ and β^-, respectively. The second one is computed by interacting $B_{i,t-1}$ with a dummy indicator which equals one (zero) when the debt at time $t-1$ is above (below) the 60 percent ceiling. The coefficients associated to these regressors are denoted as ϕ^+ and ϕ^-.

Tables 14 and 15 (see the online appendix at www.ijcb.org) report estimates of the panel models (4) and (5), respectively, when we use the sample of nineteen EU countries. In addition, table 16 of the online appendix shows results from model (5) when we consider the group of twenty-seven EU countries. Specifically, for each budget category, we report the estimates from three possible nested specifications of our models. In particular, the first column shows estimates accounting only for asymmetric responses of discretionary fiscal policy indicators to the economic cycle. The second one considers the possibility of asymmetries linking discretionary measures to debt developments. Finally, the third column reports estimates from the nested model, where the reaction to both the output gap and debt development can be characterized by two regimes.

To formally test for asymmetric effects in these models, some Wald tests are proposed. The first one tests the null hypothesis $\beta^+ = \beta^-$, i.e., equality of coefficients associated with positive and negative output gaps. The second one tests the linear restriction $\beta^+ = \beta^- = 0$, i.e., equal coefficients, and jointly not statistically different from zero. These two tests are also carried out for the parameters ϕ^+ and ϕ^-, which measure the reaction of discretionary fiscal policies to debt developments when the debt ratio is respectively above and below the 60 percent threshold. Results are reported at the bottom of each table.

Table 14 indicates that when we consider cyclically adjusted indicators as a measure of discretionary fiscal policy, changes in taxes and social contributions seem to be disconnected from the economic cycle and do not behave in an asymmetric way (in fact, both the parameter estimates $\hat{\beta}^+$ and $\hat{\beta}^-$ are not statistically significant, and the Wald test rejects the null that $\hat{\beta}^+ = \hat{\beta}^-$). Analyzing the behavior of the revenue-side budgetary subcomponents, we find that changes in direct taxes by households and social contributions remain acyclical in each phase of the cycle. At the same time, changes in taxes payable by enterprises have responded in a countercyclical way, especially during bad times ($\hat{\beta}^{-} = 0.15$) rather than good times ($\hat{\beta}^{+} = 0.08$). However, the hypothesis that these two coefficients are statistically different is rejected by the reported Wald statistic. Finally, asymmetric effects due to debt development do not seem to exist.

Tables 15 and 16 show that legislated changes in taxes and social contributions occur in a strongly procyclical way in "good times" and in an acyclical way during "bad times." This evidence holds in particular for the sample of nineteen countries, for which the Wald test rejects (at the 10 percent level) the null hypothesis that $\beta^{+} = \beta^{-}$. At the same time, as regards the panel of twenty-seven EU countries, while the coefficient associated with positive output gaps is again negative and significant at the 99 percent level, and $\hat{\beta}^{-}$ is not significantly different from zero, there is no strong statistical evidence that the two parameters are different from each other (although the Wald statistic associated is very close to the 10 percent critical level).

As regards the legislation process related to each single revenue category, changes in taxes payable by households seem to be strongly procyclical when the output gap is positive. In particular, while the parameter $\hat{\beta}^{+}$ is equal to around -0.10 for the subgroup of nineteen countries, it decreases to -0.07 for the overall country sample. A possible interpretation of this result is that the fiscal position of governments tends to improve during economic upswings, at least partially on account of the fiscal drag that operates in progressive tax systems (e.g., in European ones). As a consequence, EU governments may have reacted to these developments by lowering personal income taxes, as a compensation of losses in disposable income due to the fiscal drag.

Our results also indicate that asymmetries related to the reaction of legislative changes to debt developments do not seem to be at play. In fact, although the coefficients ϕ^{+} and ϕ^{-}, in the equation of legislated change in indirect taxes, are both significant and positive (as expected), their difference is not statistically different from zero.

Finally, estimates indicate that asymmetries due to economic and debt development do not seem to occur simultaneously.

6. Robustness Checks

The robustness of the empirical findings presented above is explored in different directions. First, we test whether our results are robust to various alternative business-cycle indicators. In particular, we reestimate our baseline models (2)–(3) by replacing the output gap as reported by NCBs with the one published by the European Commission in its AMECO database. In addition, we check the sensitivity of our results by using the simple growth rate of real GDP as an alternative measure of the cycle. In fact, it cannot be excluded that fiscal policymakers do not base their decisions on the output gap—due, for example, to the unreliability of potential output estimates—and might simply use real GDP growth as a proxy for the state of the economy. Estimates of models (2)–(3) for overall taxes and social contributions obtained by these alternative measures of cyclical conditions are reported in table 10, along with our baseline estimates. Results from the use of the AMECO output gap clearly point to results in line with the baseline: overall taxes and social contributions appear to be procyclical when legislated changes are considered, but acyclical when structural indicators are used (columns 2, 5, and 8). When GDP growth is used instead, regressions based on structural indicators yield to a statistically insignificant $\hat{\beta}$. However, when legislated revenue changes are incorporated, $\hat{\beta}$ becomes negative, indicating again procyclicality, as in the baseline case (columns 3, 6, and 9).

A further robustness test consists of examining the effects of including in equations (2) and (3) additional control variables. Specifically, we are interested in testing whether the omission of variables potentially correlated to ΔR^{txs} or $\Delta \ell^{txs}$ may impact significantly on the relation between discretionary fiscal policy behavior and economic fluctuations. In particular, we control for changes in total and primary government spending and changes in the inflation rate. In addition, we check whether the ideology behind national political parties in power influences the degree of fiscal policy discretion.

