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THE CYCLICAL RESPONSE OF FISCAL POLICIES IN THE EURO AREA. WHY DO RESULTS OF EMPIRICAL RESEARCH DIFFER SO STRONGLY?

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Abstract

Whether discretionary fiscal policies in industrialized countries act counter- or pro-cyclically and whether their reaction is symmetric or asymmetric over the cycle are still largely unsettled questions. This uncertainty remains even when attention is restricted to euro-area countries, where these questions have important implications for the debate on European fiscal rules. We review the recent empirical literature to explain why the results of the various studies differ so greatly. We find that differences are driven partly by the choices made in modelling fiscal behaviour and in the related notions of fiscal policy cyclicality. Results are also affected by data source and vintage (*ex post* or real-time). The time period chosen is relatively less important. We conclude that the notion of pro-cyclical fiscal policies often upheld in the debate is not justified by the data. *Ex post* data suggest either a-cyclicality or weak counter-cyclicality. Real-time information gives clearer indications of counter-cyclical behaviour, especially when we progress from a very simple "core" model to a more complex one, including at least the impact of fiscal rules. As for symmetry or asymmetry, the answer varies with sources of data and time periods. With the more complex model the indications of asymmetric behaviour are more robust. Whenever asymmetry is present, it entails shifts in all the parameters of the fiscal rule and not necessarily in the output gap parameter.

JEL Classification: E61, D72, E62, H60

Keywords: fiscal policy, euro-area countries, fiscal rules, pro- and counter-cyclical policies, policy symmetry over the cycle, *ex post* and real-time data, dynamic panel models.

Contents

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1. Introduction

Whether discretionary fiscal policies in industrialized countries act counter- or pro-cyclically and whether their reaction is symmetric or asymmetric over the cycle are still largely unsettled questions. They are important for a variety of reasons. First, answering them would enhance our understanding of past developments and, more generally, of macroeconomic fluctuations, with potential implications on the debate concerning the right model to account for them. Second, clarifying the actual behaviour of governments would represent a useful reference point for the theoretical debate, which is on-going since at least the Thirties but has become intense in recent years, on the need and scope for counter-cyclical stabilization policies. Finally, these answers represent a necessary starting point for proposals concerning fiscal rules and institutional reforms. The latter point is particularly relevant in the European context, where fiscal policy remains the only instrument against asymmetric shocks, since the use of monetary and exchange rate policies is no longer an option for individual countries.

Over the last decades, several empirical works have analysed the behaviour of budgetary policies over the cycle in industrialized countries. Focusing on relatively recent works and excluding studies concerned with individual economies, we reviewed a group of 21 studies, all either assessing the fiscal behaviour of EMU countries or presenting results for a group of countries where EMU countries are prominent.[1] While many studies conclude that policies tended to be pro-cyclical, there are almost as many pointing to a-cyclicality and a few suggest that policies were counter-cyclical. Furthermore, little consensus seems to exist on whether the behaviour has been symmetrical over good and bad times.

We then restricted our analysis to a more homogeneous subset of 12 studies that share the following characteristics: they include the output gap *in levels* as indicator of cyclical conditions and they measure discretionary policies (implicitly or explicitly) on the basis of the change in the cyclically adjusted primary balance.

On the basis of the first condition, we excluded from our analysis 7 studies[2] that include growth or similar measures (change in the output gap, difference between growth and trend

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[1] We restrictied our attention to the studies that focus on industrialized countries. The prominent role of EMU countries in the sample is also a reflection of the availability of the data.

[2] Fatás and Mihov, 2002; von Hagen, Hallett and Strauch, 2002; Hallerberg and Strauch, 2002; Lane, 2003; Melitz, 2000; Mink and De Haan, 2006; OECD, 2003.

growth) as indicators of cyclical conditions. The choice of the output gap *in levels* focuses on whether the position of the economy is above or below its trend (potential) level and on its distance from it, while the reference to growth or similar measures focuses on whether the economy is in an upturn or in a downturn and its intensity. It is outside the scope of this paper to judge which cyclical indicator is preferable.[3] We restricted our attention to the first group of studies as they represent the majority view in the literature on this issue.[4] On the basis of the second condition we excluded two studies,[5] which rely on a different concept of discretionary action.

Even this set of 12 studies shows results that fully span the range of positions expressed in the whole literature. Table 1 reports, for each of these 12 studies, the indication concerning the sign and the symmetry of the reaction of discretionary policies to cyclical conditions and some characteristics of the specific regression we refer to.

There are many factors that could plausibly explain the differences in the results. The studies differ in several respects: the model of used policy decisions, the estimation procedures, the countries included in the sample, the analyzed periods of time, the sources of data (including different vintages of data from the same source).

In this paper we try to disentangle the relative role of these factors. However, we do not examine the role of slight variations in the specific countries included in the different samples. We base our analysis on data for a group of 11 EMU countries (only Luxembourg and Slovenia are excluded for lack of data).[6]

In Section 2 we assess the impact of the different choices in modelling fiscal behaviour. Abstracting from a number of specific characteristics pertaining to the individual analyses, in the 12 studies we find three basic specifications of the fiscal policy reaction function. We show that these three fiscal rules – which include among regressors only the initial conditions

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[3] Both indicators carry useful information. In our opinion, they largely complement each other.

[4] The literature on the cyclicality of US budgetary policies generally focuses on the output gaps in levels or on similar indicators (Auerbach, 2002; Bohn, 1998; Cohen and Follette, 2003; Taylor, 2000).

[5] Buti and van den Noord (2004) construct an indicator for discretionary policies which aims to control for errors in forecasting. Giuliodori and Beetsma (2006), in a paper largely devoted to gauge the relevance of fiscal policy interdipendence in the European Union, estimate a fiscal rule that uses real-time data for the regressors. Concerning the dependent variable, instead of focusing on the effects of actual policies (proxied by the change in the cyclically-adjusted primary balance, CAPB henceforth, measured *ex post*) the authors point out that the latter are "polluted" with the reactions to events that take place after the budget is finalized and focus on government plans (proxied by the OECD forecast one-year-ahead for the CAPB).

[6] In Golinelli and Momigliano (2006) we find that the fiscal behaviour over the cycle of the group of OECD countries outside EMU for which data of sufficient time length are available (US, Japan, Australia, Canada, New Zealand, UK, Sweden and Denmark) is significantly different from that of EMU countries.

of public finances (debt and deficit) and the output gap – embody different notions of fiscal policy cyclicality and may lead to different interpretations of the policy behaviour. In our opinion, there is often insufficient awareness of these issues when the estimates of the output gap parameter of the different studies are used in the policy debate.[7]

In the following Sections 3-4 we focus on the first model, having shown that it is possible to approximately recover from its estimates those based on the other two models. In Section 3 we examine the impact of time period, source and type of data (real-time or *ex post*) on the estimates of the fiscal reaction to cyclical conditions. We estimate rolling regressions with a fixed 15-year window over the period 1978-2006 for four alternative datasets: three are based on *ex post* data sources (OECD, AMECO, OECD data for primary deficit and debt with Hodrick-Prescott filter estimates of the output gap) and the fourth largely on real-time data (taken from Golinelli and Momigliano, 2006), available only for the reduced 1988-2006 period. Results show that the different data sources, even within the *ex post* data sets, determine sizeable shifts in the estimates of the output gap parameter. Independently of the data source, a slight tendency towards a pro-cyclical (or a less counter-cyclical) behaviour emerges over time.

In Section 4 we examine the impact of the same factors (time period, source and type of data) on determining whether fiscal policies have been symmetrical or asymmetrical over the cycle. We find contrasting results, depending on both *ex post* data sources and sample periods. Results suggest that the asymmetric behaviour of the discretionary policy, when present, entails shifts in all the parameters of the rule and not only in the output gap parameter.

In Section 5 we extend the basic fiscal rule adding, when feasible, the additional variables found significant in the 12 studies we focus on. While there is a remarkable increase of the explanatory power of the model, the results broadly confirm the conclusions reached in Sections 3-4. The only important differences are the following: a) policy asymmetry is found for all data sources; b) the evidence of counter-cyclical behaviour with real-time data becomes clearer. Section 6 concludes.

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[7] The same modelling choices are also followed in other areas of the literature on fiscal policy behaviour, for example that focusing on developing countries.

2. Modelling choices

If we focus on the "core" components of the fiscal rule – the dependent variable and the initial conditions of public finances – in the restricted set of 12 studies, we find three basic specifications of fiscal behaviour. None of the three specifications do justice to the richness of the studies we review, which often devote large part of their attention to determinants different from cyclical conditions. Nevertheless the analysis of the three models contributes significantly, in our opinion, to understand why there is no consensus on this issue in the literature.

2.1 The three models

Most studies estimate what we call a "**CAPB Model**" fiscal rule, in which the discretionary fiscal action, measured by the change in the cyclically-adjusted primary balance (Δ CAPB),[8] is explained by the initial state of public finances (measured by the cyclically adjusted primary balance and the debt of general government) and the cyclical conditions (measured by the level of the output gap):

$$\Delta \text{ CAPB}_{i\,t} = \phi^C_{capb} \text{ CAPB}_{\,i\,t-1} + \phi^C_{debt} \text{ DEBT}_{\,i\,t-1} + \phi^C_{gap} \text{ GAP}_{i\,(t \text{ or } t-1)} + u_{i\,t} \qquad [1]$$

The stability of equation [1] requires that ϕ^C_{capb} be negative and ϕ^C_{debt} positive. A positive value of ϕ^C_{gap} indicates a counter-cyclical policy, while a negative value points to pro-cyclicality. Some of the studies include the simultaneous output gap (*i.e.* at time *t*, the year in which budgetary actions have their effects); others include the lagged output gap (*i.e.* at time *t*–1, the year in which budgetary decisions are taken). The two variants of the CAPB Model (henceforth "**CAPB-s Model**" and "**CAPB-l Model**", respectively) lead to similar results (as we show in Section 3) since the values of the output gap are highly persistent.[9] Finally, the

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8 Some authors, among which Galí and Perotti (2003), use as dependent variable the level of the CAPB, instead of its change. This specification is equivalent to that of eq.[1], as it gives the same estimates for all coefficients except for that of the lagged dependent variable, for which its estimate is equal to 1 plus the estimate obtained with eq.[1]. It is largely a presentational issue, but we tend to prefer the specification in changes (eq. [1]) mainly because the explanatory power of the model and of the statistical significance of the coefficient of the lagged deficit are not artificially inflated by the component attributable to inertia (which, in turn, is largely an unexplained phenomenon).

9 The variable $\text{GAP}_{i\,t-1}$ is a plausible alternative to GAP_{it}, as policy-makers may react to current cyclical conditions or use them to forecast cyclical conditions in the following year. The inertia and complexity of the decision-making process may also justify the reference to the lagged output gap. A purely statistical reason for preferring $\text{GAP}_{\,i\,t-1}$ instead of $\text{GAP}_{\,i\,t}$ is that the latter requires recourse to instrumental variables, as the output gap is affected by fiscal policy, which opens up a number of equally acceptable alternatives with potential effects on the results.

unobservable term $u_{i\,t} = \mu_i + \lambda_t + \varepsilon_{i\,t}$ may include (depending on the study) individual (μ_i), time (λ_t) and random ($\varepsilon_{i\,t}$) components.

In a few studies authors estimate a broadly similar model, but assume that policy-makers react with a lag to the primary balance (PB $_{t-1}$) rather than to the cyclically adjusted primary balance (CAPB $_{t-1}$), as in the CAPB Model. Henceforth, we call this fiscal rule "**CAPB/PB Model**":

$$\Delta \text{ CAPB}_{i\,t} = \phi^{C/P}_{pb} \text{ PB}_{i\,t-1} + \phi^{C/P}_{i\,debt} \text{ DEBT}_{i\,t-1} + \phi^{C/P}_{gap} \text{ GAP}_{i\,(t \text{ or } t-1)} + u_{i\,t} \qquad [2]$$

The CAPB Model and the CAPB/PB Model are probably equally plausible. The CAPB Model is consistent with a fiscal rule where automatic stabilizers are left to operate fully (as discretionary actions do not react with a lag to their impact on the balance). This policy indication is very common in policy documents at the European level, especially after 1997, when the Stability and Growth Pact was introduced. CAPB/PB Model may be seen as more realistic, as policy-makers may be more concerned with headline figures; moreover, especially in the 1970s and 1980s, data on cyclically-adjusted balances were not available and even the concept of cyclical adjustment was not widespread.

