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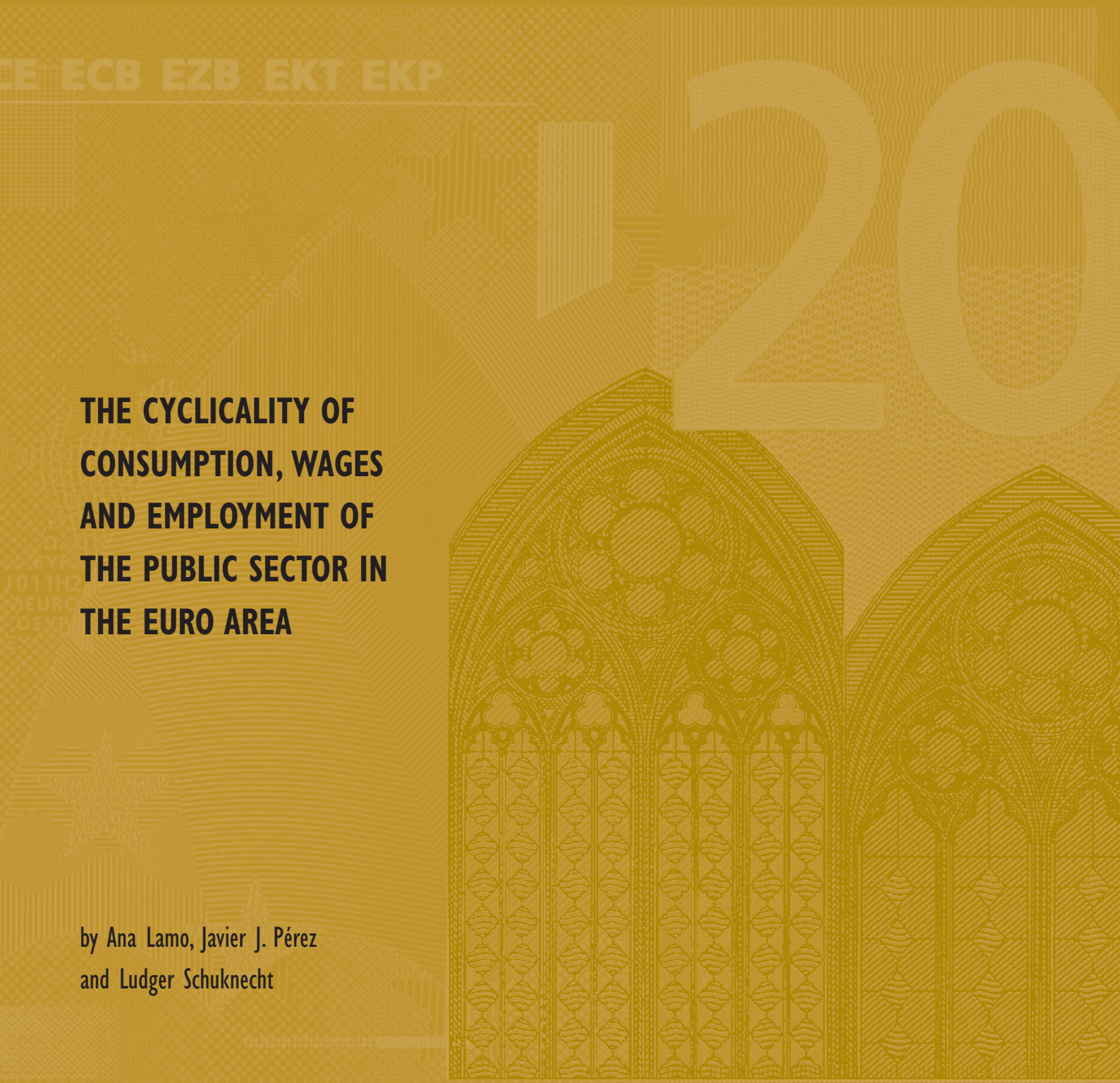

THE CYCLICALITY OF CONSUMPTION, WAGES AND EMPLOYMENT OF THE PUBLIC SECTOR IN THE EURO AREA

by Ana Lamo, Javier J. Pérez
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Abstract This study examines the business cycle behaviour of public consumption and its main components; the public wage bill (including compensation per employee and public employment) and intermediate consumption in the euro area aggregate, euro area countries and a group of selected non-euro area OECD countries (Denmark, Sweden, the UK, Japan and the US). It looks across a large number of variables and methods, using annual data from 1960 to 2005. It finds robust evidence supporting that public consumption, wages and employment co-move with the business cycle in a pro-cyclical manner with 1-2 year lags, notably for the euro area aggregate and euro area countries. The findings reflect mainly the correlation between cyclical developments (automatic stabilizers), but also point to the important role of pro-cyclical discretionary fiscal policies.

JEL Classification: E62; E63; H50.

Keywords: Public consumption, public wages, public employment, stylized facts, filtering, thick modelling

Non-technical summary

This study examines the cyclicality of public consumption and its main components, the public sector wage bill, compensation per employee, public employment and intermediate consumption. It looks at euro area countries and some other selected OECD countries (namely, the UK, Denmark and Sweden, the US and Japan) for the period 1960-2005. Moreover, it puts emphasis on analysisng the euro area aggregate given its importance for understanding the role of fiscal policies in EMU. The analysis is performed for several measures and components of public consumption and for three indicators of general economic activity (real GDP, real GDP per capita, and unemployment rate)to strengthen the robustness of results. Robustness is further corroborated by looking at the unconditional correlation between filtered/detrended series via various ways of filtering, and then synthesizing the results.[2] An additional feature of our approach is that we disentangle the part of the fluctuations around the trend that are driven by unpredictable or irregular components of the series (irregular shocks, ad-hoc policy measures, etc.) from those driven by the series inertia (systematic autocorrelation properties of the filtered series or broadly 'the cycle'). We refer to these as pre-whitened vs. detrended series. This is particularly relevant in our case as the irregular components are quite likely to reflect policy induced fluctuations, i.e. the dynamics of the series due to policy measures.

The study finds:

- Lagged pro-cyclicality appears as a dominant feature for the euro area and practically every euro area country for government consumption and most of its components; only non-euro area countries in our sample show somewhat different patterns. For the pre-Maastricht period, we find that correlation coefficients for the euro area and euro area countries are slightly larger than for the total observation period. This however does not suffice to draw conclusions whether there have been changes in fiscal behaviour over the past decade. Discretionary fiscal policies appear to play an important role in the pro-cyclicality of public sector consumption and its components in the euro area aggregate and a number of countries.