By controlling for changes in government spending, we account for the possibility that changes in taxes and social contributions may

Table 10. Estimates Using Different Measures of Business Cycle

	ΔR^{txs}			$\Delta \ell^{txs}$			$\Delta \ell^{txs27}$		
	$Outgap_t$		$Growth_t$	$Outgap_t$		$Growth_t$	$Outgap_t$		$Growth_t$
	BASE-LINE- **(1)**	***AMECO*** **(2)**	**(3)**	***BASE-LINE-*** **(4)**	***AMECO*** **(5)**	**(6)**	***BASE-LINE-*** **(7)**	***AMECO*** **(8)**	**(9)**
β	−0.086	−0.076	0.151	−0.118***	−0.122***	−0.113*	−0.156***	−0.112***	−0.088
	[0.076]	[0.053]	[0.118]	[0.033]	[0.036]	[0.067]	[0.041]	[0.033]	[0.062]
$\widetilde{R}_{t-1}$	−0.271***	−0.276***	−0.272***	−0.056	−0.060*	−0.090**	−0.054	−0.067*	−0.089**
	[0.041]	[0.040]	[0.051]	[0.037]	[0.036]	[0.042]	[0.034]	[0.036]	[0.040]
$Debt_{t-1}$	0.007	0.006	−0.003	0.002	0.000	0.012**	−0.001	−0.001	0.009
	[0.010]	[0.010]	[0.014]	[0.005]	[0.005]	[0.006]	[0.005]	[0.005]	[0.005]
$EMU15$	−1.379*	−1.352*	−1.447**	−0.486*	−0.431	−0.542*	−0.458*	−0.438	−0.536*
	[0.716]	[0.711]	[0.668]	[0.256]	[0.279]	[0.288]	[0.257]	[0.292]	[0.295]
T	0.062**	0.064**	0.059**	0.014	0.016	0.025	0.012	0.017	0.021
	[0.025]	[0.026]	[0.027]	[0.014]	[0.015]	[0.016]	[0.014]	[0.015]	[0.015]
$NONACTIVE_t$	−0.310***	−0.332***	−0.191	0.044	0.005	−0.013	0.026	−0.001	0.002
	[0.113]	[0.115]	[0.174]	[0.073]	[0.084]	[0.092]	[0.076]	[0.085]	[0.091]
$ELECT_t$	−0.021	−0.023	0.020	0.087	0.082	0.070	0.079	0.076	0.069
	[0.146]	[0.146]	[0.148]	[0.065]	[0.062]	[0.068]	[0.059]	[0.057]	[0.061]
Obs.	189	189	189	189	189	189	222	222	222
Number of Countries	19	19	19	19	19	19	27	27	27
Centered R-squared	0.23	0.23	0.28	0.22	0.21	0.07	0.17	0.20	0.09
Hansen Statistic[a]	2.93	1.95	1.72	2.87	0.75	5.18	0.04	0.91	5.83
(P-value)	(0.09)	(0.16)	(0.19)	(0.24)	(0.39)	(0.02)	(0.85)	(0.34)	(0.02)

Notes: *, ***, and *** are significant at 10, 5, and 1 percent, respectively. Robust HAC standard error is in square brackets.
[a]Overidentifying restrictions test and p-value are in parentheses. Growth rate instrumented using its own lagged values.

be driven by changes in expenditures.[27] In order to test for such hypothesis, we use two measures of spending changes: the change in the total expenditure and the changes in the primary expenditure (i.e., total expenditure less interest payments). Both series are taken from the AMECO database and are divided by nominal trend GDP. Lagged values of these series are used since a reverse causality (expenditure are adjusted to respond to revenue dynamics) cannot be a priori excluded.

In addition, experiments based on the inclusion of changes in the inflation rate are carried out. This may reflect the possibility that taxes, especially the indirect ones (VAT), may be lowered to mitigate the impact of increases in prices on consumption goods. Similarly to spending, lagged values of inflation changes are used, given that taxes may impact on prices in the same period.

Finally, the possibility that the "political orientation" of coalitions in power in the countries considered may affect the way discretionary fiscal policies are decided is tested. To that aim, the information from the Dataset of Political Indicators (DPI), provided by the World Bank, is used. In particular, the variable *EXECRCL* distinguishes between right, center, and left parties according to the government orientation with respect to economic policy. Based on this information, for each of the twenty-seven countries, the succession of political parties in charge since 1998 is reconstructed. Specifically, three dummy variables which enter as regressors in the baseline model are introduced, namely (i) *Right* takes the value of one during the years in which parties in charge can be defined as "conservative," Christian democratic, or right-wing, and zero otherwise; (ii) *Center* takes the value of one when the parties can best be described as "centrist," and zero otherwise; and finally (iii) *Left* takes value of one for parties that are defined as communist, socialist, social democratic, or left-wing, and zero otherwise.

As table 11 shows, none of these additional variables alter significantly the baseline results. In particular, spending developments do not seem to be associated with revenue decisions. Inflation appears

[27] As an alternative, one may also want to include the government deficit, instead of spending, as an additional control variable. However, the deficit clearly incorporates revenues, and therefore problems related to endogeneity are very likely to arise.

Table 11. Testing for Omitted Controls

Dependent Variable	ΔR^{txs}	$\Delta \ell^{txs}$	ΔR^{txs}	$\Delta \ell^{txs}$	ΔR^{txs}	$\Delta \ell^{txs}$	ΔR^{txs}	$\Delta \ell^{txs}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Output\ gap_t$	−0.087	−0.118***	−0.086	−0.117***	−0.076	−0.120***	−0.092	−0.120***
	[0.072]	[0.032]	[0.072]	[0.032]	[0.076]	[0.032]	[0.079]	[0.033]
$\widetilde{R}_{t-1}$	−0.275***	−0.057*	−0.275***	−0.055	−0.290***	−0.053	−0.285***	−0.073*
	[0.045]	[0.034]	[0.062]	[0.037]	[0.048]	[0.036]	[0.048]	[0.039]
$Debt_{t-1}$	0.006	0.002	0.005	0.002	0.009	0.002	0.008	0.003
	[0.010]	[0.005]	[0.010]	[0.005]	[0.011]	[0.005]	[0.010]	[0.005]
$EMU15$	−1.403*	−0.492**	−1.408**	−0.484*	−1.319*	−0.493*	−1.273*	−0.365*
	[0.719]	[0.235]	[0.656]	[0.251]	[0.693]	[0.268]	[0.756]	[0.211]
T	0.063**	0.014	0.064**	0.014	0.068**	0.013	0.068**	0.020
	[0.025]	[0.013]	[0.025]	[0.014]	[0.028]	[0.015]	[0.026]	[0.013]
$NONACTIVE_t$	−0.332***	0.039	−0.330**	0.046	−0.368***	0.050	−0.334***	0.008
	[0.126]	[0.069]	[0.134]	[0.073]	[0.128]	[0.076]	[0.114]	[0.085]
$ELECT_t$	−0.027	0.086	−0.026	0.088	−0.024	0.088	−0.029	0.067
	[0.140]	[0.066]	[0.135]	[0.066]	[0.140]	[0.064]	[0.147]	[0.062]