Finally, other studies, which essentially focus on the issue of asymmetry in budgetary reactions, adopt a fiscal rule in which, compared with the CAPB/PB Model, the dependent variable Δ CAPB$_{it-1}$ is substituted by Δ PB$_{it-1}$[10] Henceforth, we call this specification "**PB Model**":

$$\Delta\, PB_{i\,t} = \phi^{P}_{pb}\, PB_{i\,t-1} + \phi^{P}_{debt} \text{ DEBT}_{i\,t-1} + \phi^{P} gap \text{ GAP}_{i\,(t \text{ or } t-1)} + u_{i\,t} \qquad [3]$$

The PB Model assumes a behaviour of fiscal authorities significantly different from that of the other two models, as the policy decision (dependent variable) includes the effects of both the discretionary actions and the automatic stabilizers.[11] This is shown by identity [4], in which the primary balance is decomposed into the cyclically adjusted primary balance and in a

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[10] In the studies, the level of the PB, instead of its change, is used as dependent variable. As already mentioned in the case of the CAPB Model, this specification is equivalent to that of equation [3], as it gives the same estimates for all coefficients except for that of the lagged dependent variable, for which its estimate is equal to 1 plus the estimate obtained with equation [3].

[11] There is an important difference between CAPB and CAPB/PB Models on one side and the PB Model on the other concerning the dependent variable, which suggests more caution when interpreting the results of the PB Model in terms of behaviour of fiscal authorities when *ex post* data are used. In the CAPB and CAPB/PB Models it can be assumed that budget authorities are able to predict fairly accurately the effects of their discretionary actions, as the latter are in principle largely independent of cyclical conditions. In Model PB, instead, the change in the balance is not independent from the output gap.

cyclical component, equal to the product of the output gap and a coefficient $\omega_{i\,t}$ capturing the effects of automatic stabilizers.

$$\mathrm{PB}_{i\,t} \equiv \mathrm{CAPB}_{i\,t} + \omega_{i\,t}\,\mathrm{GAP}_{i\,t} \qquad [4]$$

The results in these studies have been used to identify the cyclical reaction of discretionary policies by subtracting from the estimated coefficient of the output gap (ϕ^{P}_{gap}) an average value (ω) of the individual coefficients $\omega_{i\,t}$ (which is generally assessed for the EMU countries at around 0.5; see Bouthevillain *et al.*, 2001).

$$\phi^{P(discr)}_{gap} \approx \phi^{P}_{gap} - \omega \qquad [5]$$

The use of an average value is justified by evidence of a limited variability across countries and time of the coefficients capturing the effects of the automatic stabilizers (see, e.g., Girouard and André, 2006).

2.2 *Estimating the three models*

In Table 2a we present estimates of the coefficient of the output gap based on the three models for the two variants (which include, respectively, the simultaneous and the lagged output gap). As most of the reviewed studies, we use *ex post* data. The source is OECD for all data except for public debt; for this variable, as OECD data are incomplete, the source is the AMECO database.[12] The full 1978-2006 sample is used.

Since all specifications are dynamic panels and embody fixed country effects (μ_i), their parameters are estimated by one-step GMM-sys (see Blundell and Bond, 1998), using only a subset of the potentially available instrument matrix: the *t*–2 and *t*–3 lags of the debt, of the output gap and of the primary balance.[13] The use of GMM-sys, compared to OLS, avoids estimation biases. Compared to other instrumental-variable estimators, such as the Arellano and Bond (1991) GMM-dif, GMM-sys is potentially less affected by the problem of weak instruments, *i.e.* scarcely correlated with the variables to be instrumented, as is typical with persistent data such as debt or the output gap (see Celasun and Kang, 2006, for a thorough

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[12] Primary borrowing and debt are expressed as ratios of potential GDP.

[13] Omitting from the instruments the more distant lags does usually entail a limited loss of information. On the other side, it has been often pointed out that using too many instruments can significantly reduce the power of the Sargan test in finite samples (see, e.g., Bond, 2002).

discussion of alternative estimators in the context of fiscal reaction funtions).[14] Our preference for GMM-sys is also supported by the results reported in the Appendix, where the performance of alternative estimators is reported.

Contrary to the most common practice of the reviewed studies, time effects (λ_t) are allowed (in all regressions presented in Table 2a they are found to be jointly significant). We include the time dummies (accounting for effects that are almost invariant to all countries and change over time) as, hopefully, they can reduce the omitted-variable bias stemming from the very simple specifications we are using.[15]

Four results stand out, which are largely independent of the sample used and the source of data:

(a) The estimates of the cyclical reaction using the CAPB/PB Model tend to indicate a more counter-cyclical behaviour than those of the CAPB Model.

(b) The estimates of the cyclical reaction based on the PB Model are relatively close to those of the other two models. This result is rather surprising. We would expect a large difference (close to 0.5) because the estimated coefficient of the PB Model should include, in principle, also the effects of automatic stabilizers.

(c) The estimates of the parameters of the initial fiscal conditions (debt and deficit) are largely constant across the three models, notwithstanding the fact that only in the CAPB Model the lagged deficit is cyclically adjusted.

(d) The estimates of almost all parameters are not significantly affected by the choice between the simultaneous and the lagged output gap (this emerges by comparing the coefficients in columns 1-3 with the corresponding ones in columns 4-6); the only (partial) exception is the estimate of the cyclical reaction measured by the PB Model.

Result (d), as already mentioned, reflects the high persistence of the output gap. In the following two sections we explain the other results.

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[14] In Hayakawa (2007), it is analytically shown that in finite samples GMM-sys is less biased than GMM-dif, even though it uses more instruments. However, as shown by the simulations reported in Bun and Kiviet (2006), the ranking of the alternative estimators depends on the specific model and characteristics of data.

[15] Allowing time dummies determines a non-negligeable shift of all estimates of the cyclical reaction towards counter-cyclicality (Table 2a reports the results of the specifications without time dummies). We interpret this result, in line with the argument stated in the main text, as reflecting an omitted variable bias in the coefficient of the output gap. This interpretation is supported by the fact that broadly the same shift towards counter-cyclicality in the estimates of the cyclical reaction occurs when we add additional variables (see section 5).

2.3 Comparing Model CAPB and Model CAPB/PB

Starting from the CAPB-l Model (*i.e.* equation [1], in the variant which includes the lagged output gap) we subtract and add $\phi^{C\text{–}l}{}_{capb}\ \omega_{i\ t-1}\ \mathrm{GAP}_{i\ t-1}$ on the right side of the expression. Using also identity [4], we obtain the following equation, in which the CAPB/PB-l Model is expressed in terms of the CAPB-l Model parameters:

$$\Delta\ \mathrm{CAPB}_{i\,t} = \phi^{C\text{–}l}{}_{capb}\ \mathrm{PB}_{\,i\,t-1} + \phi^{C\text{–}l}{}_{debt}\ \mathrm{DEBT}_{\,i\,t-1} + (\phi^{C\text{–}l}{}_{gap} - \phi^{C\text{–}l}{}_{capb} \times \omega_{i\,t-1})\ \mathrm{GAP}_{i\,t-1} + u_{i\,t} \qquad [6]$$

By comparing equation [6] with the CAPB/PB-l Model (*i.e.* equation [2], in the variant which includes the lagged output gap), we identify the following three relationships between the parameters:

$$\phi^{C/P\text{–}l}{}_{pb} = \phi^{C\text{–}l}{}_{capb} \qquad [7a]$$

$$\phi^{C/P\text{–}l}{}_{debt} = \phi^{C\text{–}l}{}_{debt} \qquad [7b]$$

and, using also eq. [7a]:

$$\phi^{C/P\text{–}l}{}_{gap} \approx \phi^{C\text{–}l}{}_{gap} - (\phi^{C\text{–}l}{}_{capb} \times \omega) = \phi^{C\text{–}l}{}_{gap} - (\phi^{C/P\text{–}l}{}_{pb} \times \omega) \qquad [7c]$$

The first two equivalences indicate that in the CAPB and CAPB/PB Models the effects of the initial fiscal conditions (notwithstanding the different choice regarding the balance) are measured by the same parameters. The third relationship, which is not exact because we substitute the time- and country-specific coefficients measuring the effects of the automatic stabilizers $\omega_{i\ t-1}$ with their average value ω, indicates that the reaction to cyclical conditions estimated in the CAPB/PB Model is approximately equal to $\phi^{C\text{–}l}{}_{gap}$ (which measures the estimate of the reaction in the CAPB Model) *minus* the product of ω and the coefficient for the lagged deficit.

This latter component is negative, since $\omega > 0$ (otherwise, the automatic budgetary reactions would be destabilizing) and $\phi^{C/P\text{–}l}{}_{pb} = \phi^{C\text{–}l}{}_{capb} < 0$ (otherwise, we would observe exploding deficits). Therefore, the estimates of the coefficient of the output gap in the CAPB/PB-l Model are systematically more counter-cyclical than those obtained using the CAPB-l Model. On the basis of the estimated parameters of the regression for the CAPB/PB-l Model in Table 2a, the difference stemming from the modelling choice is 0.08, about twice the standard deviation of the estimate for the coefficient. A similar difference can be found when comparing the CAPB-s Model with the CAPB/PB-s Model.

The explanation of the result obtained above is rather intuitive. Compared to the CAPB Model, in the CAPB/PB Model discretionary policies react to the lagged effects of the automatic stabilizers on the budget (with the same coefficient of their reaction to the lagged cyclically-adjusted deficit). This additional reaction, which is stabilizing with respect to public finances, is pro-cyclical and determines (compared to the CAPB Model) a corresponding shift towards counter-cyclicality in the estimate of the coefficient of the output gap.

Summing up, CAPB and CAPB/PB Models are basically a re-parameterization of one another (as such, data cannot discriminate between them) and lead to different estimates only for the parameter of the output gap. The differences in the latter can be attributed to a different notion of cyclicality (net or gross of the reaction to the lagged effects of automatic stabilizers). In the lower part of Table 2a we present the estimate of $\phi^{C-1}{}_{gap}$ obtained using the parameters estimated with the CAPB/PB Model and the approximated relationship [7c]. The results are almost identical to the estimates based on the CAPB Model, suggesting that the relationship is validated by actual data.

2.4 Interpreting the cyclical reaction parameter in Model PB

We add to both sides of the CAPB/PB-s Model (*i.e.* eq. [2] in the variant that includes the simultaneous output gap) the effects of the automatic stabilizers ($\Delta\ [\omega_{i\,t}\ \mathrm{GAP}_{i\,t}]$). Using also identity [4], we obtain the following equation:

$$\Delta\ \mathrm{PB}_{i\,t} = \phi^{C/P}{}_{pb}\ \mathrm{PB}_{\ i\,t-1} + \phi^{C/P}{}_{i\,debt}\ \mathrm{DEBT}_{i\,t-1} + (\phi^{C/P}{}_{gap} + \omega_{i\,t-1})\ \mathrm{GAP}_{i\,t} - \omega_{i\,t}\mathrm{GAP}_{i\,t-1} + u_{i\,t} \qquad [8]$$

Eq. [8] differs from the PB-s Model by the presence of the last term ($-\ \omega_{i\,t}\,\mathrm{GAP}_{i\,t-1}$). It shows that if we could omit that term, directly estimating the discretionary cyclical reaction in the CAPB/PB-s Model would be approximately equivalent to subtracting ω from the estimate of the cyclical reaction in the PB-s Model (the two alternatives are not exactly equivalent because we treat ω as a constant).

We can disregard the last term of eq. [8] only if we can assume that it is uncorrelated with all the other regressors. However, the very notion of economic cycle implies the correlation over time of the output gap. If we assume the autocorrelation coefficient $\rho = 1$, so that $\mathrm{GAP}_{i\,t} = \mathrm{GAP}_{i\,t-1} + \mathrm{v}_{i\,t}$ and $\omega_{i\,t} = \omega_{i\,t-1}$, we obtain the following equation:

$$\Delta\ \mathrm{PB}_{\ i\,t} = \phi^{C/P}{}_{pb}\ \mathrm{PB}_{\ i\,t-1} + \phi^{C/P}{}_{i\,debt}\ \mathrm{DEBT}_{i\,t-1} + (\phi^{C/P}{}_{gap})\ \mathrm{GAP}_{i\,t} + u_{i\,t} \qquad [9]$$

Eq. [9] shows that under these assumptions the estimate of the output gap parameter of the CAPB/PB-s Model is identical to that of the PB-s Model.[16]

As noted, the output gap is highly persistent, with values of the autocorrelation coefficient ρ for the different data sources ranging between 0.8 and 0.9. This behaviour (a *quasi* random walk) intuitively explains our findings in section 2.2 that the estimates of the cyclical reaction in the PB model are relatively close to those of the CAPB/PB Model.

Sustituting $GAP_{i\,t}$ with ρ $GAP_{i\,t-1}$, with a few simple manipulations we can obtain approximate relationships between the parameters of the PB Model and those of the CAPB Model. The effects of the initial fiscal conditions are measured by approximately the same parameters (an exact equivalence was found in section 2.3 for the CAPB and CAPB/PB models). The approximate relationship between the coefficients measuring the reaction to cyclical conditions (for the variants which includes the lagged output gap) is the following:

$$\phi^{P-l}_{gap} \approx \phi^{C-l}_{gap} - (\phi^{P-l}_{pb} \times \omega) + ((1-\rho) \times \omega) \qquad [10]$$

In the lower part of Table 2a we present the estimate of ϕ^{C-l}_{gap} obtained using the parameters estimated with the PB Model and eq. [10]. As in the similar exercise described in section 2.3, the results are very close to the estimate based on the CAPB Model, suggesting that eq. [10] is validated by actual data.