- More specifically, in the **euro area**, government consumption and all its components except intermediate consumption follow pro-cyclical patterns. When we filter out the dynamics of the series due to systematic autocorrelation (broadly the cycle) to end up with the irregular

[2]This is done, in the vein of thick modeling as proposed by Granger and Jeon (2004), by taking averages of the Fisher transformed correlations.

component (shocks and notably discretionary policies), co-movement patterns between the public sector compensation variables and the cyclical indicators are very similar (pro-cyclical with one lag) but less strong than for the detrended series. This indicates that the irregular component of these series is responsible for an important part of the series pro-cyclicality.

- Public consumption variables in **Germany** show a strong to moderate lagged pro-cyclical behaviour, which is amongst the strongest pro-cyclicality of all sample countries. The large coefficients for pre-whitened series also suggest that policy induced dynamics can be largely responsible for this pro-cyclical behaviour. For the pre-Maastricht period we find that pro-cyclicality of series appears slightly stronger.

- For **Italy**, **Spain**, **France**, and the **Netherlands** the lagged pro-cyclical behaviour of fiscal variables is confirmed for detrended series, and somewhat less for the pre-whitened series.

- It is interesting to notice that detrended series for **Netherlands** (Table 9), at least for some variables, in spite of the dominant lagged pro-cyclicality show contemporaneous a-cyclicality or weak counter-cyclicality. This is consistent with a relatively strict budget execution (where cyclical deviations manifest themselves in counter-cyclical fiscal effects) followed by expansionary dynamics as the additional income results in rising spending pressures. Similar evidence is found for some variables in the **UK** (Table 10) and the **US** (Table 11).

- In **Sweden** (Table 12) detrended series are mostly pro-cyclical while all the pre-whitened series co-move counter-cyclically giving an indication of counter-cyclical policy induce fluctuations.

- Two other non-euro countries in our sample, notably **Japan** and **Denmark** show a general pattern of counter-cyclicality.

These results are substantially robust given that they hold for six fiscal variables, three different measures of the business cycle, and a wealth of statistical methods. They broadly confirm a political economy view of the behaviour of public consumption, public compensation of employees and employment. They are also consistent with the anecdotal evidence of spending pressures building up over upswings and abating only as consolidation needs become stronger over a downturn. From a macroeconomic perspective, there may be a need to improve the stabilising role of public consumption, wages and employment in the euro area and in a number of countries.

1 Introduction

The role of fiscal policies in stabilizing the economy has received renewed attention since the creation of the European Economic and Monetary Union (EMU). As the single monetary policy is geared to maintaining price stability in the euro area as a whole, the monetary stance is not necessarily synchronized with the cyclical situation in all individual member countries. It has, therefore, frequently been argued that fiscal policies must take a greater role in demand and output stabilization over the business cycle in euro area countries than before EMU. But the role of fiscal policies in economic stabilization is also an important issue at the country level in and outside EMU, given that 1/3 to 1/2 of all economic resources in today's industrialised economies flow through the hands of government.

This study re-examines the business cycle behaviour of one of the main elements of public spending, i.e. public consumption, and its main components, the public sector wage bill, compensation per employee, public employment and intermediate consumption over the period 1960-2005 in the euro area and a number of non-euro area OECD countries. Their role in total demand and employment is very significant, with public consumption averaging roughly 20% of GDP and public employment amounting to about 15% of total employment.[1]

Other empirical studies on the pro- versus counter-cyclicality of fiscal policies are relatively few. They have typically focused on a limited number of OECD countries' fiscal aggregates (to our knowledge none so far have looked at the euro area as an economic entity) while paying relatively limited attention to the decomposition of spending and the vagaries of detrending fiscal and output series. The studies find mostly pro-cyclical fiscal behaviour. However, it is quite common to find that different detrending methods and even variable definitions and samples can lead to widely varying findings (for the behaviour of fiscal aggregates and major budgetary components, see Fiorito and Kollintzas 1994, Arreaza, Sorensen and Yosha 1999, Talvi and Vegh 2000, Ballabriga and Martinez-Mongay 2002 or Gali and Perotti 2003). The most comprehensive study of public expen-

[1]The literature suggests little consensus as to whether fiscal policies should have, are likely to have, or in fact do have a stabilizing effect on demand. Keynesian economics suggests that governments should and would stabilize demand by behaving counter-cyclically while the normative predictions from a neoclassical perspective depend on the relationship between private and public consumption. Political economy models generally predict pro-cyclical discretionary policies, e.g. due to competition amongst multiple power blocks leading to more than proportionate increases in public expenditure during upswings (the voracity effect defined by Lane and Tornell, 1999) or lobbying pressures rising disproportionately with improving primary balances (Talvi and Vegh, 2000).

diture cyclicality is Lane (2003), which estimates the elasticity of government expenditure and its components with respect to output for OECD countries for the period 1960-1998. Lane finds that government consumption in most countries behaves pro-cyclically, mainly due to the behaviour of wages.

This paper complements the existing empirical literature on the cyclicality of fiscal policies through its coverage and its methodological approach. As regards coverage, it focuses on government consumption and its sub-components, public compensation to employees and employment and intermediate consumption, covering then a broad and detailed set of fiscal variables. It examines the euro area aggregate, euro area countries and some selected non-euro area OECD countries (namely, the UK, Denmark and Sweden, the US and Japan) for the period 1960-2005.[2]

As regards methodology, the main aim of this study is to obtain the most robust results possible. To this end the analysis is performed for several measures and components of public consumption and for three indicators of general economic activity (real GDP, real GDP per capita, and unemployment rate). Moreover, to corroborate the robustness of results, the study looks at the unconditional correlation between filtered/detrended series via various ways of filtering (up to 14). Then, rather than choosing the results arising from a 'preferred' filter, which will discard information contained in the other filters, it takes an agnostic approach and summarises the results in the vein of thick modeling as proposed by Granger and Jeon (2004) by taking averages of the Fisher transformed correlations.

An additional feature of our approach is that we distinguish between the fluctuations around the trend that are driven by unpredictable or irregular components of the series (irregular shocks, ad-hoc policy measures, etc.) from those due exclusively to the series inertia (systematic autocorrelation properties of the filtered series). We find this particularly relevant as in our case the irregular components are quite likely to reflect policy induced fluctuations, i.e the dynamics of the series due to policy measures.