(continued)

Table 11. (Continued)

	ΔR^{txs}	$\Delta \ell^{txs}$	ΔR^{txs}	$\Delta \ell^{txs}$	ΔR^{txs}	$\Delta \ell^{txs}$	ΔR^{txs}	$\Delta \ell^{txs}$
Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
$\Delta Spending^{(1)}_{t-1}$	−0.033	−0.008						
	[0.048]	[0.020]						
$\Delta Spending^{(2)}_{t-1}$			−0.036	0.003				
			[0.050]	[0.022]				
$\Delta Inflation_{t-1}$					−0.060	0.007		
					[0.050]	[0.021]		
Left							0.024	0.228
							[0.299]	[0.304]
Center							−0.305	−0.199
							[0.310]	[0.313]
Right							−0.057	0.189
							[0.142]	[0.265]
Obs.	189	189	189	189	189	189	189	189
Number of Countries	19	19	19	19	19	19	19	19
R-squared	0.23	0.22	0.23	0.22	0.25	0.22	0.23	0.25
Hansen Statistic[a]	2.30	3.51	3.06	3.17	4.86	2.75	2.75	3.12
(P-value)	(0.13)	(0.17)	(0.08)	(0.21)	(0.03)	(0.25)	(0.10)	(0.21)

Notes: *, ***, and *** are significant at 10, 5, and 1 percent, respectively. Robust HAC standard error is in square brackets.
[a]Overidentifying restrictions test and p-value are in parentheses.
(1) Excluding interest rates.
(2) Total expenditure.

to be not significant in the regression for ΔR^{txs} and $\Delta \ell^{txs}$. Finally, the political orientation of ruling parties plays no role in accounting for revenue developments. In all these experiments, the core findings related to the coefficient on the output gap are unaffected, pointing to the fact the baseline model seems to be well specified.

7. Conclusion

This paper proposes a new approach to study the cyclical sensitivity of discretionary revenue policies in EU countries, based on measures of legislated revenue changes as provided by EU national central banks in the framework of the "ESCB disaggregated approach." The findings from this analysis, which focuses on the period 1998–2008, can be summarized as follows.

First, it emerges that legislated changes on the revenue side of the government budget seem to have been used in a strongly procyclical way, in contrast to what emerges based on cyclically adjusted indicators, which point to acyclicality. This result holds for the whole set of EU countries, but also when countries belonging to the EMU are analyzed separately.

Second, the observed procyclicality of discretionary revenue appears to be mainly driven by direct taxes paid by households and—to a minor extent—social security contributions. In particular, the former have been significantly reduced during booming economic times, thus probably contributing to overheating economies which were already in an expansionary phase. These developments might be driven by deliberate decisions of governments to lower personal income taxes in booming times, as a (at least partial) compensation of losses in disposable income generated by the fiscal drag, in progressive tax systems.

Finally, indirect taxes are the only revenue item that seems to react to the government debt-to-GDP ratio.

These findings suggest that a sound identification of the discretionary component of fiscal policy is of key importance to appropriately assess how fiscal policies have been implemented over the economic cycle. This is, in particular, relevant for the EU fiscal surveillance process where, currently, cyclically adjusted indicators have a prominent role in the analysis of fiscal policymaking.

Appendix

Table 12. Changes in the Structural Fiscal Components (as Percentage of Trend GDP) from a DA Table for Italy, as Reported in Kremer et al. (2006)

Increasing +, Decreasing −	1998	1999	2000	2001	2002	2003	2004	1998–2004
Unadjusted Balance	0.3	1.4	1.5	−2.4	−1.7	−1.2	1.1	−1.0
Cyclical Component	0.8	0.4	0.6	1.0	−0.2	−1.4	−1.2	0.1
Temporary Measures	0.0	0.0	0.6	−0.9	0.3	0.0	0.2	0.2
Balance	−0.5	1.0	0.3	−2.6	−1.8	0.3	2.0	−1.3
Interest Payments	−0.3	−0.3	−0.6	−0.5	−0.4	−0.2	−0.1	−2.4
Due to Changes in Average Interest Rate	0.0	−0.1	−0.2	−0.2	−0.3	−0.2	−0.1	−1.2
Due to Changes in Debt Level	−0.2	−0.2	−0.4	−0.3	−0.1	0.0	0.1	−1.1
Primary Balance	−0.8	0.7	−0.3	−3.1	−2.2	0.1	1.9	−3.7
Total Revenue	−0.7	1.3	−0.2	−1.9	−1.7	0.1	1.4	−1.7
Direct Taxes Payable by Corporations	0.0	0.0	0.0	−0.1	−0.6	−0.5	0.2	−1.1
Fiscal Drag	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decoupling of Base from GDP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	−0.2
Legislation Changes	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Residual	0.0	0.0	0.0	−0.1	−0.6	−0.5	0.0	−1.1
Direct Taxes Payable by Households	−0.3	0.0	0.0	−0.6	0.5	0.0	−0.1	−0.5
Fiscal Drag	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Decoupling of Base from GDP	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.4
Legislation Changes	−0.2	−0.1	−0.2	−0.6	0.3	−0.2	0.0	−1.1
Residual	−0.2	0.0	0.1	−0.1	0.1	0.1	−0.1	0.0
Memo Item: Included in Expenditure	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2