Summing up, if the output gap has low autocorrelation the estimate of the output gap parameter of the PB Model differs from that of the CAPB/PB Model by approximately the value of ω. The two estimates are therefore consistent, taking into account eq. [5]. If the output gap has high autocorrelation, which is our case, the two estimates are instead relatively close. In this case, using eq. [5] (*i.e.* subtracting ω from the PB Model estimate) leads to a large difference in the cyclical reaction attributed to discretionary policy, with the PB Model suggesting a much more pro-cyclical (or a much less counter-cyclical) policy than the CAPB/PB Model (or the CAPB Model). The difference can be as large as 0.5, or twelve times the standard deviation of the estimates.

The assessment of the cyclical reaction of discretionary policies based on the PB Model and eq. [5] can be considered as reflecting a third notion of cyclicality.

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[16] If the output gap behaves as a random walk, adding (or subtracting) the effects of the automatic stabilizers from the dependent variable has no impact on the estimates because in that case Δ ($\omega_{i\,t}$ $GAP_{i\,t}$) collapses into the unpredictable noise vit, which simply inflates the random component $u_{i\,t}$.

It is hard to judge, and it is outside the scope of this paper, whether the PB model is a better description of policy choices than the other two. In particular, there is no clear difference in the performance of the three models (as shown in Table 2a) and all lack a fully satisfactory theoretical underpinning. Nevertheless, the first two models appear to be more direct solutions for the specific aim of gauging the cyclicality of discretionary policies and they are used in most of the works covered in our review of the literature. We therefore use the notions of cyclicality embodied in them in assessing the empirical results in the rest of the paper.

3. Time periods and sources of data

In this section we assess to what extent the estimates of the fiscal rule depend on the source of data (OECD against European Commission, henceforth EC), on the data vintage (*ex post* against real-time), and on the estimation period. We focus on the CAPB Model. In the initial part of the analysis we provide additional evidence of the broad equivalence between the results based on the CAPB-s and CAPB-l Models. Henceforth, we present results only for the CAPB-l Model. We include, when jointly significant, fixed time effects.

To avoid repetitions we do not estimate the CAPB/PB and PB Models. The results for these models are approximately equal to those of the CAPB Model for all parameters except for the one assessing the cyclical reaction. To recover the estimates of the output gap parameter of the CAPB/PB-l Model, (using the approximate relationship [7c]) those of the CAPB-l Model need to be shifted upward (toward counter-cyclicality) by approximately 0.1. As for the PB-l Model, the estimates of the coefficient (using the approximate relationship [10]) tend to be in an intermediate position between those of the other two models.[17]

Figure 1a compares across different samples (obtained by rolling regressions with a fixed window of 15 years over 1978-2006) the GMM-sys estimated (see Section 2.2) parameters using the CAPB-s Model with those using the CAPB-l Model, obtained with OECD *ex post* data. In this figure, four graphs are reported. The two in the upper row and the one in the lower left-hand allow us to assess the estimates of the parameters of, respectively, the lagged deficit (upper-left), the lagged debt (upper-right), and the output gap (lower-left).

[17] As for the variants with simoultaneos output gap, there is approximately the same difference (0.1) between the coefficient of the CAPB Model and the CAPB/PB Model, while the estimate of the coefficient of the PB Model tend to be close to that of the CAPB/PB Model.

The points of each graph are marked with labels indicating the model used in the estimation (CAPB-s or CAPB-l). Each point corresponds to an estimate obtained over the sub-sample ending in the year indicated on the horizontal axis and starting 15 years before. For each estimation period, the 95% confidence interval of the estimate obtained with the CAPB-s Model is plotted. The confidence interval shown in the lower right-hand graph is an average of the two confidence intervals based on the CAPB-s and CAPB-l Models; it is centred on zero: approximately, the ϕ^{A}_{gap} point estimates falling inside this zero-interval are not significantly different from zero.

As we found in Tables 2a and 2b, the estimated parameters of both lagged deficit and debt, plotted, respectively, in the first row of graphs, are indistinguishable. The ϕ^{C}_{gap} point estimates of the CAPB-l Model (in the lower left-hand graph) are always relatively close to those of the CAPB-s Model and fall well inside their confidence interval. This supports the view (based on the high persistence of the output gap) that the two variants are interchangeable. Finally, in the lower right-hand graph, ϕ^{C}_{gap} estimates with the CAPB-s and CAPB-l Models both fall inside the average 95% confidence interval, indicating that by using *ex post* OECD data the hypothesis of an a-cyclical policy cannot be rejected for all periods.

Figures 1b-1d compare the CAPB-l Model parameter estimates across different samples (again obtained by rolling regressions with a fixed 15 year window) for four different data sources: OECD *ex post* data (labelled OECD), OECD *ex post* data for fiscal variables and estimates of the output gap based on *ex post* GDP and the Hodrick-Prescott filter (labelled HP), AMECO *ex post* data (labelled EC) and the real-time data computed in Momigliano and Golinelli (2006) on the basis of various issues of the OECD Economic Outlook (labelled RT).[18] Due to data unavailability, the starting point of the estimates based on real-time data is 1988, which corresponds to 2002 as final year. The structure of Figures 1b-1c is the same as the one for Figure 1a. Figure 1d focuses only on the parameter estimates of the cyclical reaction.

From Figures 1b-1c it emerges that the ϕ_{capb} and ϕ_{debt} point estimates are not statistically different for all samples and across different data sources and vintages. Instead, differences emerge for ϕ^{C-s}_{gap} point estimates. As shown in Figure 1d, OECD and HP based estimates suggest an a-cyclical behaviour; EC and RT estimates point to a weak, generally not significant, counter-cyclicality. To translate these results in terms of the notion of cyclicality

[18] As OECD data for public debt are incomplete, for this variable we always use AMECO data.

embodied in the CAPB/PB Model, all $\phi^{C-s}{}_{gap}$ estimates would need to be shifted upwards (towards counter-cyclicality) by approximately 0.1. In this case, most EC and RT estimates would become significant.

As the sample moves forward over time, excluding the furthest years and including the most recent ones, the estimates shift slightly in the direction of pro-cyclicality. This result contrasts with other papers, which find a shift from pro-cyclicality to a-cyclicality after the Maastricht Treaty (Wyplosz, 2006; IMF, 2004; Galí and Perotti, 2003).

In Table 3 we report the estimation results of the CAPB-l Model over the fixed 1988-2006 period[19] for the four different data sources and vintages. In all cases, the usual over-identifying restrictions and residuals' autocorrelation tests are always largely not rejected, while the time effects are always significant. The results broadly confirm the indications emerging from Figures 1a-1d.

Summing up, the results included in this section suggest the following remarks.

The significance of the fixed time effects is a common feature in all cases under scrutiny. This fact highlights the need of always including them in order to prevent biased estimates due to the omission of relevant factors influencing all countries at the same time (e.g. fluctuations in the prices of stocks and oil).

Independently of model, sample period, data source and vintage, the initial fiscal conditions (lagged borrowing and debt) always matter. This evidence suggests caution when using inferences on the cyclical response of fiscal policies based on models omitting these two regressors.

Findings about cyclical conditions do not enjoy a comparable robustness. Point estimates of the cyclical reaction of discretionary policies tend to be influenced (and the sign reversed) by the use of alternative data sources and/or vintages. The sample selection is generally less important. The overall picture is that of a-cyclicality or weak counter-cyclicality in *ex post* data and counter-cyclicality (significant with the CAPB/PB Model and not significant with the CAPB Model) with real-time data.

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[19] The period 1988-2006 corresponds to the largest sample available for real-time data.

4. Policy asymmetries

Two approaches can be followed when testing for asymmetries in fiscal behaviour. The sample can be split into two sub-samples (corresponding to “good” and “bad” times) and two distinct sets of estimates for the parameters of the fiscal rule are obtained. Alternatively, only the ϕ_{gap} parameter can be allowed to vary across the two states of nature. In what follows, we refer to the practice of splitting the sample as the “two-sample approach” (2SA) and to that of splitting only the ϕ_{gap} parameter as the “two-parameter approach” (2PA).

The first approach (2SA) is more general. If all parameters change across states, 2SA leads to consistent and efficient estimates of all the parameter shifts, while 2PA estimates are biased and inconsistent. If only the parameter ϕ_{gap} shifts, 2SA leads to still consistent but inefficient estimates, while 2PA is consistent and efficient.

In order to conduct efficient inferences with a parsimonious model without imposing invalid symmetry restrictions to ϕ_{capb} and ϕ_{debt} parameters and to the deterministic components of the model, we follow two sequential steps. First, the sample is split, following 2SA, and the joint significance of the shifts between states of nature in all model parameters except ϕ_{gap} is assessed. Second, if the null (*i.e.* parameters are symmetrical) of the previous test is rejected, the symmetry of the policy reaction to the economic cycle is assessed with the same test but including all model parameters. If the null is not rejected, the more efficient 2PA is carried out, and the symmetry of the policy reaction to the economic cycle is assessed by testing for the significance of the ϕ_{gap} shift between “good” and “bad” times.

In Figure 2a we present the results for the CAPB-l Model[20] of these two sequential steps across data sources and vintages and sample periods. In the upper part, we show whether the null of symmetry of all model parameters except ϕ_{gap} is rejected (black boxes) or not (grey boxes). In the lower part we show whether the null of policy rule symmetry is rejected (black boxes) or not (grey boxes) by using the most appropriate approach (either 2SA or 2PA, depending on the outcome of the upper part). The two diagrams are identical, indicating that,

[20] CAPB-l and CAPB/PB-l Models have the advantage, over CAPB-s and CAPB/PB-s Models, of avoiding the risk of biased parameter estimates linked to an endogenous selection of good and bad times. In fact, in order to split either the whole sample or only the gap parameter, a zero-one indicator variable $I_{i\,t}$ must be defined. When the cyclical indicator is the output gap in levels, the usual practice is to set $I_{i\,t} = 1$ if $GAP_{i\,t} > 0$ (“good times”), and $I_{i\,t} = 0$ if $GAP_{i\,t} \leq 0$ (“bad times”). However, this selection risks being endogenous, given the possible simultaneity between the idiosyncratic policy shock $\varepsilon_{i\,t}$ (see equations [1] to [3] of Section 2) and the actual $GAP_{i\,t}$ realisation that drives $I_{i\,t}$. If such endogeneity occurs, the selection based on the sign of the output gap at time t entails biased parameter estimates.

if the first test is not rejected, asymmetry in the cyclical reaction is never found and, if the first test is rejected, asymmetry for all parameters, including ϕ_{gap}, is always found. In other terms, when asymmetry exists, it always depends on a general shift in parameters of the rule and not on a specific shift of ϕ_{gap}. Indeed, when we restrict our attention to the final ϕ_{gap} parameters, independently of the result of the first test, they are never significantly different. This is shown for the specific period 1988-2006 in Table 4. Another indication emerging from Figure 2a is that the answer to whether policies are symmetrical or asymmetrical varies, with *ex post* information, across data sources and time periods. With real-time data, the indication is of symmetrical behaviour.

Figure 2b plots the differences between the $\phi^{C}{}_{gap}$ parameter in good and bad times. Though not significant, such differences are aways positive in all the samples ending later than 1995. A similar indication is also conveyed by the analysis of the constant term across states of nature. These results seem at odds the usual interpretation of asymmetry, *i.e.* that it arises because government action is pro-cyclical in good times.[21]

In order to give an insight into the level of the alternative $\phi^{C}{}_{gap}$ estimates, Figure 2b also reports two splines representing the yearly average of the $\phi^{C}{}_{gap}$ parameters in good and bad times for the three sources of *ex post* data (from 1992) and for real-time data (from 2002).

To integrate the analysis carried out in Figures 2a and 2b, in Table 4 we report the GMM-sys estimates of the CAPB-l Model for four alternative data sources and vintages over the same 1988-2006 period. For each source the final outcome of the general-to-specific procedure outlined above is reported. If 2SA is appropriate, the estimates are reported in two columns (for good and bad times), while if 2PA proves to be valid, a single column suffices.

The lower part of Table 4, at the "no-switch" row, reports the p-value of the test whose null admits the restriction from 2SA to 2PA. Results clearly reject the null with EC data and with HP data.[22] Results with OECD and RT, instead, do not reject 2PA as a valid reduction of 2SA. Alone, the shift in the output gap effect is never the main cause of symmetry rejection, as shown by high p-values of the "no-shift" hypothesis, never rejected in the last row of the table.

Results in the upper part of Table 4 confirm the findings of Section 3: the data source affects the estimates of the policy reaction to cyclical conditions. With OECD and HP the policy is weakly a-cyclical, while with EC and RT it is weakly counter-cyclical.

