GOVERNMENT SIZE, THE ROLE OF COMMITMENTS

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Abstract. We explore the hypothesis that long-term commitments affect the dynamics of Government expenditure. This results in a novel view of the fiscal policy variable, which is seen to consist of only a part of the total current expenditure, the rest being pre-determined by its past level. We confront this hypothesis with OECD post-war data, and find that the long-term trend in the inherited part of public expenditure is to grow at the same rate as the GDP; this implies that under budget balance the tax rate does not decrease unless Government costly dismisses existing programs. In the light of these findings, with the aid of a simple median-voter model of government size we interpret the pattern of increasing, then constant tax rates observed in OECD countries in the second half of the last century. The fiscal policy variable is found to be anti-cyclical, asymmetric and negatively affected by the joint impact of taxes and debt.

JEL Classification Numbers: H5, N4
Keywords: Government size; Efficiency of Public Expenditure; Long-term Commitments; Post-war Evidence

1. Introduction

The fact that motivates the present research is that for most countries for which data exist the share of government in GDP has grown since the nineteenth century until around 1990, then remained constant or slightly decreased. The two main alternative approaches to the study of government size are the demand-driven median-voter model and the supply-driven model of revenue-maximizing government (some references are [12, 15, 16] which contain surveys of relevant literature, and [9, 16, 21, 26] which confront models with empirical evidence). Casual observation of real government behavior makes it difficult to think that given voters’ imperfect information, supply-side factors like self-interested bureaucracy have no weight in the observed increase in the share of government, and politicians may well resort to targeted transfers. On the other hand, to make sense of increases like the ones observed for example in the OECD area, where from 1970 to 1990 public expenditure grew from 35 to over 50% of GDP (see Figure 1) one must surely go beyond the idea of pork-barrel spending by non-benevolent governments, and think of the working of explicit electoral programs which have voters’ support and call for public interventions. Relatedly, without recurring to demand-side considerations it would be difficult to locate an upper limit to this share. And in any case it seems reasonable to think that in mature democracies, in the long run observed equilibrium cannot be totally detached from voters’ preference.

The conceptual point we wish to stress is that governments’ actions cannot be easily undone, because they almost always involve long-term commitments. In particular, as is well known (in the economics literature at least since Baumol [7]), a substantial part of public funds is spent...
on labor-intensive activities carried out by public servants typically with long-term contracts; and entitlements to services provided by the State are usually for good. Thus a fraction of a period’s public expenditure is inevitably carried over to the future (this fraction may well be larger than 1, because implied commitments and outlays are often underestimated, and it often happens that plans which are initially targeted to a restricted category are subsequently, by legislative intervention usually motivated by equity considerations, extended to much broader groups of beneficiaries). But if part of current expenditure is pre-determined the policy decision variable concerns not the whole of $G$ as usually thought, but only new interventions. These typically consists of new programs, except when the incumbent government embarks in costly termination of existing ones. As we shall see this way of looking at fiscal policy has interesting implications for the dynamics of the size of Government and the tax rate. For even in absence of a deliberate policy choice, the latter is driven up when income does not grow fast enough to generate sufficient revenue to meet past commitments; and of course it increases more in the presence of expansionary plans supported by the electorate. If incumbent governments do not dismiss existing programs if not pressed by the electorate, then we shall see that the tax rate tends to increase. In line with the median-voter view, we shall assume that the upper limit on the relative size of government is determined by the median voter when she starts paying too much for the services it provides.

Our interpretation of the post-war evidence on the tax rate and the size of Government in the OECD countries derives from the view just expressed. Drawing on results of Krusell and Rios-Rull [21] we argue that until the nineties there was a gap between the current size of Government and the level acceptable by the majority of citizens. This is the force that drew the tax rate upwards in those post-war decades. Approaching the nineties that gap started to close, and voters’ pressure put a halt to the process. It took several decades to reach equilibrium because in our view, as we expand in section 4, spending potential on the part of governments is bound by limited knowledge of what the economy may need and by what it may absorb at a given stage of development.