(continued)

Table 12. (Continued)

Increasing +, Decreasing –	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**1998–2004**
Social Contributions	−0.2	0.8	−0.1	−2.4	−0.7	0.7	0.8	−1.0
Fiscal Drag	−0.2	−0.2	−0.3	−0.3	−0.2	−0.2	−0.1	−1.4
Decoupling of Base from GDP	0.3	0.3	0.1	0.2	0.1	0.0	0.0	0.9
Legislation Changes	−0.1	0.2	0.0	−1.8	−0.1	0.8	0.3	−0.8
Residual	−0.2	0.5	0.1	−0.5	−0.4	0.1	0.7	0.3
Memo Item: Included in Expenditure	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Indirect Taxes	0.0	0.5	−0.1	0.4	−0.4	0.1	0.4	1.0
Fiscal Drag	0.0	0.0	−0.1	−0.1	−0.1	0.0	0.0	−0.3
Decoupling of Base from GDP	0.0	0.0	−0.1	−0.1	−0.1	−0.1	0.0	−0.3
Legislation Changes	0.0	0.1	0.0	0.6	−0.2	0.3	0.2	0.9
Residual	0.0	0.4	0.0	0.0	0.0	−0.1	0.3	0.7
Taxes and Social Contributions Overall	−0.4	1.4	−0.4	−2.6	−1.3	0.3	1.4	−1.6
Fiscal Drag	−0.2	−0.2	−0.3	−0.4	−0.2	−0.2	−0.1	−1.5
Decoupling of Base from GDP	0.4	0.4	0.1	0.1	0.0	−0.1	−0.1	0.8
Legislation Changes	−0.3	0.2	−0.2	−1.8	−0.1	0.8	0.6	−0.8
Residual	−0.3	1.0	0.1	−0.6	−0.9	−0.3	1.0	−0.1
Memo Item: Included in Expenditure	0.1	0.1	0.0	0.0	0.1	0.0	−0.1	0.2

(continued)

Table 12. (Continued)

Increasing +, Decreasing −	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**1998–2004**
Non-Tax-Related Revenue								
of which EU	−0.3	−0.1	0.2	0.7	−0.4	−0.2	0.0	−0.1
Total Primary Expenditure	0.1	0.7	0.1	1.2	0.5	0.0	−0.6	2.0
Social Payments	−0.2	−0.2	−0.1	0.0	0.3	0.2	−0.1	−0.2
of which old-age pensions	0.0	0.0	−0.1	−0.1	0.0	0.0	0.0	−0.1
of which unemployment benefits	0.0	−0.1	−0.1	0.0	−0.1	−0.1	−0.1	−0.3
of which social transfers in kind	0.1	0.1	0.1	0.2	0.5	0.2	0.1	1.3
Subsidies	−0.2	0.1	−0.1	0.0	0.0	−0.1	0.0	−0.2
of which EU	−0.1	0.0	0.0	−0.1	0.0	0.0	0.0	−0.2
Compensation of Employees	0.0	0.2	−0.1	−0.1	0.1	0.1	0.0	0.2
Intermediate Consumption	0.1	0.3	0.00	0.8	0.1	0.0	−0.1	1.1
Government Investment	0.1	0.1	0.1	0.3	0.2	−0.2	−0.3	0.3
Other	0.3	0.2	0.3	0.2	−0.1	0.1	−0.1	0.8
of which EU	0.2	−0.1	0.0	−0.1	−0.2	0.0	0.1	0.0
Memorandum Items								
Health Care	0.0	0.1	0.2	0.2	0.5	0.2	0.1	1.3
Trend Growth of Real GDP	3.0	2.8	2.4	2.1	1.7	1.6	1.5	
Change in GDP Deflator	1.7	1.6	3.9	5.2	3.8	2.5	0.9	
Change in Public Employees	3.1	0.9	0.8	1.8	2.1	0.4	−0.7	

Table 13. Data Set Description (countries and time coverage)

Variables	Data Set 1 (EU-19 Countries) $\Delta R^j, \Delta\ell^j$	Data Set 2 (EU-27 Countries) $\Delta\ell^j$
Austria	00–08	00–08
Belgium	98–08	98–08
Bulgaria		06–08
Cyprus	00–08	00–08
Czech Rep.	98–07	98–08
Denmark		04–08
Estonia		04–08
Finland	98–08	98–08
France	98–08	98–08
Germany	98–08	98–08
Greece	00–08	00–08
Hungary		04–08
Ireland	00–08	00–08
Italy	00–08	98–08
Latvia	98–08	98–08
Lithuania	98–08	98–08
Luxembourg	00–08	00–08
Malta	04–08	04–08
Netherlands	00–08	98–08
Poland	99–08	99–08
Portugal	00–08	00–08
Romania		06–08
Slovakia		04–08
Slovenia	00–08	00–08
Spain	96–08	96–08
Sweden		04–08
United Kingdom		04–08

Notes: The first data set incorporates data on (i) fiscal drag (fd^j), (ii) decoupling of the tax base from GDP (de^j), and (iii) residual component (re^j) and legislated changes ($\Delta\ell^j$). The sum of these four components is equal to the change in structural revenues (ΔR^j). The second data set incorporates only data on $\Delta\ell^j$.

References

Afonso, A., L. Agnello, and D. Furceri. 2010. "Fiscal Policy Responsiveness, Persistence and Discretion." *Public Choice* 145 (3): 503–30.

Alesina, A., and R. Perotti. 1995. "Fiscal Expansions and Fiscal Adjustments in OECD Countries." NBER Working Paper No. 5214.

Auerbach, A. 2002. "Is There a Role for Discretionary Fiscal Policy?" NBER Working Paper No. 9306.