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[21] See European Commission (2006).

[22] The lack of significance of time effects in good times and their significance in bad times may contribute to the no-switch rejection with EC and OECD-HP.

5. Extending the "core" model

In Sections 2-4 we abstracted from a number of specific variables included in our sample of 12 studies, in order to focus on what we called "core" components of the fiscal rule – the dependent variable and the initial conditions of public finances. In this Section we add, when feasible, the additional variables used and found significant in this group of studies. The aim is to understand, in a common framework, how important these variables are and to what extent they modify the conclusions reached in Sections 3-4.

In this version of the paper, we are able to include, in addition to the variables used in the regressions presented in Table 4, four groups of explanatory variables. First, in order to capture the impact of European fiscal rules on the behaviour of the countries in excessive deficit, we introduce a regressor, ϕ_m (referred to as the *Maastricht variable*) which defines a *benchmark* correction of the primary balance which is essentially a function of the excessive deficit and the number of years in which the latter needs to be eliminated.[23] Second, the relevance of the electoral cycle is assessed by using three dummy variables. They are equal to 1, respectively, in the year of regular elections (ϕ_{e1}), defined as those held at the end of a full term, in the year before (ϕ_{e2}), and in the year of unexpected (snap) elections (ϕ_{e3}).[24] Third, the *ex ante* real interest rate (measured by the nominal three-month interest rate minus the expected rate of inflation) is addedd in order to allow for the interaction of fiscal and monetary policies. In fact, this variable (labelled ϕ_{monpol}) can be considered as a simple proxy of the monetary conditions under the assumption that central banks control short-term interest rates (see, e.g., Faini, 2006). Finally, two dummy variables, for "commitment states" and "delegation states" (ϕ_{com} and ϕ_{del}), refer to a well known classification of budgetary institutions (as set out in Hallerberg, 2004), and a synthetic indicator (ϕ_{rule}) captures the overall set of national-level numerical fiscal rules.[25]

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[23] The Maastricht variable is set equal to zero in the years before 1992 or if the deficit is below the 3% threshold. For the years 1992-96, it is equal to the difference between the deficit and 3% of GDP, divided by the number of years leading up to 1997 and then reduced by the expected change in interest expenditure in the following year. After 1996, the provisions of the Stability and Growth Pact (in principle, also of its 2005 version) require countries to correct an excessive deficit in the year after its official recognition, which usually occurs with a one-year lag. Therefore, in the first year that an excessive deficit occurs, the excess deficit is divided by the constant 2 and, in the following years, by one. See Golinelli and Momigliano (2006) for further details.

[24] Details concerning the election dummies are in Golinelli and Momigliano (2006).

[25] We wish to thank Alessandro Turrini and Laurent Moulin for kindly supplying the data concerning the overall index used in the regression. For information concerning the original source and the aggregation methodology, see Ayuso-i-Casals *et al.* (2007).

Table 5 presents a set of estimates analogous to that of Table 4, but includes the additional variables mentioned above. The results broadly confirm the conclusions drawn on the basis of Table 4. The main differences are:

(a) The evidence of asymmetric fiscal behaviour becomes stronger; the null of policy symmetry is rejected for all data sources.

(b) We find large asymmetries (often individually significant) in the coefficients of many of the additional explanatory variables. This strengthens the conclusion, already reached on the basis of the "core" model, that the asymmetric cyclical effects operate through a general shift of the model parameters.

(c) The evidence of counter-cyclical behaviour with real-time data becomes clearer.

(d) The (stabilizing) reaction to the lagged debt with *ex post* data is weaker.

(e) Time effects are less significant (except for the results with real-time data).

Overall, though the inclusion of eight additional parameters in the splitted samples may entail some inefficient estimates, there is a remarkable increase of the explanatory power of the enriched rule, as documented by the increase of about 20-30% in all the measures of goodness-of-fit. In order to improve the readability of the results, Table 5 reports in bold the estimates that are 10% significantly different to zero. The increase to 10% of the significance level of the t-tests tries to take in account the loss of efficiency due to the inclusion in the model of a number of (possibly) irrelevant explanatory variables. We refrained from "fine-tuning" the model specifications to allow full comparability between the enlarged specification adopted in this section with the "core" model used above.

More in detail, the significance of the inclusion of the regular electoral dummies (prevalently affecting policies in good times) is warranted by the results of a joint test for the presence of an electoral cycle; this finding is independent from the data used. Snap elections seem to exert some relevant effects only using *ex post* data.

The *Maastricht variable* is significant only in case of bad times; however, the limited number of cases of excess deficit in good times does not allow for valid inferences.[26] Table 6 reports the detail about data availability in good and bad times. Note that negative estimates of the Maastricht variable parameter suggest that a country in excess of deficit further adjusts its

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[26] The same can be said for the snap elections. Note also that the shift towards counter-cyclicality would also emerge by simply adding the Maastricht variable, alone, to the "core" model.

finances with respect to what would be implied by the parameters of the fiscal initial conditions.

The estimates of the parameter measuring the effect of the monetary policy stance vary in significance across different sources of data. The prevalently negative sign suggests (as in IMF, 2004 and in Galí and Perotti, 2003) that fiscal and monetary policies are substitutes: when monetary policy is tight, discretionary fiscal policy loosens with respect to what it would otherwise be. The small magnitude of the estimates implies that the fiscal policy is only a very slight substitute for monetary policy.

The results for the variables capturing the role exerted by budgetary institutions and fiscal rules seem to suggest that "commitment" strategies may be relatively more successful in solving the common pool problem inherent in budget preparation, but only in bad times.

6. Conclusions

Whether discretionary fiscal policies act counter- or pro-cyclically and whether their reaction is symmetric or asymmetric over the cycle are still largely unsettled questions. The different results obtained by the empirical literature may in principle depend on the model of policy decisions used, the estimation procedures adopted, the countries included in the sample, the periods of time analyzed, or the source of data selected (including different vintages of data from the same source).

In this paper we restrict our attention to a subset of relatively homogeneous papers presenting econometric evidence on the euro-area countries and assess the role of all the factors mentioned above in a common empirical context in order to disentangle their relevance.

In the first part of the paper we assess the impact of different choices in modelling fiscal behaviour. We focus on the "core" components of the fiscal rule – the dependent variable and the initial conditions of public finances – finding in the studies reviewed three basic specifications of fiscal behaviour. We show that these fiscal rules – whose regressors are only the initial conditions of public finances (debt and deficit) and the output gap – lead to significant differences in the estimates of the parameter measuring the reaction to cyclical conditions. In particular, comparing the first model (CAPB) – used in most empirical studies – with the second (CAPB/PB), the latter suggests a more countercyclical behaviour. The difference can be ascribed to the different notions of fiscal policy cyclicality embodied in the fiscal rules (net or gross of the reaction to the lagged effects of automatic stabilizers).

For the third model (PB), the assessment of the cyclical reaction of discretionary policies based on eq. [5] reflects a third notion of cyclicality. Such an assessment, depending on the characteristics of the series of the output gap, may give results entirely different from those based on the first or second model.

This part of the paper shows the need for extreme caution in comparing empirical results based on different models. In our opinion, there is often insufficient awareness of these issues when the estimates of the output gap parameter of the different studies are used in the policy debate.

In the second part of the paper we focus on the first of the three models and examine the impact of time period and source of data on the estimates. In particular, we estimate rolling regressions with a fixed window of 15 years over the period 1978-2006 for four alternative datasets: three of them are based on *ex post* data sources and the fourth largely on real-time data, available only for the reduced 1988-2006 period. The results suggest that:

a) The different data sources have sizeable effects on the estimates of the reaction of fiscal policy to cyclical conditions. In particular, *ex post* data from AMECO and real time data indicate weakly counter-cyclical policies while the other *ex post* data sources broadly suggest a-cyclicality. Overall, we do not find support for the frequently upheld notion of pro-cyclical fiscal policies.[27]
b) Independently of the data source we use, a slight tendency towards more pro-cyclical (or less counter-cyclical) behaviour emerges over time. This result contrasts with other papers, which find a shift from pro-cyclicality to a-cyclicality after the Maastricht Treaty (Wyplosz, 2006; IMF, 2004; Galí and Perotti, 2003).
c) The effect of the fiscal initial conditions (lagged debt and deficit) on policies is strongly significant. This evidence suggests caution when using inferences on the cyclical response of fiscal policies based on models omitting these regressors.
d) Testing for asymmetries in fiscal behaviour, we find contrasting results, depending on both *ex post* data sources and sample periods. We also find that the asymmetric behaviour

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[27] An example is the following statements, from OECD (2007): "Fiscal policy has not contributed to stabilising the cycle in the euro area. When the economy was above potential at the start of the decade several fiscal authorities did not allow the automatic stabilizers to operate fully as they used cyclical tax receipts to finance tax cuts and expenditure increases…[ ]More systematic investigations using longer time series confirm the observation that fiscal policy tends to act pro-cyclically in euro area countries".

of the discretionary policy, when present, entails shifts in all the parameters of the rule and not only in the output gap parameter.

In the final part of the paper we extend the basic model to include the additional variables found significant in the group of studies we reviewed. This was possible only for some regressors, due to data limitations. This extension determines a substantial increase in the explanatory power, but the conclusions reached on the basis of the "core" fiscal reaction function are generally confirmed. The only important differences are that policy asymmetry is now found for all data sources and that the evidence of counter-cyclical behaviour with real time data is clearer.

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Appendix
Results based on GMM-sys and alternative estimators

GMM estimators are typically used to obtain consistent parameter estimates in the context of dynamic single equations with panel data. However, GMM may be subject to large finite-sample biases when available instruments are weak (see e.g. Bond, 2002). Specifically, this problem occurs using GMM-dif when data are highly persistent.

All variables used in the core specifications of our study show relevant persistence: the autoregressive parameters of primary balance, output gap and debt are in the range 0.7-0.9 (details are available upon request). Therefore, we expect that pooled OLS, whithin-groups and GMM-dif estimates be biased. In particular, Blundell and Bond (1998) suggests that the lagged dependent variable parameter OLS estimate is likely to be upward biased, while the within group and GMM-dif estimates are likely to be downwards biased. As a consequence, also the other parameter estimates (*i.e.* those of the output gap and the debt) will be biased in a direction that depends on the covariances of model variables.

Table A1 reports the estimates of the CAPB-s Model using the following approaches: GMM-sys, pooled OLS, within group and GMM-dif.[28] Data used are *ex post* measures. All GMM estimates are one-step, which is a standard practice in the empirical literature in view of the very modest efficiency gains from two-step estimators and of the lower reliability of their asymptotic distribution approximations. Regarding the choice of the instruments, GMM estimates in the columns 5-8 use the subset spanned by lags from t–2 to t–3 (the same as that used in Tables 2a and 2b), while columns 9-12 report estimates from the alternative subset spanned by lags from t–2 to t–4.

The validity of the additional moment conditions exploited by GMM-sys with respect to GMM-dif is subject to the condition that the means of the relevant series be constant within each country. This assumption is more acceptable in models with time effects, as their presence entails means that are constant once the series are expressed as deviations from period-specific averages, *i.e.* that the country-means evolve over time in a common way. This is another reason to add the time dummies in our models, beyond those given in the main text. Estimation results in Table A1 are in line with the main predictions found in the literature, see e.g. Blundell and Bond (1998) and Bond (2002). In fact, pooled OLS present the highest estimate of the autoregressive parameter (defined as $\phi_{capb}+1$, and equal to about 0.81), while

[28] Qualitatively similar outcomes could be reported for all the other models used in this study.

the within group persistence estimate is lower (about 0.75). GMM-sys estimate stay in the middle (about 0.8) of the overestimating pooled OLS and underestimating within group. Such range is small, reflecting: the low individual-effects variability (only about 10% of the total unexplained heterogeneity)[29] and the relatively long time span. Indeed, our span of about 30 years is probably enough to prevent large negative biases, as the bias of the within groups estimates in dynamic panel models is inversely proportional to the number of time periods (see Nickell, 1981; Judson and Owen, 1999; and Attanasio *et al*., 2000).[30] Due to the data persistence noted above, GMM-dif estimates of the autoregressive parameter are heavily underestimated, because they rely on weak instruments.

Other parameter estimates are consistent with the assessment above: for example, GMM-dif debt parameter estimates seem unreasonably high and this fact may be related to their underestimation of the autoregressive parameter, which measures policy persistence.

The output gap parameter estimates in models without time dummies are always significantly pro-cyclical. As also shown in Tables 2a and 2b, the introduction of time dummies shifts all the estimates towards counter-cyclicality (but does not involve significant changes in the other model estimates and in model diagnostics). We interpret this result as reflecting an omitted variable bias in the coefficient of the output gap. This interpretation is supported by the fact that the inclusion of additional regressors (see Section 5) weakens both the significance of time dummies and the policy pro-cyclicality.