Focusing on new interventions as the relevant policy variable we also address two classical empirical problems: the relation of expenditure to business cycles, and its dependence on taxes and debt. Our fiscal policy variable appears to be anticyclical in an asymmetric way, in the sense that it is used to contrast downturns but it does not revert to lower levels during periods of expansion. Secondly, expenditure is negatively influenced by tax and debt levels as expected, but interestingly, when the interaction term between tax and debt is included tax and debt are not significant separately, while their joint effect is negative and highly significant. Thus it seems that budget considerations become binding when both tax and debt are high; otherwise government could make use of one of the two alternative financing sources to vary their spending.

The sequel of the paper is organized as follows. In the next section we sketch a simple model which motivates the view expressed above; section 3 confronts theory and data to estimate the extent to which current expenditure is pre-determined; in section 4 we apply the conclusions reached in the previous two to interpret post-war evidence on the dynamics of the tax rate and draw, in a speculative vein, the implication of our analysis on efficiency of government expenditure that evidence suggests; in section 5 we regress the newly defined policy variable on a vector of usual policy determinants; section 6 contains a speculative remark on efficiency of Governments in the last decades; and section 7 contains conclusions.

2. Mechanics of Expenditure and Taxes

There are two goods, one produced by private individuals, the other by Gov. There is no capital, and leisure is not valued. The privately produced consumption good is obtained by
labor, and productivity is stochastic over time. Each unit of the Gov-good is produced from the private good and labor, \( p \) units of private good and one of labor yielding one unit of Gov-good. So if quantities at time \( t \) are respectively \( C_t \) and \( G_t \), total income \( Y_t \) in units of the private good is

\[
Y_t = C_t + pG_t.
\]

The point we make here is that owing to multi-period commitments the quantity \( G_t \) of Gov good produced at \( t \) depends on \( G_{t-1} \). Our linear specification is

\[
G_t = \xi_t G_{t-1} + g_t,
\]

with \( g_t \) newly added intervention at \( t \). We do not restrict \( g_t \) to be positive; if negative, it represents explicit cuts on expenditure which otherwise Gov has to sustain. The main consequence of this specification is that the real, discretionary policy decision at \( t \) is \( g_t \) rather than \( G_t \). For notational convenience we let \( z_t = g_t/G_{t-1} \), so that \( g_t = z_t G_{t-1} \); then, letting \( \zeta_t = \xi_t + z_t \), assumption (2) reads

\[
G_t = \zeta_t G_{t-1}.
\]

We assume that Gov must balance budget, so tax rate \( \tau \) must satisfy \( \tau Y = pG \). Using this, equation (3) (multiplied by \( p \)) gives Gov budget constraint as

\[
\frac{\tau_t}{\tau_{t-1}} = \frac{\zeta_t Y_{t-1}}{Y_t}.
\]

Consumers have Cobb-Douglas utility \( u(C,G) = C^{1-\tau} G^\tau \) with \( \tau \), parametrizing relative preference on goods, varying across consumers. In particular we let \( \tau = \tau^m \) for the median consumer; so her MRS between \( C \) and \( G \) is

\[
p^m(C,G) \equiv \frac{u_G}{u_C} = \frac{\tau^m G}{1 - \tau^m C}.
\]

If \( MRS < MRT \equiv p \), utility would increase with a fall in \( G \). But from \( \tau = pG/(C + pG) \) it follows that

\[
p > p^m \iff \tau > \tau^m,
\]

so we assume that if \( \tau > \tau^m \) voters urge politicians to lower \( \tau \). The government does not know \( \tau^m \), so we let \( E_t \tau^m \) denote the expected value of \( \tau^m \) conditional on Gov’s information. Since commitments make it difficult to cut spending we posit existence of a lower bound \( z^b_t \) on \( z_t \) (i.e. on \( g_t \)); this induces a lower bound \( \zeta^b_t = \xi_t + z^b_t \) on \( \zeta_t \). Then if \( \tau_{t-1} \leq \tau^m \) Gov will, under voters’ pressure, lower \( \tau \) as much as it can towards \( E_t \tau^m \) while meeting GBC. Given the lower bound \( \zeta^b_t \), if \( \tau_{t-1} > \tau^m \) Gov will then set

\[
\tau_t = \max \left\{ E_t \tau^m, \tau_{t-1}, \frac{\zeta^b_t Y_{t-1}}{Y_t} \right\}.
\]