Ballabriga, F., and C. Martinez-Mongay. 2002. "Has EMU Shifted Policy?" Economic Papers of the European Commission, Directorate-General for Economic and Financial Affairs, No. 166.

Beetsma, R., and M. Giuliodori. 2010. "Fiscal Adjustment to Cyclical Developments in the OECD: An Empirical Analysis Based on Real-Time Data." *Oxford Economic Papers* 62 (3): 419–41.

Bohn, H. 1998. "The Behavior of U.S. Public Debt and Deficits." *Quarterly Journal of Economics* 113 (3): 949–63.

Bouthevillain, C., P. Cour-Thimann, G. van den Dool, P. Hernández de Cos, G. Langenus, M. Mohr, S. Momigliano, and M. Tujula. 2001. "Cyclically Adjusted Budget Balances: An Alternative Approach." ECB Working Paper No. 77.

Canova, F. 1998. "Detrending and Business Cycle Facts." *Journal of Monetary Economics* 41 (3): 475–512.

Chalk, N. A. 2002. "Structural Balances and All That: Which Indicators to Use in Assessing Fiscal Policy." IMF Working Paper No. 02/101.

Cimadomo, J. 2011. "Fiscal Policy in Real Time." Forthcoming in *Scandinavian Journal of Economics.*

Corsetti, G., A. Meier, and G. Müller. 2010. "Cross-Border Spillovers from Fiscal Stimulus." *International Journal of Central Banking* 6 (1): 5–37.

Darby, J., and J. Melitz. 2008. "Social Spending and Automatic Stabilisers in the OECD." *Economic Policy* 23 (56): 715–56.

Debrun, X., L. Moulin, A. Turrini, J. Ayuso-i-Casals, and M. Kumar. 2008. "Tied to the Mast? National Fiscal Rules in the European Union." *Economic Policy* 23 (54): 297–362.

Eschenbach, F., and L. Schuknecht. 2004. "Budgetary Risks from Real Estate and Stock Markets." *Economic Policy* 19 (39): 313–46.

European Commission. 2004. "Public Finances in EMU — 2004." *European Economy* No. 3.

———. 2006. "Public Finances in EMU — 2006 — Part IV, Fiscal Policy in Good Times." *European Economy* No. 3.

Fatás, A., and I. Mihov. 2003. "The Case for Restricting Fiscal Policy Discretion." *Quarterly Journal of Economics* 118 (4): 1419–47.

———. 2009. "The Euro and Fiscal Policy." NBER Working Paper No. 14722.

Favero, C. 2003. "How Do European Monetary and Fiscal Authorities Behave?" In *Monetary and Fiscal Policies in EMU,* ed. M. Buti (chapter 7). Cambridge University Press.

Forni, L., and S. Momigliano. 2004. "Cyclical Sensitivity of Fiscal Policies Based on Real-Time Data." *Applied Economics Quarterly* 50 (3): 299–326.

Galí, J., and R. Perotti. 2003. "Fiscal Policy and Monetary Integration in Europe." *Economic Policy* 18 (37): 533–72.

Gavin, M., and R. Perotti. 1997. "Fiscal Policy and Saving in Good Times and Bad Times." In *Promoting Savings in Latin America,* ed. R. Hausman and H. Reisen, 149–67. IDB and OECD.

Giavazzi, F., and M. Pagano. 1996. "Non-Keynesian Effects of Fiscal Policy Changes: International Evidence and the Swedish Experience." NBER Working Paper No. 5332.

Giuliodori, M., and R. Beetsma. 2008. "On the Relationship between Fiscal Plans in the European Union: An Empirical Analysis Based on Real-Time Data." *Journal of Comparative Economics* 36 (2): 221–42.

Golinelli, R., and S. Momigliano. 2006. "Real-Time Determinants of Fiscal Policies in the Euro Area." *Journal of Policy Modeling* 28 (9): 943–64.

———. 2009. "The Cyclical Reaction of Fiscal Policies in the Euro Area: The Role of Modelling Choices and Data Vintages." *Fiscal Studies* 30 (1): 39–72.

Jaeger, A., and L. Schuknecht. 2004. "Boom-Bust Phases in Asset Prices and Fiscal Policy Behaviour." IMF Working Paper No. 04/54.

Jaimovich, D., and U. Panizza. 2007. "Procyclicality or Reverse Causality?" Inter-American Development Bank Working Paper No. 599.

Kremer, J., C. Rodrigues Braz, T. Brosens, G. Langenus, S. Momigliano, and M. Spolander. 2006. “A Disaggregated Framework for the Analysis of Structural Developments in Public Finances.” ECB Working Paper No. 579.

Larch, M., and M. Salto. 2005. “Fiscal Rules, Inertia and Discretionary Fiscal Policy.” *Applied Economics* 37 (10): 1135–46.

Larch, M., and A. Turrini. 2009. “The Cyclically Adjusted Budget Balance in EU Fiscal Policymaking. Love at First Sight Turned into a Mature Relationship.” MPRA Paper No. 20594.

Morris, R., C. Rodrigues Braz, F. De Castro, S. Jonk, J. Kremer, S. Linehan, M. R. Marino, C. Schalck, and O. Tkacevs. 2009. “Explaining Government Revenue Windfalls and Shortfalls: An Analysis for Selected EU Countries.” ECB Working Paper No. 1114.

OECD (Organisation for Economic Cooperation and Development). 2003. “Fiscal Stance over the Cycle: Evidence from Panel Analysis.” Appendix to chapter IV, “Fiscal Stance over the Cycle: The Role of Debt, Institutions, and Budget Constraints.” *Economic Outlook* 74 (December): 137–41.

Romer, C., and D. H. Romer. 2009a. “A Narrative Analysis of Post-War Tax Changes.” Appendix to “The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks” (June).

———. 2009b. “Do Tax Cuts Starve the Beast? The Effect of Tax Changes on Government Spending.” *Brookings Papers on Economic Activity* (Spring): 139–200.