The choice of instrument subsets does not affect estimates (the last four columns of Table A1 report estimates that are almost undistinguishable from those in the previous four columns) but it influences outcomes of the Sargan overidentification restriction test.[31] Therefore, the estimation results in Table 2a and 2b can be considered not largely affected by mild 5% (but almost never 1%) overidentifying restrictions rejections. In addition, note also that the differences Sargan statistics, testing for the validity of the additional moment conditions of the GMM-sys, accepts their validity with high p-values: lagged first-differences are informative instruments for the endogenous variables in levels.

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[29] If the individual-effects variability had been high, we would have expected the pooled OLS residuals to be positively autocorrelated because of the individual effects omission, while here the autocorrelation tests never reject the hypothesis of white noise residuals (see the results in the first column of Table A1).

[30] We also use shorter samples (only 15 years). In these cases the bias of within group estimator may be larger.

[31] Therefore, the rejection of the Sargan test using lags t–2 and t–3 as instruments cannot be ascribed to lag t–2, as it enters both subsets of instruments. Instrumenting with only the subset t–3 and t–4, *i.e.* omitting lag t–2 as if it was not valid because of measurement errors (see Blundell and Bond, 1999), delivers results (not reported) that are very similar to those with instruments from t–2 to t–4.

Overall, main results in this appendix can be summarised as follows.

First, the estimation method matters for the parameter outcomes. Biases in the estimation of the autoregressive parameters (here, they are badly underestimated by GMM-dif) induce biases in the other model parameter estimates. Estimates in Table A1, interpreted in the light of the basic results of the literature, lead to the presumption that GMM-sys estimator is the best performing method.

Second, notwithstanding the mild rejection of overidentifying restriction tests, we find that the choice of instrument subsets does not affect estimates. Therefore, we set the lags from *t*–2 to *t*–3 as instruments for all the estimates in the present paper. In this regard, note that Sargan tests for shorter time spans or for more complex models (e.g. allowing for policy asymmetries or for more regressors) never reject the null of valid instruments.

Table 1 – The Cyclical Reaction of Fiscal Policies in a Homogeneous Group of Recent Studies (1)

Studies	Countries	Period	Data	Additional variables	Asymmetry	Cyclicality
Annett (2006)	EMU-11	1980-2004 (272)	OECD	Fiscal governance & elections	n.a.	Pro-cyclical (ante-Maastricht) a-cyclical (post-Maas.) (2)
Debrun & Kumar (2006)	OCSE-13	1990-2004 (224)	OECD	Fiscal rules & political v.	n.a.	Pro-cyclical (some specifications) (3)
European Commission (2006)	EMU-11	1980-2005 (251)	EC (AMECO)	dummies: >91 e >98	asymmetry (4)	A-cyclical (o.gaps<0) pro-cyclical (o. gaps>0) (4)
Golinelli & Momigliano(2006)	EMU-11	1988-2006 (209)	real time	Maastricht var. & elections	symmetry	Counter-cyclical
Wyplosz (2006)	EMU-10	1980-2005	OECD	none (5)	n.a.	Pro-cyclical (ante-Maastricht) a-cyclical (post-Maast.)
CEPII (2005)	EMU-10	1981-2005	OECD	none	symmetry	Acyclical
Balassone & Francese (2004)	EU,USA,JAP	1970-2000	EC (AMECO)	none	symmetry (6)	Pro-cyclical
Forni & Momigliano (2004)	EMU-10	1993-2003 (110)	real time	Maastricht var.	asymmetry	Counter-cyclical (o.gaps<0) a-cyclical (o. gaps>0)
IMF (2004)	EMU-11	1982-2003 (242)	OECD	Monetary gaps (7)	symmetry	Pro-cyclical (ante-Maastricht) a-cyclical (post-Maast.)
Galí & Perotti (2003)	EMU-11	1980-2002 (238)	OECD	Monetary gaps	n.a.	Pro-cyclical (ante-Maastricht) a-cyclical (post-Maast.)
Ballabriga & Martinez-Mongay (2002)	individual EMU-10	1979-1998	EC (AMECO)	none	n.a.	A-cyclical (overall assessment of individual reg.)
Brunila & Martinez-Mongay (2002)	EU	1970-1997	EC (AMECO)	none (8)	n.a.	Pro-cyclical

(1) Highly preliminary, do not quote. We refer to the 5 percent level of significance in our assessment of the reported results. (2) We refer to the specification which includes country dummies in Table 5 of the paper. (3) We refer to Table 3 of the paper; other results presented by the authors tend to indicate, for most specifications, a-cyclicality. (4) The evidence of asymmetric behaviour and the assessment concerning cyclicality, in line with the conclusions drawn in the paper, take into account both the estimates for the constant and for the coefficient of the output gap. The coefficient for the output gap has roughly the same value irrespective of cyclical conditions (good or bad) and would indicate a-cyclicality (5) We refer to column 3 of Table 2a of the paper. The specification does not include the lagged deficit. (6) Balassone and Francese (2004) conclude in favour of asymmetry on the basis of an equation with the overall balance as dependent variable. For the sake of comparability with the other studies we use the results of the equation with the primary balance (also reported by the authors), where the asymmetry is not significant. (7) We refer to the results of the upper part of Table 2.8 of the Appendix 2.4. The study examines the role of other regressors in separate analyses. (8) We refer to Figure 6.7 (also published in European Commission, 2001) which shows the results of a regression involving, as dependent variable, the changes in CAPB, and as regressors, a constant and the output gap. The analysis refer only to episodes where over at least three years the absolute values of the annual average output gap and of the annual average change in the cyclically-adjusted primary balance were bigger than 0.25% of trend GDP.

Table 2a – Estimates of Alternative Fiscal Rules *with* Time Effects [1]

	explanatory output gap in t			explanatory output gap in t–1		
Model:	**CAPB-s**	**CAPB/PB-s**	**PB-s**	**CAPB-l**	**CAPB/PB-l**	**PB-l**
Dependent variable:	$\Delta CAPB_{it}$	$\Delta CAPB_{it}$	ΔPB_{it}	$\Delta CAPB_{it}$	$\Delta CAPB_{it}$	ΔPB_{it}
ϕ_{capb}	–0.203			–0.203		
	(0.035)			(0.035)		
	–5.81			*–5.73*		
ϕ_{pb}		–0.195	–0.206		–0.198	–0.191
		(0.036)	(0.037)		(0.036)	(0.037)
		–5.40	*–5.55*		*–5.52*	*–5.14*
ϕ_{debt}	0.009	0.009	0.010	0.009	0.009	0.009
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
	3.48	*3.35*	*3.60*	*3.47*	*3.45*	*3.32*
ϕ^{C}_{gap}	–0.042			–0.031		
	(0.040)			(0.039)		
	–1.06			*–0.79*		
$\phi^{C/P}_{gap}$		0.034			0.054	
		(0.040)			(0.039)	
		0.85			*1.39*	
ϕ^{P}_{gap}			0.093			–0.001
			(0.041)			(0.040)
			2.24			*–0.02*
average μ_i [2]	–0.145	–0.214	–0.092	–0.156	–0.179	–0.132
	(0.394)	(0.397)	(0.407)	(0.396)	(0.396)	(0.410)
	–0.37	*–0.54*	*–0.23*	*–0.39*	*–0.45*	*–0.32*
Observations = $N \times T$	300	300	300	300	300	300
$\overline{T}$	27.27	27.27	27.27	27.27	27.27	27.27
Sargan' test [3]	0.0127	0.0138	0.0055	0.0152	0.0117	0.0036
Autocorrelation [4]	0.3921	0.3726	0.4032	0.3765	0.3954	0.3996
R-squared [5]	0.2971	0.2817	0.1584	0.2906	0.2900	0.1659
Time effects significance [6]	0.0242	0.0347	0.0000	0.0136	0.0156	0.0000
Implicit ϕ^{C-1}_{gap} [7]					–0.042 [7]	–0.036 [8]
					(0.040)	(0.041)

[1] GMM-sys estimates, see Blundell and Bond (1998), over the 1978-2006 period. Below each point estimate, the corresponding standard error is in brackets and the Student's t is in italics. [2] Average of the 11 country-effects estimates. [3] Over-identifying restrictions test, p-values. [4] Residuals' 2nd order autocorrelation test, p-values. [5] Proxied by the squared correlation between actual and fitted values. [6] Test for the null hypothesis that all the 28 time dummies are jointly zero, p-values. [7] Obtained rearranging eq. (7c) using: $\phi^{C/P-1}_{gap}$ and $\phi^{C/P-1}_{pb}$ estimated above, and $\omega = 0.4825$, *i.e.* the sample average of ω_{it} (the semi-elasticity of primary balance w.r.t. the output gap stemming from automatic stabilizers; source, see Girouard and André, 2007). [8] Obtained rearranging eq. (10) using: ϕ^{P-1}_{gap} and ϕ^{P-1}_{pb} estimated above, and $\omega = 0.4825$, *i.e.* the sample average of ω_{it} (the semi-elasticity of primary balance w.r.t. the output gap stemming from automatic stabilizers; source, see Girouard and André, 2006).

Table 2b – Estimates of Alternative Fiscal Rules *without* Time Effects [(1)]

	explanatory output gap in *t*			explanatory output gap in *t–1*		
Model:	**CAPB-s**	**CAPB/PB-s**	**PB-s**	**CAPB-l**	**CAPB/PB-l**	**PB-l**
Dependent variable:	**$\Delta CAPB_{it}$**	**$\Delta CAPB_{it}$**	**ΔPB_{it}**	**$\Delta CAPB_{it}$**	**$\Delta CAPB_{it}$**	**ΔPB_{it}**
ϕ_{capb}	–0.201			–0.217		
	(0.032)			(0.032)		
	–6.35			*–6.73*		
ϕ_{pb}		–0.207	–0.223		–0.219	–0.170
		(0.034)	(0.036)		(0.033)	(0.035)
		–6.17	*–6.11*		*–6.67*	*–4.83*
ϕ_{debt}	0.011	0.011	0.014	0.011	0.011	0.011
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
	4.24	*4.09*	*4.79*	*4.23*	*4.24*	*3.88*
ϕ^{C}_{gap}	–0.105			–0.096		
	(0.030)			(0.030)		
	–3.53			*–3.18*		
$\phi^{C/P}_{gap}$		–0.030			0.001	
		(0.033)			(0.032)	
		–0.93			*0.03*	
ϕ^{P}_{gap}			0.069			–0.073
			(0.036)			(0.034)
			1.95			*–2.15*
average μ_i [(2)]	–0.559	–0.550	–0.669	–0.547	–0.556	–0.626
	(0.173)	(0.175)	(0.190)	(0.176)	(0.176)	(0.188)
	–3.23	*–3.15*	*–3.53*	*–3.12*	*–3.16*	*–3.33*
Observations = $N \times T$	300	300	300	300	300	300
$\overline{T}$	27.27	27.27	27.27	27.27	27.27	27.27
Sargan' test [(3)]	0.0261	0.0288	0.0080	0.0391	0.0331	0.0048
Autocorrelation [(4)]	0.4293	0.3856	0.5207	0.3644	0.3737	0.5018
R-squared [(5)]	0.1969	0.1845	0.1395	0.1751	0.1766	0.1579
Implicit $\phi^{C\text{–}1}_{gap}$ [(6)]					–0.105 [(6)]	–0.085 [(7)]
					(0.031)	(0.032)

[(1)] GMM-sys estimates, see Blundell and Bond (1998), over the 1978-2006 period. Below each point estimate, the corresponding standard error is in brackets and the Student's *t* is in italics. [(2)] Average of the 11 country-effects estimates. [(3)] Over-identifying restrictions test, *p*-values. [(4)] Residuals' 2nd order autocorrelation test, *p*-values. [(5)] Proxied by the squared correlation between actual and fitted values. [(6)] See footnote 7 to Table 2a. [(7)] See footnote 8 to Table 2a.

Table 3 – *CAPB*–l Model Estimates with Alternative Data Sources (1)

Source:	OECD	HP (2)	EC	RT (3)
ϕ_{capb}	–0.220	–0.205	–0.158	–0.167
	(0.045)	(0.045)	(0.042)	(0.047)
	–4.88	*–4.59*	*–3.75*	*–3.60*
ϕ_{debt}	0.011	0.011	0.009	0.010
	(0.003)	(0.003)	(0.003)	(0.003)
	3.51	*3.63*	*2.93*	*3.18*
ϕ^{C}_{gap}	–0.054	0.007	0.086	0.141
	(0.044)	(0.053)	(0.065)	(0.091)
	–1.22	*0.12*	*1.34*	*1.54*
avg. μ_i (4)	–0.555	–0.425	–0.384	–0.140
	(0.404)	(0.396)	(0.454)	(0.414)
	–1.37	*–1.07*	*–0.85*	*–0.34*
$N \times T$	209	209	200	209
$\overline{T}$	19.00	19.00	18.18	19.00
R-squared (5)	0.2832	0.2836	0.2653	0.2910

(1) GMM-sys estimates, see Blundell and Bond (1998), over the 1988-2006 period. Below each point estimate, we report the corresponding standard error (in brackets) and the Student's *t*. (2) Data for the initial conditions are from OECD; data for output gap are obtained using HP filtered GDP levels. (3) Real-time data based on OECD Economic Outlook, see Golinelli and Momigliano (2006). (4) Average of the 11 country-effects estimates. (5) Proxied by the squared correlation between actual and fitted values.