If on the other hand \( \tau_{t-1} \leq \tau^m \) we assume that Gov receives signals which make \( E_t \tau^m \geq \tau_{t-1} \). This induces Gov to realize new projects, i.e. set \( g_t > 0 \), and these are likely to entail an increase in \( \tau \). Indeed, to anticipate in the OECD data we observe \( g_t > 0 \) always implies a tax raise.

\[1\] Of course this is not realistic; in the empirical analysis we take also public debt into account.

\[2\] The idea behind this reduced form utility is that the good provided by Gov is distributed uniformly to the citizens; so the poor like \( G \) more than the rich because in absence of public provision they could afford less of it hence enjoy a lower utility. An equivalent utility function is used by Barro [5] for a representative consumer (and for different purposes). A different interpretation (not implied here) in terms of ideological positions is given in [35].
(technically we estimate $\xi_t = 1 + r_t$, where $r_t$ is the growth rate of $Y_t$, whence $\tau_t > \tau_{t-1}$ iff $g_t > 0$). 3

Thus, given a long run equilibrium with $\tau = \tau^m$, this paper tells a story of essentially monotone convergence from below, well in accordance with OECD data, based on commitments and imperfect information on the part of the government. Commitments make it difficult to lower the tax rate. Imperfect information makes convergence sluggish, for the government knows neither whether it can raise public spending nor what is the best way to do it, so that it experiments with new programs when it is relatively more confident to have voters’ support, in particular during slumps and when the electorate’s voice is clear about specific needs and directions of intervention.

3. Empirics of Commitment

Data. To verify the empirical basis of our model, a measure for the overall size of government is needed. There are three main data sources: Penn World Tables, IMF Government Statistics and the OECD Database. The first dataset reports the government share of GDP, roughly corresponding to a measure of government consumption, but this is only a partial measure since it doesn’t include investment and transfers. The second dataset is confined to central government expenditures. We therefore rely on the OECD data which report, as a percentage of GDP, the total disbursements for general government and includes all the components of central, state, and local government.

We examine a balanced panel of 20 countries covering the period 1960-2004. The data are collected from various issues of OECD Historical Statistics and OECD Economic Outlook. 4

Figure 1 shows the pattern of Government revenue and expenditure as a fraction of GDP observed over the period in the group of countries. Both variables are generally increasing until roughly 1990, then stable or decreasing.

3The behavior we assume on the part of government is in the spirit of the (Markov perfect) equilibrium policy in Battaglini and Coate [6], which is such that in times of abundance gov uses funds to finance pork-barrel projects, while if pressed by financial constraints it scales down intervention and eliminates transfers. The difference here is that we posit that government action does not have full flexibility, that there is a biting constraint to reversibility of choices.

4The countries are: Australia, Austria, Belgium, Canada, Denmark, Finland France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Sweden, Switzerland, United Kingdom and United States.
Re-writing equation (2). Our story depicts the importance of long term commitments to understand the dynamics of government size. To assess this question we test how much Gov size tends to persist unless new shocks (represented by $g_t$ in our model) perturb its value. More precisely, we test the hypothesis $\lambda = 1$ in the panel regression

$$G_{it} = \lambda G_{i,t-1} + \gamma_t + \eta_i + \epsilon_{it}$$

where $i$ is country and variables are expressed in nominal terms.

We consider $\lambda$ as a measure of the inertia of past expenditures. Turning back to Government expenditure, expressed by (2), we obtain (4) by assuming that $\xi_t$ can be written as a constant multiple of $Y$’s rate of growth, $\xi_t = \lambda (1 + r_t)$.

As we report in the sequel of this section the hypothesis is not rejected, so that sticky trend for $G/Y$ is to persist. The implication is that the pattern observed in the ratio of public spending to GDP in the last decades, first increasing then constant, should be explained by the nature of new interventions. Our view is that the observed deviations from trend are generated by the gap between voters’ preferences and current ratio; we will take this point again in the next section.