The study finds that lagged pro-cyclicality of public consumption, public wages and employment predominates for the euro area and practically every euro area country (and most notably for Germany). Only some of the non-euro area countries in our sample show somewhat different patterns. Automatic stabilisers but also discretionary fiscal policies appear to play an important

[2]Euro area countries in this study include all the current euro area countries except Luxembourg, and Slovenia which only joined recently. These are the following: Belgium, Germany, Greece, Spain, France, Italy, the Netherlands, Ireland, Austria, Portugal, and Finland.

role in the pro-cyclicality of public sector consumption and its components in the euro area aggregate and a number of countries. While the pre-Maastricht period (1960-1992) in euro area countries features somewhat larger correlation coefficients that the total sample, the evidence however does not allow drawing conclusions about changes in the fiscal policy behavior thereafter.

The study is organized as follows. Section 2 provides some stylised facts on public consumption and its sub-components to illustrate the relevance of these fiscal variables from a demand management perspective. Section 3 discusses the methodology and variables for the correlation analysis which follows in section 4. Section 5 concludes.

2 Some facts about public wage expenditure

Public consumption is one of the most important components of aggregate demand.[3] It ranges from about 15% to 25% of GDP in our sample countries (Figure 1, panel 1). The euro area average of 20% of GDP is well below peak figures for France, the Netherlands and the Nordic countries. Public consumption in Ireland and the US is distinctly below average. In most cases public consumption amounts to 40-50% of total public spending (panel 2).

The three main components of public consumption include public wages, intermediate consumption (including everything from pencils, to cars and office space consumed by the public sector) and social transfers in kind (mainly education and medical services). Public wages (or more precisely the public compensation bill) comprise broadly half of public consumption or over 10% of GDP in the euro area. This share, however, is significantly higher in France, Portugal and the Nordic countries and significantly lower in Germany and Japan (panel 3).[4] Intermediate consumption (panel 4) amounts to broadly one quarter of government consumption or 5% of GDP and there is again significant variance across countries that is broadly correlated with the pattern for public wages.[5]

[3]For data sources and variable definitions refer to the Appendix.

[4]Even though the size of government consumption over GDP is similar in Germany and other euro area countries, the composition of government consumption is somewhat different. Compensation of employees makes up around 40% of total government consumption in Germany against 55% in France, Italy or Spain. At the same time, the item "social transfers in kind provided via non government units" (reimbursements of social security benefits and social assistance benefits) amounts to 40% of government consumption in Germany, compared to 25% in France and Italy or 14% in Spain. The case of the Netherlands is similar to that of Germany.

[5]The interpretation of Intermediate consumption might be somewhat biased in the case of the UK. UK National Accounts do not contemplate a formal social security sector, and thus a great deal of expenditure items under "social transfers in kind provided via non government units" are recorded under Intermediate consumption. This explains

Public consumption reflects the importance of government as an employer. Panel 5 of Figure 1 illustrates that in the euro area roughly 15% of total labor force is with the public sector. Small public work forces in Germany, the Netherlands or Japan comprise around 10% of the total work force whilst for some countries this share is about twice as high (notably in Portugal, France and the Nordic countries). The euro area average is broadly comparable to the UK and the US. It is noteworthy that public employment and relative public-private sector wages tend to be inversely related (panels 5 and 6 of Figure 1). The Nordic countries and France report large public employment coupled with low wages compared to the private sector. Ireland, the Netherlands, Germany and Spain in the euro area and Japan outside, by contrast, have the smallest public work forces and the highest relative wages per employee.[6]

Comparing the early 1990s and the early 2000s, there are some significant changes in public consumption patterns. While euro area average spending remained broadly unchanged, a few European countries that have reformed public expenditure policies significantly since the early 1990s have also successfully reduced public consumption as a share of GDP. These countries include notably Ireland, Finland and Austria and, perhaps to a lesser extent Germany and the US. By contrast, Portugal, Greece, France, Belgium and Japan have increased public consumption spending (Figure 2, panel 1).

Public consumption as a share of total spending has somewhat increased (Figure 2, panel 2) as other spending components (notably interest spending and in some cases transfers and public investment) shrank. Public wages and employment went slightly down as a share of GDP for the euro area while intermediate consumption remained unchanged (Figure 2, panels 3 -5). Cross-country developments in public wages and employment broadly mirror those for total public consumption. Relative wages between the public and the private sector have increased in the euro area, especially in Germany, Japan, Austria and Ireland in the previous decade, while they fell most notably in Portugal (and to a lesser extent in Spain and the US).

Finally, it is noteworthy that none of the figures show a 'catching up' or convergence in cross-country figures. Relative increases in spending, employment and relative wages do not seem to be correlated with a starting point below (euro area/sample) average in any of the displayed categories.

that this latter item amounts to some 50% of total government consumption in the UK statistics.

[6]Note that the relative public-private sector wages ratios can be affected by a different occupational composition in the public versus private sector.

3 Measuring business cycle behaviour of public consumption

To describe the degree of cyclicality of public consumption (and its components) we look at co-movements of this variable (detrended) and several measures of economic activity, also detrended. Focusing on co-movements of detrended variables is general practice in empirical business cycle literature, where the business cycle is usually defined as the recurrent fluctuations of some aggregate time series (GDP, GNP, unemployment rates, etc.) from trend, and therefore business cycle regularities are widely understood as observed statistical properties of these deviations from trend (see Lucas, 1977).

Three decisions to be taken are therefore how to calculate deviations from trend, what variables should be used, and what kind of statistical properties to look at. The choices on these three dimensions have generated a diversity of results in the literature that are not always easy to reconcile (see for example Canova, 1998). Another source of disparity in the results of the empirical literature is related to measurement issues regarding the raw data, e.g. how to deflate GDP or what measure of earnings to use when looking at wages.[7]

Regarding the selection of variables we use three indicators of economic activity (namely real GDP, real GDP per capita and the unemployment rate), two different variables that measure public sector wages (total compensation of public sector employees, per capita compensation of public sector employees), plus some related, less controversial measures of other government consumption related variables (total public consumption, per capita public consumption, intermediate consumption and public employment). All the variables are in logs.

As for the statistical measure of co-movement between two series, we choose the Cross Correlation Function (CCF thereafter).

As regards detrending methods, we use a variety of filters, with each detrending filter extracting a different kind of information from the raw data when removing the trend. Given that one cannot discern what method is the correct one in each case, we take an agnostic approach and to avoid discarding relevant information we opt for summarising that information.