Table 4 – *CAPB*–l Model Estimates in Good and Bad Times with Alternative Data Sources [1]

Source:	**OECD** *ex post*		**EC** *ex post*		**OECD with HP-GDP**		**OECD real-time**	
Times [2]:	**bad**	**good**	**bad**	**good**	**bad**	**good**	**bad**	**good**
ϕ_{capb}	–0.216		–0.161	–0.171	–0.238	–0.186	–0.169	
	(0.039)		(0.056)	(0.054)	(0.072)	(0.055)	(0.047)	
	–5.56		*–2.85*	*–3.16*	*–3.30*	*–3.38*	*–3.62*	
ϕ_{debt}	0.012		0.011	0.009	0.016	0.011	0.011	
	(0.003)		(0.004)	(0.005)	(0.005)	(0.005)	(0.003)	
	3.75		*2.49*	*1.67*	*3.43*	*2.07*	*3.17*	
ϕ^{C-1}_{gap}	–0.062	0.036	0.037	0.142	–0.047	0.09	0.105	0.214
	(0.050)	(0.095)	(0.081)	(0.118)	(0.068)	(0.102)	(0.116)	(0.171)
	–1.24	*0.38*	*0.46*	*1.20*	*–0.70*	*0.88*	*0.90*	*1.25*
avg. μ_i [3]	–0.384		–0.107	1.016	–0.630	0.560	–0.222	
	(0.413)		(0.431)	(1.460)	(0.419)	(1.363)	(0.445)	
	–0.93		*–0.25*	*0.70*	*–1.50*	*0.41*	*–0.50*	
$N \times T$	209		110	90	113	96	209	
$\overline{T}$	19.00		10.00	8.18	10.27	8.73	19.00	
R-squared [4]	0.2856		0.3015	0.2767	0.3290	0.3046	0.2906	
Time eff. [5]	0.0372		0.0080	0.2447	0.0034	0.3650	0.0038	
No switch [6]	0.0985		0.0002		0.0236		0.0709	
Shift [7]	0.098		0.105		0.137		0.109	
	0.3953		0.4632		0.2638		0.8259	

[1] GMM-sys estimates, see Blundell and Bond (1998), over the 1988-2006 period. Below each point estimate, we report the corresponding standard error is (in brackets) and the Student's *t*. [2] Bad times: when GAP ≤ 0; good times: when GAP > 0. [3] Average of the 11 country-effects estimates. [4] Proxied by the squared correlation between actual and fitted values. [5] Test for the null hypothesis that all the 18 time dummies are jointly zero, *p*-values. [6] *P*-values of the test for parameters (excluding ϕ^{C-1}_{gap}) being equal in the two sub-samples of good and bad times, *i.e.* for the restrictions collapsing 2SA to 2PA. ([7]) First row: estimate of the difference ${}_g\phi^{C-1}_{gap} - {}_b\phi^{C-1}_{gap}$ in good and bad times; second row: *p*-values of the test for the coresponding difference being zero (*i.e.* for the "no-shift" hypothesis).

Table 5 – *CAPB*–l Model with Additional Explanatory Variables (1)

Source:	OECD *ex post*		EC *ex post*		OECD with HP-GDP		OECD real-time	
Times (2):	bad	good	bad	good	bad	good	bad	good
	Explanatory factors of the "core" model (initial fiscal conditions and output gap):							
ϕ_{capb}	**–0.158**	**–0.206**	**–0.165**	**–0.178**	**–0.176**	**–0.173**	**–0.217**	**–0.160**
	(0.053)	**(0.056)**	**(0.053)**	**(0.058)**	**(0.057)**	**(0.050)**	**(0.057)**	**(0.052)**
	–2.98	***–3.70***	***–3.11***	***–3.06***	***–3.08***	***–3.44***	***–3.83***	***–3.09***
ϕ_{debt}	**0.010**	0.002	**0.009**	0.004	**0.012**	0.008	**0.012**	**0.013**
	(0.004)	(0.005)	**(0.004)**	(0.005)	**(0.004)**	(0.005)	**(0.004)**	**(0.005)**
	2.48	*0.44*	***2.36***	*0.79*	***2.84***	*1.58*	***3.12***	***2.74***
ϕ^{C-1}_{gap}	–0.041	–0.084	0.065	0.037	–0.033	0.036	**0.169**	**0.315**
	(0.049)	(0.104)	(0.0790)	(0.122)	(0.063)	(0.099)	**(0.087)**	**(0.177)**
	–0.83	*–0.81*	*0.82*	*0.30*	*–0.52*	*0.37*	***1.94***	***1.78***
	The effect of the electoral cycle (regular and snap elections) (3)*:*							
ϕ_{e1}	**–0.479**	**–1.274**	**–0.465**	**–1.065**	–0.312	**–1.102**	–0.300	**–1.251**
	(0.232)	**(0.338)**	**(0.256)**	**(0.333)**	(0.258)	**(0.294)**	(0.227)	**(0.340)**
	–2.06	***–3.76***	***–1.82***	***–3.20***	*–1.21*	***–3.75***	*–1.32*	***–3.68***
ϕ_{e2}	–0.320	**–0.624**	–0.045	–0.509	–0.258	**–0.540**	–0.109	**–0.652**
	(0.229)	**(0.331)**	(0.252)	(0.327)	(0.241)	**(0.311)**	(0.221)	**(0.307)**
	–1.40	***–1.88***	*–0.18*	*–1.56*	*–1.07*	***–1.74***	*–0.49*	***–2.12***
ϕ_{e3}	–0.336	–0.519	**–0.453**	–0.416	–0.365	–0.378	–0.084	–0.339
	(0.277)	(0.487)	**(0.269)**	(0.560)	(0.277)	(0.417)	(0.273)	(0.441)
	–1.21	*–1.07*	***–1.68***	*–0.74*	*–1.32*	*–0.91*	*–0.31*	*–0.77*
	The effect of the "Maastricht variable" (4)*:*							
ϕ_{m}	**–0.652**	–1.153	**–0.611**	–0.717	**–0.658**	–0.456	**–0.574**	0.329
	(0.143)	(0.849)	**(0.143)**	(0.542)	**(0.139)**	(0.329)	**(0.140)**	(0.877)
	–4.54	*–1.36*	***–4.28***	*–1.32*	***–4.71***	*–1.39*	***–4.09***	*0.38*
	The effect of the monetary conditions (5)*:*							
ϕ_{monpol}	–0.050	–0.122	0.032	–0.014	–0.033	**–0.148**	**–0.112**	–0.048
	(0.054)	(0.077)	(0.060)	(0.104)	(0.053)	**(0.076)**	**(0.058)**	(0.066)
	–0.92	*–1.58*	*0.54*	*–0.13*	*–0.62*	***–1.94***	***–1.93***	*–0.72*

	The role of fiscal institutions [(6)]:							
ϕ_{com} [(6)]	**0.688**	–0.176	**0.582**	0.059	**0.639**	–0.128	0.300	–0.066
	(0.249)	(0.339)	**(0.290)**	(0.379)	**(0.253)**	(0.339)	(0.249)	(0.312)
	2.77	*–0.52*	***2.01***	*0.16*	***2.52***	*–0.38*	*1.20*	*–0.21*
ϕ_{del} [(6)]	0.110	**–0.760**	0.172	–0.579	0.169	**–0.570**	–0.137	–0.041
	(0.239)	**(0.331)**	(0.256)	(0.385)	(0.246)	**(0.339)**	(0.240)	(0.336)
	0.46	***–2.30***	*0.67*	*–1.50*	*0.69*	***–1.68***	*–0.57*	*–0.12*
ϕ_{rule} [(6)]	0.181	0.164	**0.257**	0.163	0.127	0.189	0.135	0.029
	(0.116)	(0.167)	**(0.119)**	(0.178)	(0.115)	(0.157)	(0.105)	(0.165)
	1.56	*0.98*	***2.16***	*0.92*	*1.11*	*1.20*	*1.29*	*0.18*
	Other statistics:							
avg. μ_i [(7)]	–0.769	0.643	–0.491	1.154	–0.852	0.654	–0.448	0.842
	(0.474)	(1.139)	(0.479)	(1.689)	(0.440)	(1.441)	(0.447)	(1.626)
	–1.62	*0.56*	*–1.02*	*0.68*	*–1.94*	*0.45*	*–1.00*	*0.52*
$N \times T$	127	82	110	90	113	96	108	101
$\overline{\mathrm{T}}$	11.55	7.45	10.00	8.18	10.27	8.73	9.82	9.18
R-squared [(8)]	0.427	0.435	0.472	0.368	0.471	0.416	0.533	0.371
Time eff. [(9)]	0.109	0.186	0.017	0.453	0.086	0.199	0.001	0.081
	Asymmetry tests outcomes:							
No switch [(10)]	0.0112		0.0001		0.0115		0.0035	
Shift [(11)]	–0.043		–0.028		0.069		0.146	
	0.708		0.847		0.557		0.459	

[(1)] GMM-sys estimates, see Blundell and Bond (1998), over the 1988-2006 period. Below each point estimate, we report the corresponding standard error (in brackets) and the Student's *t*. In bold, estimates that are significantly different to zero at 10%. [(2)] Bad times: when GAP ≤ 0; good times: when GAP > 0. Details about data availability over the cycle are in Table 6. [(3)] Election explanatory dummy variables: $e1_{it}$ = 1 occurred in *t*; $e2_{it}$ = 1 in *t+1*; $e3_{it}$ = 1 snap elections. [(4)] Explanatory Maastricht variable, see Golinelli and Momigliano (2006). [(5)] Explanatory real short-term *ex ante* interest rate. [(6)] Fiscal governance form dummy variables: com_{it} = 1 committment; del_{it} = 1 delegation. Overall Index of national-level fiscal rules (ϕ_{rule}), see Ayuso-i-Casals *et al.* (2007). [(7)] Average of the 11 country-effects estimates. [(8)] Proxied by the squared correlation between actual and fitted values. [(9)] Test for the null hypothesis that all the 18 time dummies are jointly zero, *p*-values. [(10)] *P*-values of the test for parameters (excluding ϕ_{gap}^{C-1}) being equal in the two sub-samples of good and bad times, *i.e.* for the restrictions collapsing 2SA to 2PA. ([11]) First row: estimate of the difference ${}_g\phi_{gap}^{C-1} - {}_b\phi_{gap}^{C-1}$ in good and bad times; second row: *p*-values of the test for the coresponding difference being zero (*i.e.* for the "no-shift" hypothesis).