**Estimating $\lambda$.** We first estimate (4). Table 3 contains estimates of $\lambda$ obtained by different methods. Column 1 reports the value obtained by using a Fixed Effect estimator. This is a usual choice for analysis regarding countries, since it allows for correlation between the individual effect (in this case all the fixed factors in each country like political system rule and other) and the error terms. But the lag of the dependent variable produces a downward bias in the estimate of $\lambda$ of order $1/T$ (Nickell [27]). In addition, this bias could be more pronounced if the coefficients of $\lambda$ is large, as it is in our case. For this reasons a better choice is a GMM estimator. This solution was initially proposed by Arellano and Bond [2] and is based on exploiting the lagged values of the dependent variable to obtain a full set of instruments for the endogenous regressor in the first-differencing version of the dynamic (panel) equation. The Arellano-Bond estimator is refined by Arellano and Bover [3] and Blundell and Bond [8], who devise an estimator which performs better than the former if the autoregressive parameter is large; the estimate is in column 2. Consistency of this estimator in our case is confirmed by the test proposed in [2] for the hypothesis of no second-order serial correlation for the disturbances and the Hansen test of over-identifying restrictions. An additional problem in our case is the small sample in the $N$ dimension. There is an outstanding literature debating the efficiency of GMM methods to estimate dynamic equation in small panel. In particular, we cite Judson and Owen [18] and Bun and Kiviet [11]; they show that the bias-corrected LSDV estimator by Kiviet [19] outperforms the GMM estimator and recommend this method if the cross-sectional dimension is not large. The result is in column 3. For completeness we report pooled FGLS and OLS estimates in columns 4 and 5.

**Testing $\lambda = 1$.** Given the LSDVC estimate of $\lambda$ it is natural to test the hypothesis $\lambda = 1$. This again we do by applying different methods. We first run the Levin-Lin-Chu [22] test. This test assumes a specification similar to ours (it postulates each individual unit in the panel sharing the same AR(1) coefficient and allows for individual and time effects) and is based on the following Augmented Dickey Fuller (ADF) regression:

$$\Delta G_{it} = \theta G_{i,t-1} + \sum_{k=1}^{K_i} \mu_{ik} \Delta G_{i,t-k} + \gamma_t + \eta_i + \epsilon_{it}$$

so that the null is formulated as $\theta = 0$. The hypothesis is not rejected at 5% level. We next consider the possibility of misspecification in the process postulated above, in particular the presence of heterogeneity in the AR parameter and cross-sectional dependence.
Table 1. Panel Regressions of G/Y

<table>
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<th></th>
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<td>OLS</td>
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<td>0.97</td>
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</table>

Note. FE is fixed effect; GMM is the Blundell-Bond estimator; LSDVC is the Kiviet LSDV corrected estimator; the last two are pooled FGLS and GLS.

With heterogeneity in the AR parameter the true process for $G/Y$ would be

$$
\frac{G_{it}}{Y_{it}} = \lambda_i \frac{G_{it-1}}{Y_{it-1}} + \gamma_t + \eta_i + \epsilon_{it},
$$

where unlike in (4) $\lambda$ is allowed to differ across countries. This difference is relevant in our context since Pesaran and Smith [32] and Pesaran et al. [33] demonstrated the inconsistency of pooled estimators in dynamic heterogeneous panel models. Im, Pesaran and Shin [17] developed a unit root test for this case. It is based on the average of individual Augmented Dickey-Fuller $t$-statistics of each unit in the panel and assumes that all series are non-stationary under the null hypothesis against the alternative that some of them have unit roots. The IPS test is a way of combining the evidence on the unit root hypothesis from the $N$ individual unit root tests performed on the $N$ country series, thus avoiding the inconsistency problems in the estimation of a pooled $\lambda$ parameter. An alternative is the Fisher test developed by Maddala and Wu [24]. This test have some advantage in our case in that its asymptotic results depend on $T$ going to infinity (while in the IPS test the asymptotic results depend on $N$ going to infinity). However, the crucial element that distinguishes the two tests is that the Fisher test is based on combining the $p$-values of the different ADF test for each cross-sectional unit while the IPS test is based on combining their test statistics, so this test appears to be particularly robust to sample size and lag length (in the formulation of the ADF regressions).