The underlying assumption to detrending filters is that aggregate economic series can be decomposed into a trend component T_t, the so-called cyclical component C_t that fluctuates around the trend, and an unpredictable random component (or irregular component ϵ_t). Most of the de-

[7] See for example Abraham and Haltiwanger (1995) that offers a review of the debate on wage cyclicality. They report pro- or counter-cyclicality depending on the measure of real wages used and on the business cycle indicator.

trending filters take out the trend component from the original series, so that both the cyclical and irregular components $C_t + \epsilon_t$ are taken as measure of the cycle. Therefore, it is not clear whether the co-movement patterns of the variables are driven by the systematic autocorrelation properties of the filtered time series or by irregular components. To address the relevance of using detrended series to measure the cyclical behaviour of such a series we use a second set of methods that exclusively focus on the non-systematic behavior of the series (irregular component). In fact, our variables of interest, public consumption and its components, possibly follow a dynamics that is driven more by government decisions rather than by the systematic autocorrelation of the series stemming from cyclical patterns.

3.1 First group of filtering methods

Among the first group of filters, i.e. detrending filters, we will use the following:

First order differences First order differencing takes the cycle to be the variable in first differences. In other words, it assumes that the trend is the lagged variable, or similarly the series is a random walk with no drift. Therefore y_t can be represented as:

$$y_t = y_{t-1} + C_t + \epsilon_t \tag{1}$$

where the trend is $T_t = y_{t-1}$ and an estimate of the detrended component is obtained as $y_t - y_{t-1}$.

Deterministic trends Assuming deterministic trends is another possibility; the usual procedure to remove them is to take the least squares residual after regressing the series on a constant and a polynomial function of time. The implicit assumption is that the trend and cyclical components are orthogonal, and that T_t is a deterministic process which can be approximated with polynomial functions of time. These assumptions imply a model for y_t of the form:

$$\begin{aligned} y_t &= T_t + C_t + \epsilon_t \\ T_t &= f(t) \\ f(t) &= a_0 + a_1\ t + a_2\ t^2 ... + a_h\ t^h \end{aligned} \tag{2}$$

where h is the order of the polynomial. Even though the disturbance may be serially correlated, it can be shown that the unknown parameters in $f(t)$ can be estimated efficiently by ordinary least squares. In this paper we take $h = 2$.

HP Filter The Hodrick and Prescott filter (HP Filter) is perhaps the most popular filter in applied macroeconomics. This filter extracts a stochastic trend that moves smoothly over time and is not correlated with the cycle component. An estimate of the trend component is obtained by minimising:

$$\min_{\{T_t\}_{t=1}^{T}} \left[\sum_{t=1}^{T} C_t^2 - \lambda \sum_{t=1}^{T} \left((T_{t+1} - T_t) - (T_t - T_{t-1}) \right) \right]^2, \quad \lambda > 0 \tag{3}$$

The HP filter crucially depends on a smoothing parameter (λ) that penalizes large fluctuations. A large λ implies a higher penalty and, therefore, a smoother cycle. For annual data the value of λ typically used has been 100, although recent studies suggest that lower values leave cycles of more reasonable duration. In particular, it has been shown that λ values of 6.25 deliver cycles of similar length to the cycles resulting with quarterly data when using λ of 1600, which is the standard value (see Ravn and Uhlig, 2001). We therefore calculate two versions of the HP filter, one with λ equal 100 and another one with λ equal 6.25.

Band pass filter The band pass filter, is a frequency domain based filter. It assumes that the trend component has the power at lower frequencies of the spectrum. The choice in this procedure is to define the limits of the frequency band, say p_l and p_u, to isolate the cyclical component with a period of oscillation between p_l and p_u. We use an 'optimal' finite sample approximation for the band pass filter as proposed by Christiano and Fitzgerald (2003). We make two choices for the cycle length between 2 and 8 years, $\{p_l, p_u\} = \{2, 8\}$, and between 2 and 6 years, $\{p_l, p_u\} = \{2, 8\}$, removing thus all the fluctuations that have a periodicity larger than 8(6) or smaller the 2 years.

Unobserved components models We consider structural time series models in the vein of the basic structural model in Harvey (1989):

$$y_t = T_t + C_t + \epsilon_t \tag{4}$$

where T_t is the trend component, C_t the cyclical component and and ϵ_t a white noise disturbance term which is assumed to be uncorrelated with any stochastic elements in the other components. The trend is specified as:

$$\begin{aligned} T_t &= T_{t-1} + S_t^T + \epsilon_t^T \\ S_t^T &= S_{t-1}^T + \epsilon_t^{S^T} \end{aligned} \tag{5}$$

where ϵ_t^T and $\epsilon_t^{S^T}$ are mutually uncorrelated white noise disturbances with zero means and variances $\sigma^2_{\epsilon_t^T}$ and $\sigma^2_{\epsilon_t^{S^T}}$. This model is known as the local linear trend model. Note that if $\sigma^2_{\epsilon_t^{S^T}} = 0$,

the model collapses to a random walk plus drift specification (local level model). If both $\sigma^2_{\epsilon_t^{ST}} = 0$ and if $\sigma^2_{\epsilon_t^{T}} = 0$ then the model for the trend is simply a linear trend.

The cyclical component C_t is assumed to be a stochastic cycle, a mixture of sine-cosine waves in a given period shocked with disturbances. The statistical specification of C_t is as follows:

$$\begin{bmatrix} C_t \\ C_t^* \end{bmatrix} = \rho \begin{bmatrix} \cos(\omega_c) & \sin(\omega_c) \\ -\sin(\omega_c) & \cos(\omega_c) \end{bmatrix} \begin{bmatrix} C_{t-1} \\ C_{t-1}^* \end{bmatrix} + \begin{bmatrix} \kappa_t \\ \kappa_t^* \end{bmatrix} \tag{6}$$

where ω_c is the frequency, in radians, in the range $0 < \omega_c < \pi$, κ_t and κ_t^* are the two mutually uncorrelated white noise disturbances with zero means and common variance σ^2_κ, and ρ is a damping factor. Note that the period is $2\pi/\omega_c$.

The estimated models for the empirical exercise are the following. First, we take the basic structural model and adjust the smoothness of the trend, looking at three cases: (i) linear trend model ($\sigma^2_{\epsilon_t^{ST}} = 0$ and if $\sigma^2_{\epsilon_t^{T}} = 0$) plus cycle; (ii) local level model ($\sigma^2_{\epsilon_t^{ST}} = 0$) plus cycle; and (iii) local linear trend model plus cycle. Next, we maintain assumptions (ii) and (iii) for the trend, and adjust the model for the cycle allowing for cycles of period 2 to 6 years to be estimated (not just one $2\pi/\omega_c$ as in the basic case) using the so-called DHR (Dynamic Harmonic Regression) methods as in Young, Pedregal and Tych (1999). All in all, we fit 5 different unobserved components models to the data.[8]

3.2 Second group of filtering methods

The second group of filtering methods try to isolate the pure irregular component of the time series of interest. In this paper we follow three different strategies to do so.