Table 6 – Size of Sub-samples Across Data Sources (Full Sample: 1988-2006)

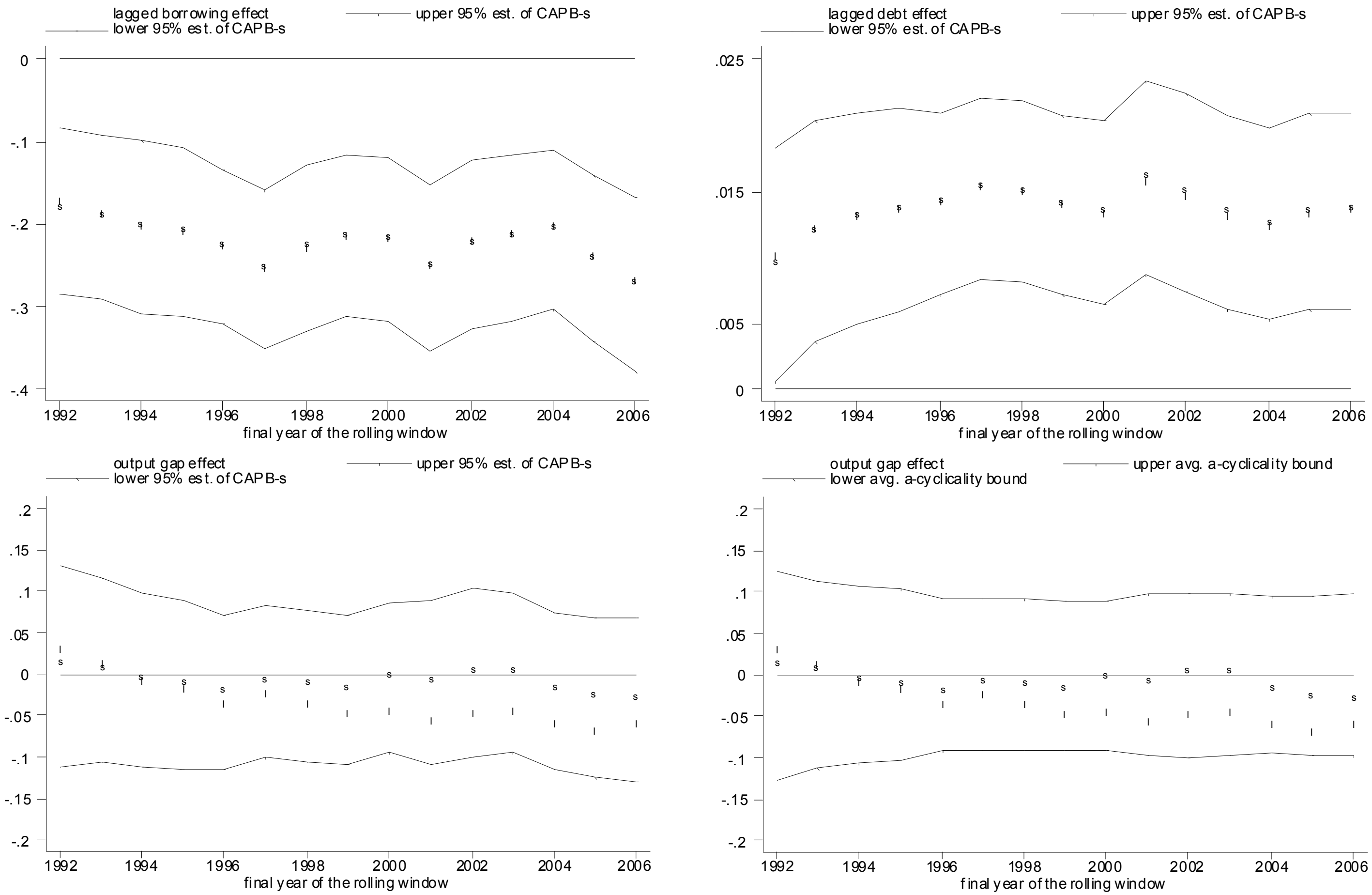
Data source:	**OECD** ***ex post***	**EC** ***ex post***	**OECD with HP-GDP**	**OECD real-time**
Total observations, of which:	209	200	209	209
- in good times	82	90	96	101
- in bad times	127	110	113	108
Regular elections in *t*, of which:	33	32	33	33
- in good times	13	19	18	17
- in bad times	20	13	15	16
Regular elections in *t*+1, of which:	38	36	38	38
- in good times	16	17	17	19
- in bad times	22	19	21	19
Snap elections in *t*, of which:	19	18	19	19
- in good times	6	4	6	9
- in bad times	13	14	13	10
Excess deficit cases, of which:	55	52	55	55
- in good times	7	8	13	2
- in bad times	48	44	42	53
Negative *ex ante* real interest rates, of which:	28	28	28	28
- in good times	13	15	12	9
- in bad times	15	13	16	19
Governance committment cases, of which:	67	67	67	67
- in good times	23	31	27	31
- in bad times	44	36	40	36
Governance delegation cases, of which:	68	68	68	68
- in good times	24	25	30	30
- in bad times	44	43	38	38

Table A1 – *CAPB-s* Model Estimates Using Alternative Approaches [1]

Instruments:					from *t–2* to *t–3*				from *t–2* to *t–4*			
Estimator:	**Pooled OLS**		**Within Group**		**GMM-dif**		**GMM-sys**		**GMM-dif**		**GMM-sys**	
Time dummies:	**no**	**yes**	**no**	**yes**	**no**	**yes**	**no**	**yes**	**no**	**yes**	**no**	**yes**
ϕ_{capb}	–0.186	–0.188	–0.251	–0.251	–0.506	–0.439	–0.201	–0.203	–0.409	–0.350	–0.202	–0.203
	(0.027)	(0.030)	(0.032)	(0.036)	(0.060)	(0.059)	(0.032)	(0.035)	(0.049)	(0.047)	(0.029)	(0.031)
	–7.01	*–6.22*	*–7.97*	*–7.05*	*–8.36*	*–7.40*	*–6.35*	*–5.81*	*–8.37*	*–7.38*	*–6.92*	*–6.44*
ϕ_{debt}	0.010	0.008	0.020	0.019	0.080	0.078	0.011	0.009	0.063	0.060	0.011	0.009
	(0.003)	(0.003)	(0.004)	(0.006)	(0.012)	(0.015)	(0.003)	(0.003)	(0.009)	(0.010)	(0.003)	(0.003)
	3.82	*2.93*	*4.57*	*3.51*	*6.84*	*5.21*	*4.24*	*3.48*	*6.98*	*5.77*	*4.17*	*3.28*
ϕ^{C}_{gap}	–0.119	–0.069	–0.097	–0.035	–0.059	0.082	–0.105	–0.042	–0.077	0.037	–0.110	–0.069
	(0.028)	(0.038)	(0.029)	(0.040)	(0.030)	(0.048)	(0.030)	(0.040)	(0.029)	(0.043)	(0.028)	(0.037)
	–4.31	*–1.81*	*–3.38*	*–0.86*	*–1.98*	*1.70*	*–3.53*	*–1.06*	*–2.66*	*0.86*	*–3.86*	*–1.85*
average μ_i [2]	–0.498	–0.572	–1.066	–1.485			–0.559	–0.145			–0.543	–0.131
	(0.172)	(0.526)	(0.269)	(0.532)			(0.173)	(0.394)			(0.172)	(0.393)
	–2.89	*–1.09*	*–3.96*	*–2.79*			*–3.23*	*–0.37*			*–3.15*	*–0.33*
Sargan test [3]					0.0000	0.0003	0.0261	0.0127	0.0007	0.0021	0.1045	0.0434
Dif-Sargan [4]							0.9999	0.9292			0.9875	0.9725
1st order AC [5]	0.8569	0.7605			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2nd order AC [5]	0.1364	0.1827			0.3871	0.4018	0.4293	0.3921	0.4166	0.4190	0.4309	0.3957

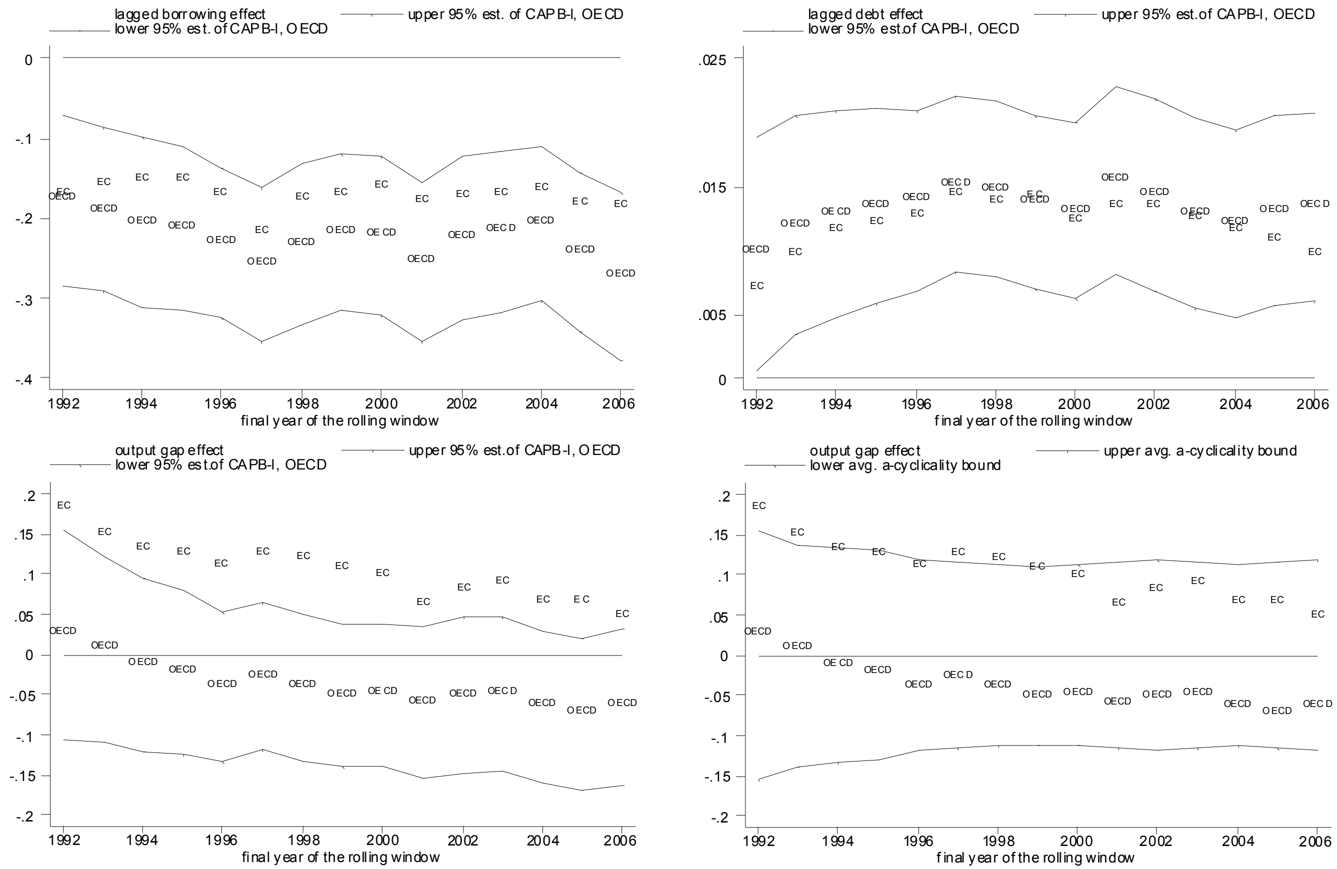
[1] Time period: 1988-2006, $N \times T$ = 300 (=289 for GMM-dif because the first observation is lost), $\overline{T}$ = 27.3 (26.3 for GMM-dif). Below each point estimate, the standard error (in brackets) and the Student *t*. [2] Average of the 11 country-effects estimates (except for the estimates in differences, *i.e.* for GMM-dif). [3] Overidentifying restrictions test, *p*-values. [4] Difference Sargan test for additional moment conditions embodied by GMM-sys, *p*-values. [5] Residuals autocorrelation test, *p*-values (not appropriate with within group transformed residuals).

Figure 1a – CAPB-s and CAPB-l Models Estimates with OECD *Ex Post* Data in Rolling Samples [1]



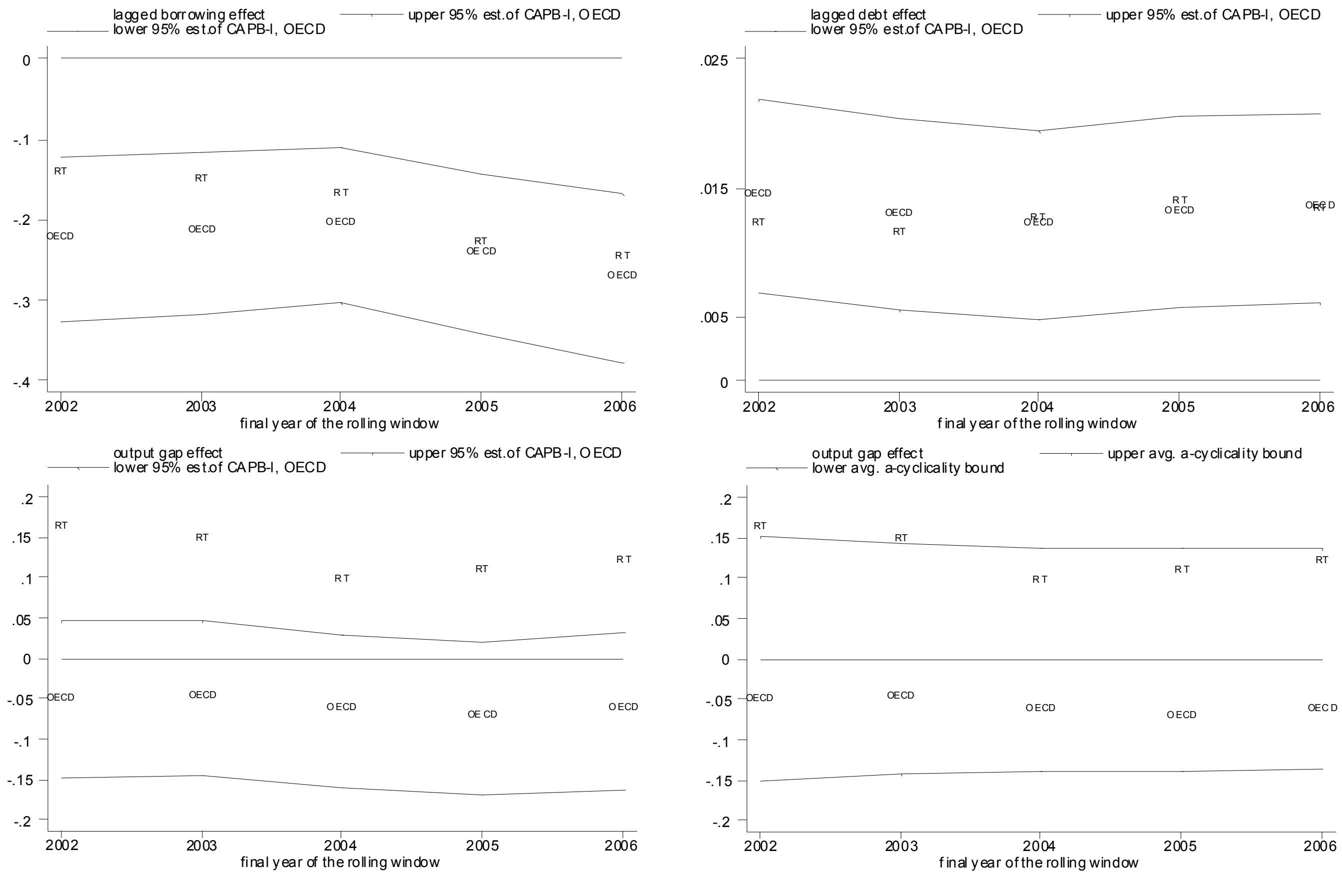
[1] The CAPB-s and CAPB-l Models estimates are indicated by *s* and *l* respectively. The first point estimates correspond to the 1978-92 sample, the last to 1992-2006. All the sub-samples cover a fixed 15-year period. In the first three graphs the 95% confidence intervals refer to the point estimate of the CAPB-s Model corresponding parameter. The fourth graph reports the zero-interval for both point estimates with the CAPB-s and CAPB-l Models (as such, it cannot use the standard error of only one model's estimate, but the average standard errors of both CAPB-s and CAPB-l Model estimates).