The other issue is that the individual time series in the panel may not cross-sectionally independent. Philipps and Sul [34] and Pesaran [30] show that conventional panel estimators can result in misleading inference and even inconsistent estimators in this case. In our context the problem is mitigated by the presence of the common time effect which reduces the bias due to cross sectional dependence (Sarafidis and Robertson [37]); but it is still interesting to explore the following more general formulation:

$$
\frac{G_{it}}{Y_{it}} = \lambda_i \frac{G_{it-1}}{Y_{it-1}} + \theta_{it} + \eta_i + \epsilon_{it},
$$

where the time effect enters in a possibly different way for each country. We run a unit-root test introduced by Pesaran [31] for this model. It is based on the mean of individual Augmented
Dickey-Fuller t-statistics of each unit in the panel, like the IPS test, but where the ADF regressions are also augmented with the cross section averages of lagged levels and first-differences of the individual series to eliminate the cross dependence.

Table 3 contains the results of the four unit-root test we have run. They all support the null $\lambda = 1$ in the AR regression (4) of the ratio $G/Y$.

### Table 2. Panel unit root Tests

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<td>0.421</td>
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</table>

**Method**

| Method | LLC | IPS | MW | P |

**Note.** $H_0$ is $\theta = 0$ in (5). LLC is the Levin-Lin-Chu test; IPS is the Im-Pesaran-Shin test; MW is the Maddala-Wu test; P is the Pesaran test.

### 4. Budget Constraint and Post-war Evidence

**The Budget Constraint.** Given the estimates presented in the previous section one has $\zeta_t = 1 + r_t + z_t$, so that the government budget constraint equation (GBC) of page 3 reads

$$\frac{\tau_t}{\tau_{t-1}} = 1 + \frac{z_t}{1 + r_t}, \quad \text{(GBC)}$$

where recall that $z_t$ is defined by $g_t = z_t G_{t-1}$. Thus the above specification of (GBC) implies that owing to commitments inherited from the past, new programs will always raise taxes, the more so the lower output growth; and that dually, to reduce the tax rate the government needs to intervene and breach existing obligations. This is politically costly, and it seems reasonable to assume that will be done only under pressure from the electorate, which is exerted if $\tau > \tau^m$ as explained in section 2. Otherwise new programs will usually start with consequent increment of the tax rate.

As anticipated in section 2, the picture which emerges from the assumption embedded in equation (2) specified in accordance with OECD post-war data is then the following. As long as it is lower than $\tau^m$ the tax rate will always increase, the more the higher $g_t$ is pushed by political consensus. When $\tau$ reaches its upper bound $\tau^m$ it will remain around that value as long as $\tau^m$ does not change.

**Interpreting Evidence.** Historically, there are two phases in the growth of government which we may roughly split in the World War II years: the first from virtually nothing to a sizeable amount (around 20% of GDP, numbers varying across countries), the second from there up to figures ranging from 30 to 50% (and more in some European countries). In the first phase the institutional change, in particular extensions of the voting franchise, has surely played a major role (recent evidence is in [1]), in accordance with the median-voter model. Indeed, it is unquestionable that decisive political power came from poorer segments of the population after introduction of universal suffrage. This pressure determined the widespread diffusion of essential public goods like education and health care. The way we look at the post-war phase is as follows. According to Krusell–Ríos-Rull [21] the median-voter model, duly extended, fits data well in the 90’s (they use 1992 U.S. data), so that roughly speaking government size reflects voters’ preferences at that time. On the other hand it is hard to think that the decisive mass of
voters has undergone after World War II a dramatic change comparable to that caused by early institutional change in the pre-war phase; but if the present-day median voter was already there in the fifties, we are left with a large gap to fill between government size and voters’ preferences in the post-war decades until the nineties.

Our model then explains the observed pattern of the tax rate (see figure 1): in the pre-nineties phase \( \tau < \tau^m \) so new programs were largely backed by the electorate which explains the tax rate steadily going up; towards the nineties it approached \( \tau^m \), and this is why it remained constant thereafter.

It may look puzzling that it took forty years to reach equilibrium, but we are talking of rates of increase in public spending which for instance in Europe are well above 5%, which as we know imply doubling in less than 15 years. In fact, our view is that in the interaction between voters and government, the more severe lack of information concerning public projects is on the government’s side. To implement an increase in public spending the government must know that a majority of the population is willing to transfer private resources to that end, and also what goods and services best fit their preferences and needs. In some cases citizens’ voice is clear and loud, think for instance of the construction of railways in the nineteenth century U.S. (cfr. e.g. the book of Bertrand Russell [36]); but in general it is not, and what limits governments’ spending becomes their knowledge of what has to be done.