Univariate pre-whitening André, Pérez and Martin (2002) propose studying the co-movement between economic variables using the cross correlation function of pre-whitened variables, where all the inertia of the series (from both the trend and cyclical part) has been filtered out, and the component for which the correlations are calculated reflects only the non-systematic behavior of the series. This method requires stationary series; therefore we apply it to the series detrended following every one of the procedures described in Section 3.1.

In practical terms, whitening the series can be done by taking the residual from an ARIMA

[8] All models were estimated by exact maximum likelihood using the MATLAB toolbox of Pedregal (2004).

model fitted to the series.[9] In formal terms, let's assume that a given time series y_t is representable by a linear model of the general ARIMA class $\phi(B)y_t = \theta(B)\epsilon_t$ where ϵ_t is a white noise variable, and $\phi(B)$, $\theta(B)$ are polynomials in the lag operator B. Pre-multiplying y_t by an estimate of $\theta(B)^{-1}\phi(B)$ provides a pre-whitened version of y_t, which is an estimate for ϵ_t, a white noise variable representing the purely stochastic component of y_t.[10] If the series y_t follows the above mentioned ARIMA process, the dynamic properties of the detrended series, call it y_t^F can be studied by means of expression $y_t^F = F(B)y_t = F(B)\frac{\theta(B)}{\phi(B)}\epsilon_t = \Pi(B)\epsilon_t$, where F(B) is the filter applied to detrend the series. Thus, obtaining an estimate $\hat{\Pi}(B)$ of $\Pi(B)$ it is possible to generate the pre-whitened series $\hat{\epsilon}_t = \hat{\Pi}^{-1}(B)y_t^F$.

If properly applied this method should be independent of the filtering procedure as it only looks at the irregular component. In this paper we approximate $\hat{\Pi}(B)$ by a pure AR(3) polynomial, which proved to be a fair approximation for most of the series given its annual frequency. It must be mentioned that the cross correlation between pre-whitened series is proportional to the impulse response function.

Direct univariate pre-whitening In this case we pre-whiten directly the series of interest by using the optimal ARIMA model as estimated by the well known program TRAMO. I.e. we use the estimate irregular component $\hat{\epsilon}_t = \hat{\theta}(B)^{-1}\hat{\phi}(B)y_t$ provided by TRAMO.[11]

Bivariate pre-whitening A recent, quite influential paper that also relies on the idea of pre-whitening for measuring cyclical co-movements is den Haan (2000). Den Haan proposed using the correlation coefficients of VAR forecast errors at different forecast horizons as a measure of co-movements of the series in the VAR. In fact, the correlation between the one-step ahead forecast errors in the VAR can be understood as a kind of bi-variate whitening, as it takes the innovation from the bi-variate VAR as measure of the cyclical component, and by doing that, it is focusing also on the irregular components of the two series under analysis. Den Haan's procedure can be used for stationary as well as integrated series, so that no de-trending of series is required.

[9] See for example André, Pérez and Martin (2002), André and Pérez (2005), Box, Jenkins and Reinsel (1994), or Bartlett (1955).

[10] Pre-whitening has been traditionally performed with ARIMA specifications, but the basic concept applies to any other econometric representation. An ad hoc pre-whitening procedure could be designed to address any econometric setting, depending on the available information.

[11] TRAMO stands for 'Time Series Regression with ARIMA noise, Missing Values and Outliers'. See Gómez and Maravall (1996).

There is also a direct relation between Den Haan's measures and the impulse response function. The covariance of the k-period ahead forecast errors is the accumulated product of the k-steps impulse response function over all fundamental shocks. An important advantage of den Haan's procedure over the standard VAR approach (which relies on impulse response functions to analyzing cycles) is that it does not require identification restrictions. In this paper we run Den Haan's method assuming: (i) unit root in the variables, (ii) no unit root in the variables.

3.3 Empirical approach

In this section we calculate the correlations between our six fiscal variables, namely: government expenditure on final consumption, real government expenditure in final consumption per public employee, real compensation of public employees (or public wage bill), public compensation per employee, number of public employees, and public sector intermediate consumption, and three business cycle indicators, namely: GDP at constant prices (base 2000), real GDP per capita, and the unemployment rate. All in all, we calculate over 25 CCFs (11 for detrended and 14 for pre-whitened) for each pair of variables, for two sample periods (1960-2005, 1960-1992). We end up with about 81,000 correlations.

For each pair of variables, each CCF is using different information as different detrending methods yield different fluctuations. Deciding that one of them is the preferred one, independently of the criteria used to take the decision, will discard useful information contained in the not selected CCFs. To avoid that, we therefore take an agnostic approach by applying the idea of 'thick modeling' as proposed by Granger and Jeon (2004). This argument would not apply to pre-whitened methods given that, if properly applied, results should be independent of the detrending method. Nevertheless, given the approximate nature of pre-whitening methods we apply the same 'thick modeling' approach to these kind of methods.

According to Granger and Jeon (2004) "thick modeling consists of using many alternative specifications of similar quality, using each to produce the output required for the purpose of the modeling exercise, such as a set of forecasting, policy scenarios, elasticity estimates, or test of some hypothesis and then combine or synthesize the results." A simple method to do this could be to average over the results. This is, however, not suitable when combining correlation coefficients which are not normally distributed variables, which can exhibit substantial variability, and which are not additive.

To combine the correlation coefficients we follow David (1949) who proposes using Fisher trans-

formations to normalize their distribution and stabilize their variance.[12] The transformed coefficients can then be averaged as usual. Once the average is computed, we need to undo the Fisher transformation to get the correlation coefficient that summarizes the information contained in the combined correlation coefficients. This transformation greatly reduces the skew in the distribution, potentially yielding a more accurate estimate of the population correlation. In addition, the result of the transformation is minimally biased in small samples.