Figure 1b – CAPB-l Model Estimates with OECD and EC *Ex Post* Data in Rolling Samples [1]



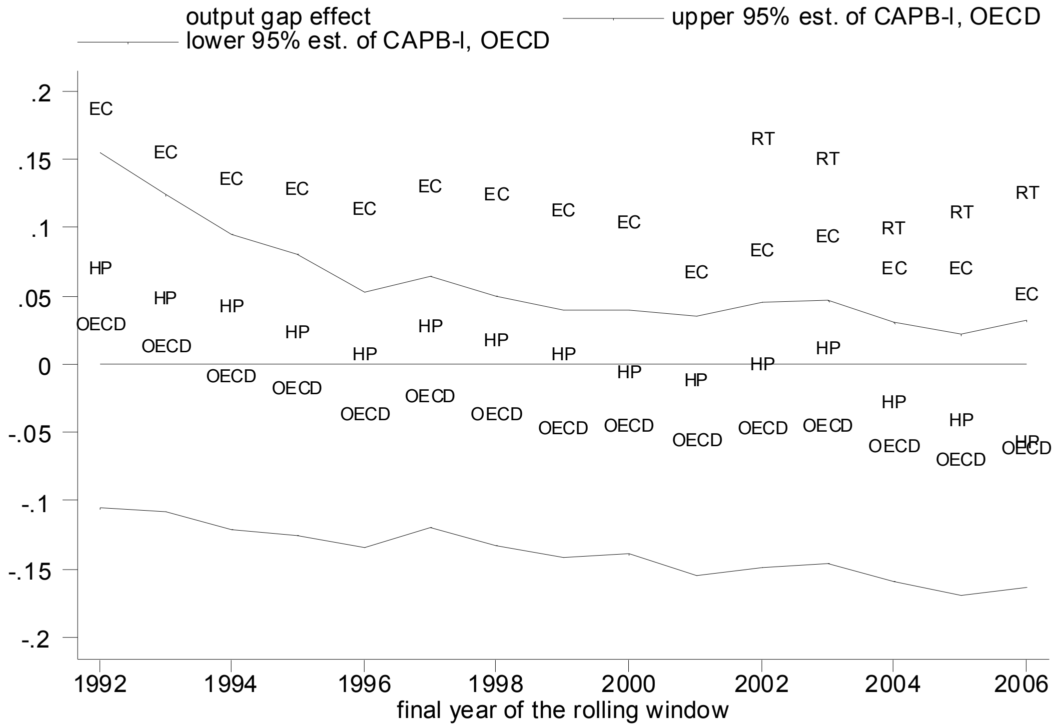
[1] The first point estimates correspond to the 1978-1992 sample, the last to 1992-2006. All the sub-samples cover a fixed 15-year period. In the first three graphs the 95% confidence intervals refer to the corresponding parameter point estimate with OECD data. The lower right-hand graph reports the zero-interval for point estimates with both OECD and EC data sources (as such, it cannot use the standard error of only one estimate from one source, but the average standard error of the estimates with both sources).

Figure 1c – CAPB-l Model Estimates with *Ex Post* and Real-time OECD Data in Rolling Samples [1]



[1] The first point estimates correspond to the 1988-2002 sample, the last to 1992-2006. All the sub-samples cover a fixed 15-year period. In the first three graphs the 95% confidence intervals refer to the corresponding parameter point estimate with *ex post* OECD data. The lower right-hand graph reports the zero-interval for point estimates with both *ex post* and real-time data (as such, it cannot use the standard error of only the estimate using *ex post* data, but the average standard error of the estimates with both *ex post* and real-time data).

Figure 1d – Estimates of $\phi^{C\text{-}1}_{gap}$ with Alternative Data Sources and Vintages in Rolling Samples (1)

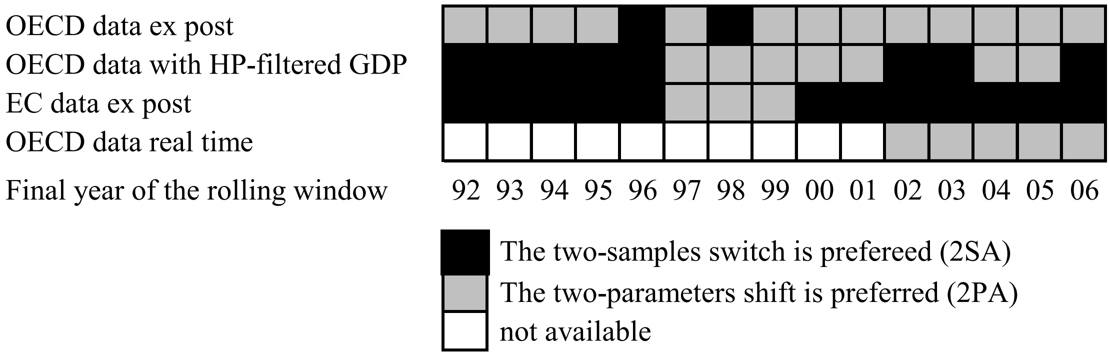


(1) The first point estimates correspond to the 1978-2002 sample, the last to 1992-2006. All the sub-samples cover a fixed 15-years period. The 95% confidence intervals refer to $\phi^{C\text{-}1}_{gap}$ estimates with *ex post* OECD data.

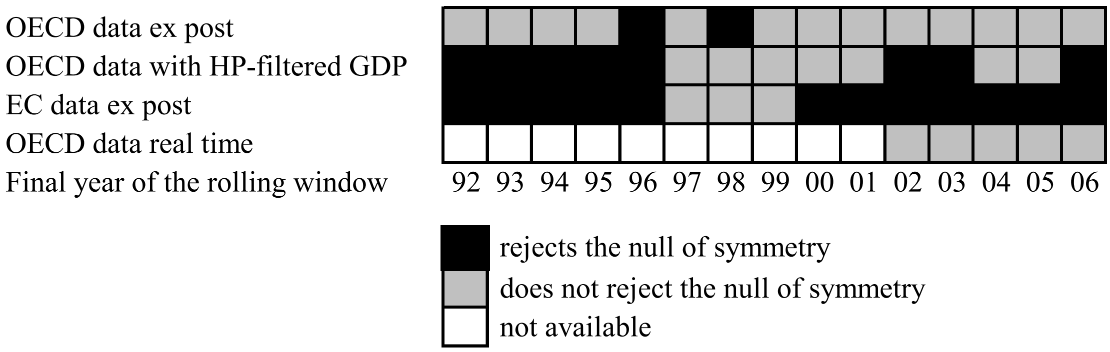
Legenda: Source of data: **OECD** = *OECD ex post* data; **HP** = *OECD ex post* data for initial fiscal conditions and HP-filterd GDP for the output gap; **EC** = *EC ex post* data; **RT** = real-time *OECD* data.

Figure 2a – Policy Asymmetry over the Cycle in Rolling Samples - CAPB-l Model [1]

(a) Selection of the most appropriate approach: either two-samples switch (2SA) or two-parameters shift (2PA) [2]



(b) Policy symmetry test outcomes using the more appropriate approach, 2SA *vs* 2PA [3]

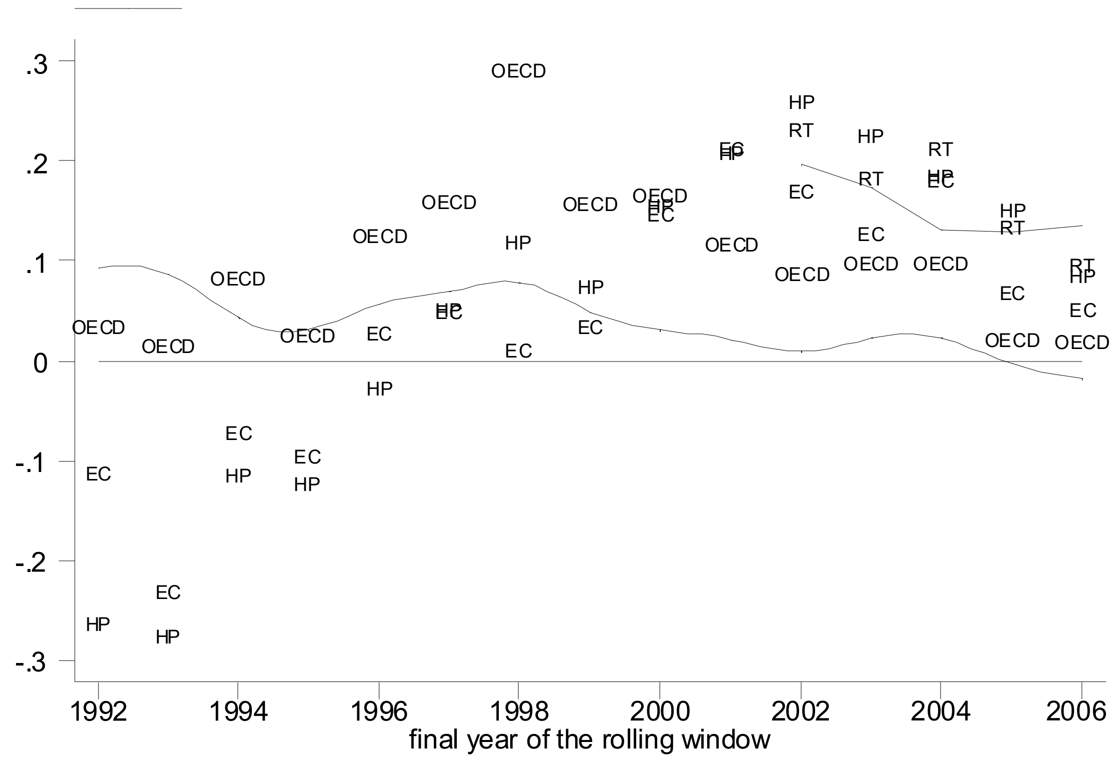


(1) The first point estimates correspond to the 1978-2002 sample, the last to 1992-2006. All the sub-samples cover a fixed 15-years period.

(2) The 2SA approach is appropriate at 5% (then preferred) when the shifts in both initial fiscal conditions and all the model's deterministic components (country and time fixed effects) are jointly significant.

(3) The 5% rejection of symmetric policies (under the null hypothesis) is based on the p-value of the most appropriate approach (either two-samples switch, 2SA, or two-parameters shift, 2PA, see panel above) using the indicated data source over the sample period ending in the corresponding year and starting 15 years before.

Figure 2b – Estimates of Parameter Difference in Good and Bad Times with Alternative Data Sources and Vintages in Rolling Samples (1)



(1) The first point estimates correspond to the 1978-2002 sample, the last to 1992-2006. All the sub-samples cover a fixed 15-years period. The lower spline (since 1992) measures the average of the ϕ^{C-1}_{gap} estimates with *ex post* data, the upper spline (since 2002) measures the average of the ϕ^{C-1}_{gap} estimates with real-time data.

Legenda: Source of data: **OECD** = *OECD ex post* data; **HP** = *OECD ex post* data for initial fiscal conditions and HP-filterd GDP for the output gap; **EC** = *EC ex post* data; **RT** = real-time *OECD* data.

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