5. Policy, Taxes and Debt

Our approach highlights the distinction between two components in public spending: inherited expenditure and new interventions. Given the estimate \( \xi_t = 1 + r_t \), the discretionary policy variable \( g_t/Y_t \) in equation (2) is \( \Delta (G/Y) \), and in this section we focus on this term.

Policy is determined by the state of the economy, described by the GDP growth rate, and by budget considerations represented by past taxes and debt. Accordingly, we analyze the following regression:

\[
\Delta \frac{G_{it}}{Y_{it}} = \alpha + X_{i,t-1}\phi + Z_{it}\beta + \gamma_t + \eta_i + \epsilon_{it},
\]

where \( X_{i,t-1} \) includes taxes and debt, and \( Z_{it} \) contains GDP growth and control variables.

We consider three different specifications. In all cases, lagged variables account for the budget considerations motivated by past tax and debt evolution. The controls included in our regressions measure different and possible economic determinants besides GDP growth (YGROWTH): the Consumer Price Index, as percent change from prior year (CPI); the long term interest rate (INTER); an index of openness to trade (OPEN), measured as the sum of import and export as a share of GDP; and finally a measure of country size, the log of population (LNPOP), and a measure of welfare, the log of GDP per capita (LNYP).

Comovements in the growth of the public spending to GDP ratio due to some unobserved common dynamic effect may be relevant, and neglecting the influence of common factor in determining the dependent variable generates correlation between units in the error term. We confirm the relevance of this question by adopting the test developed by Pesaran [29], which rejects the hypothesis of cross-sectional independence in all specifications.

If unobservable common factors are uncorrelated with the explanatory variables the coefficient estimates from standard panel estimators are still consistent (albeit inefficient). However, standard error estimates of commonly applied covariance matrix estimation techniques are biased and hence statistical inference that is based on such standard errors is invalid. Driscoll and Kraay [10] demonstrate that the standard nonparametric time series covariance matrix estimator can be modified such that it is robust to very general forms of cross-sectional dependence. In particular, Driscoll and Kraay [10] propose a nonparametric covariance matrix estimator which
produces consistent standard errors. So we first use a Fixed Effect estimator (including also time dummies) and base the inference reported in columns 1, 2 and 3 of Table 3 on standard errors obtained by Driscoll-Kraay methodology (standard errors in parenthesis).

**Table 3. Panel Regressions of \( \Delta(G/Y) \)**

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<td></td>
<td>(0.032)</td>
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<td>-0.015*</td>
<td>-0.006</td>
<td>-0.014**</td>
<td>-0.016**</td>
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<tr>
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<td>(0.008)</td>
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<td>(0.006)</td>
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<td>(0.008)</td>
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<tr>
<td>LNYP</td>
<td>1.076**</td>
<td>2.201**</td>
<td>1.375</td>
<td>1.055*</td>
<td>2.192**</td>
<td>1.361</td>
</tr>
<tr>
<td></td>
<td>(0.497)</td>
<td>(0.978)</td>
<td>(1.002)</td>
<td>(0.552)</td>
<td>(0.907)</td>
<td>(0.971)</td>
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<td>0.023</td>
<td>0.004</td>
<td>1.232</td>
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<td>(0.836)</td>
<td>(1.053)</td>
<td>(1.591)</td>
<td>(1.672)</td>
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<table>
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<th>Methods</th>
<th>FE</th>
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<th>FE</th>
<th>CCEP</th>
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<td>586</td>
<td>586</td>
<td>774</td>
<td>586</td>
<td>586</td>
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<td>( R^2 )</td>
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<td></td>
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<td>0.458</td>
<td>0.515</td>
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**Note.** FE is fixed effect with standard errors obtained by Driscoll-Kraay [10] methodology; CCEP is Pesaran [30] pooled estimator.