Let $r_1, ...r_N$ be all the correlation coefficients we want to combine, where N is the number of detrending/prewhitening methods used. Call R the summary correlation coefficient (proxy to population correlation). To combine $r_1, ...r_N$ into R we proceed in three steps. We need first the Fisher's transformations of each r_i, defined by:

$$z_i = \frac{1}{2}\log\left(\frac{1+r_i}{1-r_i}\right)$$

Each z_i is approximately normally distributed with variance $\frac{1}{T_i}$ where T_i is the sample size used to calculate r_i. Using these transformations, the coefficient that summarizes the correlations may be calculated as the sample mean.

$$Z = \sum_{i=1}^{N} \frac{z_i}{N}$$

This expression is then approximately normally distributed with variance $\frac{1}{\sum_{i=1}^{N} T_i}$. Once Z is computed, we can undo the transformation to get the summary correlation coefficient:

$$R = \frac{\exp(2\ Z) - 1}{\exp(2\ Z) + 1}.$$

The cyclical behaviour of a filtered (fiscal) variable of interest, say X, is characterised as follows:[13] given the CCF between filtered Y (indicator of economic activity) at time t, and filtered X at time $t+k$, it is said that X is pro-cyclical if the maximum value in absolute terms of the estimated correlation coefficient R (call it dominant correlation), is positive, counter-cyclical if it is negative, and a-cyclical if it is close to zero. More specifically, the series is a-cyclical if the dominant correlation in absolute terms is smaller than 0.20. We take maximum values of R in

[12] In the somewhat related literature on meta-analysis the basic principle is to calculate effect sizes for individual studies, convert them to a common metric, and then combine them to obtain an average effect size (see Rosenthal 1991). In an application to economics Camacho, Pérez-Quirós and Sainz (2006) also use Fisher transformations to combine correlation coefficients.

[13] See for example Kydland and Prescott (1990) and Fiorito and Kollintzas (1994).

the ranges 0.20-0.39 and 0.40-0.49 as evidence of weak and moderate cyclicality respectively. We refer to strong pro-/counter-cyclical series if in absolute terms it is larger or equal to 0.50. The cutoff point 0.2 was chosen because it roughly corresponds in our sample to the value required to reject at the 5% level of significance the null hypothesis that the population correlation coefficient is zero.[14] Finally X is said to be leading (lagging) the cycle if the maximum R is reached for negative (positive) values of k.

4 Results

The results of the correlations are presented in Tables 1 to 12.

The two panels of Table 1 provide detailed results over all methods for the co-movement of total compensation of public employees with real GDP and the unemployment rate respectively for the **euro area**. The first five columns of each panel are correlations of detrended series, while the other five are correlations of pre-whitened series. In other words, the first panel shows standard correlation coefficients assessing the degree of co-movement between detrended series (i.e. the cyclical plus irregular components). Thus, these co-movements combine the contribution of systematic factors (operation of the so-called automatic stabilizers) and non-systematic (irregular) factors. In our case this can be fairly interpreted as correlations between business cycle shocks and discretionary fiscal policy shocks. The second panel shows correlations in which the impact of the systematic factors (automatic stabilizers) have been removed, and focuses on the co-movements exclusively due to non-systematic factors (purely irregular component or shocks). The combined (average) correlation coefficients following the use of Fisher transformations are reported at the bottom of the two panels.[15] In this example, the large majority of methods deliver dominant correlations that tend to be in line with the dominant correlations chosen according to the combined correlation, even though there is some variation in the specific quantitative values, and some methods show a dominant correlation that it is not in line with this combined one. It is worth noticing that the dispersion is lower in the case of the correlations among non-systematic components (shocks), with

[14] The cutoff point for the combined correlation in the case of combining independent correlation coefficient estimates, which is not strictly our case, would be slightly above 0.1. Nevertheless, some studies recommend (see Rosenthal 1991) to calculate the probabilities for combined correlation by combining the individual probability values of each correlation coefficient, in which case our cutoff point would be close to 0.3. We take 0.2 as a compromise between the two alternatives which is in line with the cutoff values normally used in the literature.

[15] Similar tables for each pair of variables and for each country are available from the authors.

is expected given the presumption that after pre-whitening all methods should provide a roughly similar estimate of the correlations among shocks. Figure 3 provides some visual complementary information on the dispersion of individual methods from the Fisher transformation summary measure, for the euro area, two business cycle indicators, and the six fiscal variables.

In order to synthesize the large amount of information available, Tables 2 to 11 only display the findings for the co-movement of the cycle with all the six fiscal variables for the combined correlation (combination of the Fisher transformation of the correlation coefficients) across all methods for the euro area, Germany, France, Italy, Spain, the Netherlands, Sweden, the UK and the US. Tables 13 and 14 summarise the cyclical pattern of public consumption variables in the rest of the sample countries. Again, we distinguish the average of the detrended series from the average of the pre-whitened series.

In the **euro area**, government consumption and all its components except perhaps intermediate consumption follow a pro-cyclical pattern (see Table 2). More specifically, detrended real compensation of public employees (total public wage bill) and detrended public compensation per employee both follow pro-cyclically all three measures of the business cycle with a one year lag. The pro-cyclicality is strong in both cases, with average correlation coefficients ranging from 0.51 to 0.74 in the first case, and from a 0.55 to 0.63 in the case of detrended public compensation per employee. When we filter out the dynamics of the series due to systematic autocorrelation to end up with the irregular component, co-movement patterns between the public sector compensation variables and the cyclical indicators are very similar (pro-cyclical with one lag) though less strong than for the detrended series (with coefficients from 0.35 to 0.42). This indicates that the unpredictable component of these series, which include shocks, policy measures, etc. is responsible for an important part of the pro-cyclicality of fiscal series.

Public employment follows real GDP and GDP per-capita pro-cyclically with a two year lag, but this result is not that clear when the unemployment rate is used as the cyclical indicator. The importance of the irregular component in generating this pro-cyclical pattern is borderline, as the non-systematic part of the series is still positively correlated with the cycle, also at a two year lag, but the correlation coefficient barely reaches 0.28. Intermediate consumption seems to be the item that behaves the most a-cyclical or even counter-cyclical. The detrended series does not show a clear pattern, but it becomes clearly counter-cyclical although non-significant in the pre-whitened case. Overall, public consumption and public consumption per employee exhibit strong pro-cyclical dynamics that become weaker when looking only at the non-systematic component.

From a policy perspective it is also interesting to see whether fiscal policy behaviour has changed over time. Unfortunately, the need for sufficiently long time series allows little examination of this issue. We limited the examined sub-sample to the pre-Maastricht period to assess the relative strength of correlation and, thereby, indirectly see whether there may be a difference between the two periods. Our findings suggest that for the euro area (and sample countries) the co-movement is very similar in the pre-Maastricht period than in the total sample period with perhaps slightly more pro-cyclicality for the pre-Maastricht period (see Table 3).[16]

This, however, does not suffice for deriving conclusions on differences in pre- and post-Maastricht fiscal behaviour of euro area countries.