———. 2010. “The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks.” *American Economic Review* 100 (3): 763–801.

Taylor, J. B. 2000. “Reassessing Discretionary Fiscal Policy.” *Journal of Economic Perspectives* 14 (3): 21–36.

Turrini, A. 2008. “Fiscal Policy and the Cycle in the Euro Area: The Role of Government Revenue and Expenditure.” Economic Papers of the European Commission, Directorate-General for Economic and Financial Affairs, No. 323.

Wyplosz, C. 2002. “Fiscal Discipline in EMU: Rules or Institutions?” Mimeo, Graduate Institute for International Studies, Geneva.

———. 2006. “European Monetary Union: The Dark Sides of a Major Success.” *Economic Policy* 21 (46): 208–61.

Online Appendix

Table 14. Asymmetric Behavior of Cyclically Adjusted Measures (nineteen countries)

	ΔR^{txs}			ΔR^{dth}			ΔR^{dte}			ΔR^{itx}			ΔR^{sct}		
Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**
Output gap$_t(\beta)$	—	0.041	—	—	−0.025	—	—	0.112***	—	—	−0.048	—	—	0.014	—
	—	[0.048]	—	—	[0.023]	—	—	[0.024]	—	—	[0.029]	—	—	[0.027]	—
Output gap$_t^+(\beta^+)$	−0.027	—	−0.012	−0.022	—	−0.023	0.081*		0.084*	−0.093*	—	−0.086	0.015	—	0.022
	[0.108]	—	[0.107]	[0.041]	—	[0.042]	[0.046]		[0.046]	[0.055]	—	[0.055]	[0.043]	—	[0.042]
Output gap$_t^-(\beta^-)$	0.128	—	0.117	−0.029	—	−0.028	0.152**		0.149**	0.012	—	0.007	0.007	—	0.002
	[0.119]	—	[0.118]	[0.045]	—	[0.045]	[0.061]		[0.061]	[0.072]	—	[0.072]	[0.052]	—	[0.051]
$\tilde{R}_{t-1}$	−0.296***	−0.304***	−0.305***	−0.372***	−0.372***	−0.372***	−0.334***	−0.340***	−0.336***	−0.294***	−0.293***	−0.297***	−0.519***	−0.537***	−0.536***
	[0.072]	[0.068]	[0.068]	[0.125]	[0.125]	[0.125]	[0.079]	[0.078]	[0.079]	[0.047]	[0.046]	[0.047]	[0.159]	[0.156]	[0.157]
$Debt_{t-1}(\Phi)$	0.009	—	—	−0.002	—	—	0.001	—	—	0.009	—	—	0.006	—	—
	[0.010]	—	—	[0.006]	—	—	[0.005]	—	—	[0.008]	—	—	[0.006]	—	—
$Debt_{t-1}^+(\Phi^+)$	—	0.000	0.001	—	−0.001	−0.001	—	−0.001	−0.001	—	0.004	0.005	—	0.002	0.002
	—	[0.011]	[0.011]	—	[0.006]	[0.006]	—	[0.007]	[0.007]	—	[0.008]	[0.008]	—	[0.006]	[0.006]
$Debt_{t-1}^-(\Phi^-)$	—	−0.008	−0.007	—	−0.001	−0.001	—	−0.003	−0.003	—	0.000	0.001	—	−0.002	−0.002
	—	[0.013]	[0.013]	—	[0.007]	[0.007]	—	[0.008]	[0.008]	—	[0.010]	[0.010]	—	[0.007]	[0.007]
EMU15	−1.456***	−1.336***	−1.344***	−0.402*	−0.409*	−0.408*	−0.157	−0.129	−0.137	−0.723***	−0.669**	−0.674**	−0.055	−0.003	−0.002
	[0.537]	[0.490]	[0.487]	[0.240]	[0.235]	[0.236]	[0.247]	[0.252]	[0.245]	[0.269]	[0.270]	[0.271]	[0.120]	[0.150]	[0.149]
T	0.064***	0.055**	0.053**	0.005	0.005	0.005	0.028**	0.028**	0.026*	0.008	0.005	0.003	0.017	0.011	0.011
	[0.023]	[0.024]	[0.025]	[0.014]	[0.014]	[0.014]	[0.013]	[0.013]	[0.014]	[0.015]	[0.016]	[0.016]	[0.014]	[0.015]	[0.015]
$NONACTIVE_t$	−0.280**	−0.307**	−0.300**	−0.103	−0.102	−0.102	−0.045	−0.053	−0.048	−0.200***	−0.212***	−0.207***	0.022	0.013	0.012
	[0.131]	[0.131]	[0.133]	[0.068]	[0.068]	[0.068]	[0.051]	[0.052]	[0.052]	[0.068]	[0.068]	[0.068]	[0.067]	[0.065]	[0.065]
$ELECT_t$	−0.020	0.007	0.000	−0.010	−0.012	−0.012	−0.068	−0.060	−0.064	−0.04	−0.025	−0.03	0.084	0.093	0.094
	[0.130]	[0.135]	[0.130]	[0.058]	[0.059]	[0.059]	[0.065]	[0.066]	[0.066]	[0.090]	[0.089]	[0.090]	[0.063]	[0.065]	[0.064]
H_0: $\beta^+ = \beta^-$	0.57	—	0.40	0.01	—	0.01	0.55	—	0.47	0.86	—	0.67	0.01	—	0.07
H_0: $\beta^+ = \beta^- = 0$	0.48	—	0.73	0.64	—	0.64	10.6***	—	10.6***	1.85	—	1.67	0.10	—	0.16
H_0: $\Phi^+ = \Phi^-$	—	3.94**	3.68*	—	0.08	0.07	—	0.85	0.72	—	2.21	2.00	—	2.73*	2.77*
H_0: $\Phi^+ = \Phi^- = 0$	—	2.37	2.28	—	0.09	0.08	—	0.53	0.48	—	1.77	1.72	—	1.68	1.68
Obs.	189	189	189	189	189	189	189	189	189	189	189	189	189	189	189
Centered R-squared	0.26	0.28	0.28	0.21	0.21	0.21	0.23	0.23	0.23	0.25	0.26	0.26	0.27	0.28	0.28

Notes: *, **, and *** indicate OLS estimates significant at 10, 5, and 1 percent, respectively. Robust standard errors are in square brackets.