When the unobservable common factors are correlated with the explanatory variables the coefficient estimates from standard panel estimators are not consistent and the Driscoll and Kraay correction is inadequate. To take this possibility into account we adopt the (pooled) correlated cross equation errors (CCEP) estimator developed in Pesaran [30]. In particular, Pesaran [30] proposes to augment the individual-specific regression by means of weighted cross-section aggregates both of the dependent variable and the included regressors. He shows that doing so permits to obtain more correct parameter estimates, reducing the cross-sectional correlation bias. Therefore we estimate our three specifications using a Least Square Dummy Variables estimator augmented with the cross-sectional means of the regressors plus the cross-sectional mean of the dependent variable. The CCEP estimates are in columns 4, 5 and 6 of Table 3.

In a first specification we look at the relationship between tax rate and new interventions. It would be an inverse relation if at lower tax rates one had \( E \tau^m > \tau \). Accordingly, column (1)
and (4) in Table 3 include only a budget constraint, that is the lagged Government Revenue over GDP (LTAX) as a measure of the tax rate. The coefficient is negative and significant. This specification neglects the role of debt. Its presence removes the synchronicity between increasing in spending and variation of the tax rate, weakening the tax constraint. To verify this we add in the second specification (columns 2 and 5) the Debt-to-GDP ratio (LDEBT) to account for the debt burden, while in the third (columns 3 and 6) the interaction of the two variables is also present. The interesting result is that when the interaction term is included tax and debt are not significant separately, while their joint effect is negative and highly significant. It thus seems that budget considerations become binding when both tax and debt are high; otherwise the government seems to manage spending increases by making use of one of the two alternative financing sources.

The estimates in Table 3 contain another result, in that public spending is found to be anti-cyclical. The debate on this issue is extensive, and recent literature is surveyed in Golinelli and Momigliano [13]. That paper explains why the results of the various studies differ so greatly and concludes that the assertion that fiscal policies in the OECD countries are pro-cyclical is not supported by the data. With regard to the other variables, as we observe in Table 3, only two of them are relevant in the full specification (columns 3 and 6). First we observe that interest rates growth appear to be linked to positive variations in $G/Y$ and we can interpret this result through the link with the payments for public debt. Secondly, only in column 3 we find a negative effect of the CPI index on the variation of $G/Y$ ratio.

A more refined hypothesis concerning the cyclical behavior of $g_t$ which our model suggests is that during recessions the voice for new intervention is likely to be present, while in expansions a symmetric reduction of spending is harder to implement since cutting entitlements determined by past programs is costly. To verify this a different measure for the variation in GDP is needed. Thus, we consider the output gap (YGAP), which is defined as the gap between actual and potential GDP as a percentage of potential, the latter being the level consistent with full utilisation of all factors of production. Potential output cannot be observed directly from available data, so as usual we measure it as the country-specific trend of the log of real GDP obtained by using the Hodrick-Prescott filter; so YGAP is computed as the difference between the log of real GDP in the given country and its trend. This approach allows one to distinguish among positive and negative cyclical conditions. In particular, we can consider two additional variables (YPOSGAP and YNEGAP) defined as the products of the output gap with dummy variables identifying respectively positive and negative gap values. In Table 4 we report our estimates, which confirm the asymmetric anticyclicity of public spending. As previously observed by Hercowitz and Strawczynski [14] and Balassone et al. [4], expenditure seems to grow relative to GDP in downturns and to remain stable when output is above its trend.

6. Efficiency of Government, A Speculative Remark

A more covert implication of ‘irreversibility’ of public expenditure is the following. It seems reasonable to assume that the larger the gap between the current level of public spending and the level which would be accepted by citizens the looser their check on government initiatives. The argument is that the most motivated to implement such checks are the opponents of government plans, and their voice is less loud the smaller the minority they represent; this in turn is smaller the larger the tax gap. Then when the gap is significant there is more room for mistakes because of the other element we have stressed about public expenditure, which is the limited information the government has about the usefulness of the various projects. But government mistakes can only partially be corrected, so suboptimal projects co-exist with good ones, inefficiency builds up and the average quality of government services tends to decrease. On the other hand, when
### Table 4. $\Delta(G/Y)$ and the economic cycle