Public consumption variables in **Germany** show a strong to moderate pro-cyclical behaviour with a one year lag (two years lag in the case of public employment) when using both de-trended and pre-whitened series (see Table 4). The large coefficients for pre-whitened series also suggest that policy induced dynamics are largely pro-cyclical. For the pre-Maastricht period we find that pro-cyclicality is slightly stronger (see Table 5).

For **France**, **Italy**, **Spain** and the **Netherlands** (see tables Table 6 to 9) we find moderate to strong contemporaneous or lagged pro-cyclical behaviour of compensation of employees and per employee, public employment and total government consumption for detrended series but only weak or no pro-cyclicality for the pre-whitened series. The latter indicates that discretionary policies are not responsible for the pro-cyclical behaviour of these fiscal variables. The picture is less clear for intermediate consumption.

It is interesting to remark that detrended series for the **Netherlands** (Table 9), at least for some variables, in spite of the dominant lagged pro-cyclicality show contemporaneous a-cyclicality or weak counter-cyclicality. This is consistent with a relatively strict budget execution (where cyclical deviations manifest themselves in counter-cyclical fiscal effects) followed by expansionary dynamics as the additional income results in rising spending pressures. Similar evidence is found for some variables in the **UK** (Table 10) and the **US** (Table 11).

A remarkable case is also **Sweden** (Table 12) where detrended series are mostly pro-cyclical but all the pre-whitened series co-move counter-cyclically. With the exception of the other two non-euro area countries, **Denmark** and **Japan**, the rest of the countries show a general pattern of pro-cyclicality as summarised in Tables 13 and 14. In general, non-euro area countries in our

[16] Gali and Perotti (2003) find less pro-cyclical policies post Maastricht than pre-Maastricht for many euro area countries.

sample deviate somewhat from the general patterns of lagged pro-cyclicality of public consumption, public wages and employment observed in euro area countries.

5 Conclusions

This study looks at the cyclicality of public consumption and its main components, the public sector wage bill, compensation per employee, public employment and intermediate consumption. It looks at the euro area aggregate, euro area countries and some OECD non- euro area countries (namely, the UK, Denmark and Sweden, the US and Japan) for the period 1960-2005.

It finds strong evidence of lagged pro-cyclicality for government consumption and most of its components in the euro area and euro area countries. The findings reflect mainly the correlation between cyclical developments, but pro-cyclical discretionary fiscal policies also appear to play an important role in the euro area and a number of countries. The obtained stylised facts are substantially robust given that they hold for six fiscal variables, three different measures of the business cycle, and a wealth of statistical methods. The pattern of pro-cyclicality is not that clear for the non-euro area countries in our sample.

These findings broadly confirm a political economy view of the behaviour of public consumption, public compensation of employees and employment. They are also consistent with the anecdotal evidence of spending pressures building up over upswings and abating only as consolidation needs become stronger over a downturn. From a macroeconomic perspective, there may be a need to improve the stabilising role of public consumption, wages and employment in the euro area and in a number of countries.

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Appendix: data definitions and sources

The data source is the OECD Economic Outlook database, except for intermediate consumption, in which case the sources are the OECD Annual National Accounts database and the European Commission database AMECO. German series have been built up on the basis of: (i) as of 1991

Unified Germany; (ii) for the period 1960-1990 back-casted Unified Germany levels using growth rates of the corresponding West German variables.

Private sector compensation of employees is defined as total compensation of employees minus compensation of public sector employees. Private compensation per employee is defined as private compensation of employees divided by private sector employees (defined as total employment minus public sector employees minus self-employed persons). Real fiscal variables have been computed using the private consumption deflator.

According to the European System of National and Regional Accounts (ESA95 which is broadly consistent with the System of National Accounts of the United Nations SNA 1993, see Eurostat 1996), final consumption expenditure consists of expenditure incurred by resident institutional units (public sector) on goods or services that are used for the direct satisfaction of individual needs or wants or the collective needs of members of the community. Final consumption expenditure by government (government consumption) includes two separate categories: (i) the value of the goods and services produced by the general government itself other than own-account capital formation and sales; (ii) purchases by general government of goods and services produced by market producers that are supplied by households – without any transformation – as social transfers in kind. This implies that the general government just pays for goods and services that the seller provides to households

Compensation of employees is defined as the total remuneration, in cash or in kind, payable by an employer to an employee in return for work done by the latter during the accounting period. Intermediate consumption consist of the value of the goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital. The goods and services may be either transformed or used up by the production process (ESA95 definition).

Table 1: Euro area: correlation between real GDP and real compensation of employees, all methods.