Table 15. Asymmetric Behavior of Legislated Revenue Changes (nineteen countries)

Dependent Variable	$\boldsymbol{\Delta\ell^{txs}}$			$\boldsymbol{\Delta\ell^{dth}}$			$\boldsymbol{\Delta\ell^{dte}}$			$\boldsymbol{\Delta\ell^{itx}}$			$\boldsymbol{\Delta\ell^{sct}}$		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**
$Output\ gap_t(\beta)$	—	−0.109***	—	—	−0.060***	—	—	0.008	—	—	−0.013	—	—	−0.029*	—
	—	[0.023]	—	—	[0.013]	—	—	[0.010]	—	—	[0.016]	—	—	[0.016]	—
$Output\ gap_t^{+}(\beta^{+})$	−0.176***	—	−0.181***	−0.097***	—	−0.100***	−0.009	—	−0.010	−0.024	—	−0.027	−0.034	—	−0.031
	[0.050]	—	[0.051]	[0.028]	—	[0.029]	[0.020]	—	[0.020]	[0.031]	—	[0.031]	[0.028]	—	[0.028]
$Output\ gap_t^{-}(\beta^{-})$	−0.008	—	−0.005	−0.007	—	−0.005	0.031	—	0.031	0.005	—	0.008	−0.026	—	−0.027
	[0.053]	—	[0.053]	[0.026]	—	[0.026]	[0.026]	—	[0.026]	[0.040]	—	[0.040]	[0.031]	—	[0.031]
$\tilde{R}_{t-1}$	−0.059*	−0.055*	−0.056*	−0.132	−0.136	−0.133	−0.084***	−0.087***	−0.084**	−0.036	−0.033	−0.034	−0.272**	−0.278**	−0.278**
	[0.030]	[0.030]	[0.030]	[0.087]	[0.087]	[0.086]	[0.032]	[0.032]	[0.032]	[0.026]	[0.026]	[0.026]	[0.119]	[0.120]	[0.121]
$Debt_{t-1}(\Phi)$	0.003	—	—	−0.003	—	—	−0.003	—	—	0.009**	—	—	0.003	—	—
	[0.006]	—	—	[0.004]	—	—	[0.002]	—	—	[0.004]	—	—	[0.005]	—	—
$Debt_{t-1}^{+}(\Phi^{+})$	—	0.004	0.005	—	−0.002	−0.002	—	−0.003	−0.003	—	0.011**	0.011**	—	0.002	0.002
	—	[0.006]	[0.006]	—	[0.004]	[0.004]	—	[0.002]	[0.002]	—	[0.005]	[0.005]	—	[0.004]	[0.004]
$Debt_{t-1}^{-}(\Phi^{-})$	—	0.006	0.008	—	−0.001	0.000	—	−0.003	−0.003	—	0.013**	0.013**	—	0.000	0.000
	—	[0.007]	[0.007]	—	[0.004]	[0.004]	—	[0.003]	[0.003]	—	[0.005]	[0.005]	—	[0.005]	[0.005]
$EMU15$	−0.498**	−0.521**	−0.532**	−0.024	−0.031	−0.040	−0.113	−0.109	−0.114	−0.351**	−0.371**	−0.373**	0.074	0.094	0.093
	[0.218]	[0.216]	[0.211]	[0.131]	[0.121]	[0.121]	[0.078]	[0.084]	[0.080]	[0.151]	[0.151]	[0.152]	[0.077]	[0.088]	[0.089]
T	0.010	0.018	0.014	−0.018	−0.014	−0.016	0.003	0.004	0.003	0.008	0.011	0.01	0.014	0.012	0.012
	[0.013]	[0.014]	[0.014]	[0.013]	[0.012]	[0.012]	[0.006]	[0.006]	[0.006]	[0.009]	[0.009]	[0.009]	[0.011]	[0.011]	[0.011]
$NONACTIVE_t$	0.054	0.050	0.061	0.009	0.005	0.011	0.008	0.006	0.009	−0.053	−0.051	−0.049	0.059	0.055	0.055
	[0.061]	[0.064]	[0.063]	[0.038]	[0.039]	[0.038]	[0.023]	[0.023]	[0.023]	[0.038]	[0.038]	[0.038]	[0.045]	[0.045]	[0.044]
$ELECT_t$	0.080	0.083	0.074	−0.016	−0.014	−0.019	−0.002	0.000	−0.002	−0.012	−0.014	−0.016	0.098**	0.102**	0.102**
	[0.070]	[0.071]	[0.070]	[0.044]	[0.047]	[0.046]	[0.030]	[0.030]	[0.030]	[0.050]	[0.050]	[0.050]	[0.040]	[0.042]	[0.042]
H_0: $\beta^{+}=\beta^{-}$	3.27*		3.56*	3.49*	—	3.66**	0.96	—	0.99	0.21	—	0.30	0.03	—	0.00
H_0: $\beta^{+}=\beta^{-}=0$	10.48***		10.5***	9.88***	—	9.63***	0.76	—	0.76	0.37	—	0.44	1.73	—	1.65
H_0: $\Phi^{+}=\Phi^{-}$	—	0.85	1.19	—	0.68	0.89	—	0.00	0.02	—	1.31	1.39	—	0.97	0.95
H_0: $\Phi^{+}=\Phi^{-}=0$	—	0.52	0.76	—	0.51	0.57	—	1.30	1.19	—	2.83**	2.89**	—	0.57	0.57
Obs.	189	189	189	190	190	190	190	190	190	190	190	190	190	190	190
Centered R-squared	0.23	0.22	0.24	0.17	0.17	0.18	0.11	0.10	0.11	0.08	0.09	0.09	0.25	0.25	0.25

Notes: *, **, and *** indicate OLS estimates significant at 10, 5, and 1 percent, respectively. Robust standard errors are in square brackets.