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
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</thead>
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<tr>
<td>LDEBT×LTAX</td>
<td>$-0.0005^{***}$</td>
<td>$-0.0004^{***}$</td>
<td>$-0.0004^{***}$</td>
<td>$-0.0005^{***}$</td>
<td>$-0.0004^{***}$</td>
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</tr>
<tr>
<td></td>
<td>(0.0001)</td>
<td>(0.0001)</td>
<td>(0.0001)</td>
<td>(0.0001)</td>
<td>(0.0001)</td>
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<tr>
<td>YGROWTH</td>
<td>$-0.361^{***}$</td>
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<td>$-0.346^{***}$</td>
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<tr>
<td></td>
<td>(0.050)</td>
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<td>(0.032)</td>
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</tr>
<tr>
<td>YGAP</td>
<td>$-0.244^{***}$</td>
<td></td>
<td>$-0.223^{***}$</td>
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<tr>
<td></td>
<td>(0.072)</td>
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<td>(0.060)</td>
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</tr>
<tr>
<td>YNEGGAP</td>
<td></td>
<td>$-0.332^{***}$</td>
<td></td>
<td>$-0.307^{***}$</td>
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<tr>
<td></td>
<td></td>
<td>(0.112)</td>
<td></td>
<td>(0.106)</td>
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<tr>
<td>YPOSGAP</td>
<td></td>
<td>$-0.154$</td>
<td></td>
<td>$-0.135$</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>(0.146)</td>
<td></td>
<td>(0.111)</td>
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<tr>
<td>INTER</td>
<td>$0.126^{**}$</td>
<td>$0.152^{**}$</td>
<td>$0.146^{**}$</td>
<td>$0.121^{***}$</td>
<td>$0.148^{***}$</td>
<td>$0.142^{***}$</td>
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<tr>
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<td>(0.057)</td>
<td>(0.062)</td>
<td>(0.064)</td>
<td>(0.043)</td>
<td>(0.047)</td>
<td>(0.048)</td>
</tr>
<tr>
<td>CPI</td>
<td>$-0.058^*$</td>
<td>$-0.002$</td>
<td>$-0.01$</td>
<td>$-0.049^*$</td>
<td>$-0.002$</td>
<td>$-0.004$</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.037)</td>
<td>(0.038)</td>
<td>(0.029)</td>
<td>(0.032)</td>
<td>(0.032)</td>
</tr>
</tbody>
</table>

Methods          | FE       | FE       | FE       | CCEP    | CCEP    | CCEP    |
Observations      | 586      | 586      | 586      | 586     | 586     | 586     |
$R^2$             |          |          |          | 0.514   | 0.424   | 0.425   |

Note. FE is fixed effect with standard errors obtained by Driscoll-Kraay [10] methodology; CCEP is Pesaran [30] pooled estimator.

the share of government in the economy reaches the level the majority of voters’ are willing to accept, the latter’s check becomes tighter so one should expect efficiency of government services to be higher (see e.g. Lindert [23] on mistakes and democracy checks). With these premises, a tentative conclusion about efficiency of government expenditure is that in the decades after the war until the early nineties, misallocation of resources in the organization of the provision of goods and services on the part of governments have accumulated. On the other hand, the subsequent stabilization of the share of publicly provided goods at the level corresponding to voters’ preferences (cfr. [21] again) suggests that average quality of these goods might now be increasing. Empirical validation of this hypothesis is a natural continuation of the present work.

### 7. Conclusions

Assuming that long-term commitments affect the dynamics of Government expenditure results in a novel view of the fiscal policy variable, which is seen to consist of only a part of the total expenditure, the rest being pre-determined by its past level. This, together with a median-voter model of government size, explains the long term pattern of increasing, then constant tax rate in OECD countries in the second half of the last century. In a speculative vein we also express our view that inefficiency of Government interventions may have built up in the decades before 1990, and that it might have begun to decrease since then.
In our empirical analysis we find that the long-term trend in public expenditure is to grow at the same rate as the GDP, which implies that under budget balance the tax rate does not decrease unless Government costly dismisses existing programs under way.

We also find that the discretionary fiscal policy variable is anti-cyclical, asymmetric and negatively affected by the joint impact of taxes and debt.

Finally, it is striking that a distinct common pattern clearly emerges from the data on taxes and expenditure in all the OECD countries on which data are available (see Figure 1), and an open question remains as to why this trend is so similar across countries.

References