Table 16. Asymmetric Behavior of Legislated Revenue Changes (overall sample)

	$\Delta\ell^{txs27}$			$\Delta\ell^{dth27}$			$\Delta\ell^{dte27}$			$\Delta\ell^{itx27}$			$\Delta\ell^{sct27}$		
Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**
Output gap$_t(\beta)$	—	−0.094***	—	—	−0.050***	—	—	0.008	—	—	−0.015	—	—	−0.028*	—
	—	[0.021]	—	—	[0.012]	—	—	[0.009]	—	—	[0.014]	—	—	[0.015]	—
Output gap$_t^+(\beta^+)$	−0.143***	—	−0.145***	−0.068***	—	−0.070***	−0.005	—	−0.005	−0.037	—	−0.038	−0.027	—	−0.025
	[0.042]	—	[0.042]	[0.025]	—	[0.025]	[0.016]	—	[0.016]	[0.026]	—	[0.026]	[0.024]	—	[0.024]
Output gap$_t^-(\beta^-)$	−0.017	—	−0.015	−0.023	—	−0.021	0.027	—	0.027	0.02	—	0.022	−0.031	—	−0.033
	[0.048]	—	[0.048]	[0.025]	—	[0.025]	[0.024]	—	[0.024]	[0.036]	—	[0.036]	[0.028]	—	[0.028]
$\tilde{R}_{t-1}$	−0.066**	−0.063**	−0.064**	−0.142*	−0.143*	−0.143*	−0.085***	−0.086***	−0.085***	−0.038	−0.034	−0.036	−0.269**	−0.273**	−0.273**
	[0.030]	[0.029]	[0.029]	[0.081]	[0.081]	[0.081]	[0.030]	[0.030]	[0.030]	[0.024]	[0.024]	[0.024]	[0.112]	[0.111]	[0.112]
$Debt_{t-1}(\Phi)$	0.001	—	—	−0.003	—	—	−0.003*	—	—	0.008**	—	—	0.003	—	—
	[0.005]	—	—	[0.004]	—	—	[0.002]	—	—	[0.004]	—	—	[0.004]	—	—
$Debt_{t-1}^+(\Phi^+)$	—	0.002	0.003	—	−0.002	−0.002	—	−0.004*	−0.003	—	0.010**	0.010**		0.002	0.002
	—	[0.005]	[0.005]	—	[0.004]	[0.004]	—	[0.002]	[0.002]	—	[0.004]	[0.004]		[0.004]	[0.004]
$Debt_{t-1}^-(\Phi^-)$	—	0.003	0.004	—	−0.001	−0.001	—	−0.004	−0.003	—	0.011**	0.012**		0.000	0.000
	—	[0.006]	[0.006]	—	[0.004]	[0.004]	—	[0.002]	[0.002]	—	[0.005]	[0.005]		[0.004]	[0.004]
EMU15	−0.501**	−0.517**	−0.525**	−0.026	−0.035	−0.040	−0.114	−0.111	−0.115	−0.349**	−0.366**	−0.370**	0.071	0.089	0.089
	[0.227]	[0.225]	[0.221]	[0.135]	[0.125]	[0.126]	[0.079]	[0.084]	[0.081]	[0.142]	[0.143]	[0.143]	[0.075]	[0.085]	[0.085]
T_i	0.012	0.017	0.014	−0.016	−0.014	−0.015	0.004	0.004	0.004	0.007	0.01	0.009	0.014	0.012	0.012
	[0.013]	[0.013]	[0.013]	[0.013]	[0.012]	[0.012]	[0.006]	[0.006]	[0.006]	[0.008]	[0.008]	[0.008]	[0.011]	[0.011]	[0.011]
$NONACTIVE_{i,t}$	0.049	0.045	0.053	0.006	0.005	0.008	0.008	0.006	0.009	−0.053	−0.053	−0.05	0.059	0.056	0.056
	[0.061]	[0.063]	[0.062]	[0.038]	[0.039]	[0.038]	[0.023]	[0.023]	[0.023]	[0.036]	[0.036]	[0.036]	[0.045]	[0.045]	[0.045]
$ELECT_{i,t}$	0.079	0.079	0.076	0.001	0.000	−0.002	−0.004	−0.004	−0.005	−0.017	−0.019	−0.02	0.087**	0.089**	0.090**
	[0.064]	[0.064]	[0.064]	[0.041]	[0.043]	[0.043]	[0.027]	[0.027]	[0.027]	[0.044]	[0.044]	[0.044]	[0.037]	[0.038]	[0.038]
H_0: $\beta^+ = \beta^-$	2.49	—	2.67*	1.09	—	1.20	0.84	—	0.86	1.05	—	1.20	0.01	—	0.03
H_0: $\beta^+ = \beta^- = 0$	9.96***	—	9.88***	8.17***	—	7.92***	0.72	—	0.73	1.02	—	1.11	1.92	—	1.94
H_0: $\Phi^+ = \Phi^-$	—	0.50	0.67	—	0.56	0.65	—	0.00	0.00	—	1.22	1.38	—	0.94	0.95
H_0: $\Phi^+ = \Phi^- = 0$	—	0.26	0.37	—	0.48	0.49	—	1.58	1.42	—	2.80*	2.98**	—	0.53	0.53
Obs.	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Centered R-squared	0.21	0.20	0.22	0.15	0.15	0.15	0.11	0.10	0.11	0.09	0.09	0.09	0.23	0.24	0.24

Notes: *, **, and *** indicate OLS estimates significant at 10, 5, and 1 percent, respectively. Robust standard errors are in square brackets.