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Correlations of real compensation of public employees with real GDP										
First difference filter	0.46	0.46	0.63	0.76	0.70	-0.02	-0.18	0.15	0.52	0.29
HP Filter λ=100	-0.17	0.01	0.37	0.68	0.70	0.04	-0.13	0.14	0.52	0.28
HP Filter λ=6.25	-0.26	-0.34	0.07	0.50	0.41	-0.22	-0.38	0.00	0.46	0.32
Band Pass filter (2,8)	-0.03	-0.36	-0.06	0.32	0.13	-0.01	-0.41	-0.02	0.32	0.05
Band Pass filter (2,6)	-0.09	-0.42	-0.03	0.43	0.14	-0.15	-0.52	0.04	0.44	0.14
Deterministic polynomial (quadratic)	0.60	0.74	0.86	0.93	0.93	0.10	-0.10	0.13	0.52	0.25
UC local level plus cycle	0.85	0.93	0.97	0.97	0.93	0.07	-0.18	0.08	0.49	0.24
UC local level with drift plus cycle	0.25	-0.58	-0.21	0.55	0.13	-0.07	-0.25	0.01	0.24	0.05
UC smooth trend plus cycle	0.23	-0.56	-0.19	0.53	0.12	-0.08	-0.25	0.01	0.24	0.06
DHR local level with drift plus cycle	0.85	0.92	0.97	0.97	0.94	0.07	-0.17	0.09	0.49	0.24
DHR smooth trend plus cycle	-0.14	0.11	0.21	0.16	-0.06	-0.03	0.05	-0.02	-0.02	0.13
Automatic ARIMA model (TRAMO)	—	—	—	—	—	0.03	-0.23	-0.07	0.41	0.33
Den Haan I(0)	—	—	—	—	—	0.14	-0.09	0.36	0.06	-0.02
Den Haan I(1)	—	—	—	—	—	0.06	0.08	0.34	-0.03	-0.12
Combination of Fisher transformation	0.31	0.21	0.52	**0.74**	0.60	-0.01	-0.20	0.09	**0.35**	0.16
Correlations of real compensation of public employees with the unemployment rate										
First difference filter	0.31	0.18	-0.10	-0.24	-0.11	0.06	0.24	-0.08	-0.54	-0.01
HP Filter λ=100	0.28	0.00	-0.42	-0.67	-0.62	0.07	0.17	-0.19	-0.60	-0.08
HP Filter λ=6.25	0.40	0.27	-0.24	-0.53	-0.32	0.27	0.40	-0.02	-0.54	-0.13
Band Pass filter (2,8)	0.20	0.28	-0.13	-0.31	0.06	0.09	0.34	-0.10	-0.37	0.23
Band Pass filter (2,6)	0.33	0.39	-0.18	-0.46	0.04	0.29	0.45	-0.24	-0.50	0.18
Deterministic polynomial (quadratic)	-0.32	-0.51	-0.71	-0.82	-0.87	0.03	0.10	-0.21	-0.62	-0.04
UC local level plus cycle	0.65	0.57	0.47	0.35	0.24	0.13	0.23	-0.08	-0.50	0.09
UC local level with drift plus cycle	-0.46	0.89	0.46	-0.89	-0.46	0.37	0.51	-0.47	-0.40	0.51
UC smooth trend plus cycle	-0.45	0.89	0.45	-0.89	-0.45	0.35	0.54	-0.44	-0.43	0.46
DHR local level with drift plus cycle	0.13	0.07	-0.06	-0.10	-0.10	0.04	0.11	-0.20	-0.39	0.29
DHR smooth trend plus cycle	0.03	-0.32	-0.19	0.07	0.23	-0.27	0.07	0.21	0.02	-0.11
Automatic ARIMA model (TRAMO)	—	—	—	—	—	0.10	0.26	-0.13	-0.60	-0.08
Den Haan I(0)	—	—	—	—	—	-0.13	0.04	-0.41	-0.05	0.00
Den Haan I(1)	—	—	—	—	—	-0.01	0.08	-0.38	-0.10	0.30
combination of Fisher transformation	0.11	0.33	-0.07	**-0.51**	-0.27	0.10	0.26	-0.20	**-0.42**	0.12

Note: Bold figures mark the highest correlation coefficient.

Table 2: Euro area: combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	0.31	0.21	0.52	**0.74**	0.60	-0.01	-0.20	0.09	**0.35**	0.16
Real GDP per capita	0.21	0.05	0.31	**0.61**	0.53	-0.02	-0.22	0.10	**0.35**	0.14
Unemployment rate	0.11	0.33	-0.07	**-0.51**	-0.27	0.10	0.26	-0.20	**-0.42**	0.12
Real compensation per public employee										
Real GDP	0.34	0.12	0.36	**0.59**	0.39	0.05	-0.21	-0.01	**0.36**	0.08
Real GDP per capita	0.28	0.01	0.22	**0.55**	0.42	0.04	-0.25	0.01	**0.37**	0.07
Unemployment rate	0.01	0.40	-0.15	**-0.63**	-0.26	0.05	0.26	-0.19	**-0.40**	0.19
Real government consumption										
Real GDP	0.29	0.18	0.51	**0.73**	0.62	-0.23	-0.03	0.15	0.20	**0.37**
Real GDP per capita	0.18	0.02	0.33	**0.65**	0.60	-0.23	-0.03	0.16	0.21	**0.34**
Unemployment rate	0.24	0.50	-0.17	**-0.66**	-0.14	0.27	0.00	-0.14	**-0.36**	0.03
Real government consumption per public employee										
Real GDP	0.37	0.20	0.39	**0.55**	0.37	-0.13	0.02	0.03	0.14	**0.24**
Real GDP per capita	0.30	0.05	0.26	**0.53**	0.38	-0.12	0.01	0.04	0.15	**0.22**
Unemployment rate	0.10	0.19	-0.28	**-0.48**	-0.04	0.17	0.02	-0.08	**-0.30**	0.10
Intermediate consumption (real)										
Real GDP	-0.11	0.10	-0.08	0.05	**0.29**	-0.11	0.18	**-0.28**	0.12	**0.30**
Real GDP per capita	-0.19	0.17	0.00	-0.08	0.17	-0.08	0.13	**-0.27**	0.19	**0.28**
Unemployment rate	0.20	0.46	**0.48**	0.13	0.05	-0.07	0.04	**0.29**	-0.22	-0.15
Public employment										
Real GDP	-0.04	0.07	0.14	0.27	**0.45**	-0.13	-0.10	0.18	0.09	**0.27**
Real GDP per capita	-0.08	0.06	0.10	0.24	**0.47**	-0.12	-0.05	0.16	0.10	**0.28**
Unemployment rate	0.05	0.31	0.35	-0.22	**-0.44**	0.14	0.00	-0.12	-0.15	-0.14

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 3: Euro area (pre-Maastricht): combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	0.32	0.16	0.48	**0.74**	0.63	0.05	-0.29	0.11	**0.42**	0.07
Real GDP per capita	0.32	0.09	0.36	**0.71**	0.65	0.06	-0.28	0.11	**0.44**	0.06
Unemployment rate	0.16	0.51	-0.22	**-0.70**	-0.25	0.13	0.23	-0.33	**-0.38**	0.27
Real compensation per public employee										
Real GDP	0.40	0.22	0.47	**0.68**	0.50	0.12	-0.27	-0.01	**0.40**	0.07
Real GDP per capita	0.39	0.13	0.36	**0.67**	0.54	0.10	-0.27	0.00	**0.42**	0.06
Unemployment rate	0.12	0.37	-0.28	**-0.62**	-0.22	0.06	0.25	-0.28	**-0.40**	0.26
Real government consumption										
Real GDP	0.25	0.21	0.50	**0.71**	0.60	-0.23	0.07	0.11	0.17	**0.32**
Real GDP per capita	0.24	0.12	0.40	**0.68**	0.60	-0.23	0.04	0.13	0.18	**0.27**
Unemployment rate	0.18	0.37	-0.28	**-0.62**	-0.11	0.26	-0.08	-0.16	**-0.32**	0.10
Real government consumption per public employee										
Real GDP	0.39	0.30	0.48	**0.61**	0.40	-0.15	0.07	0.01	0.17	**0.26**
Real GDP per capita	0.36	0.21	0.39	**0.60**	0.42	-0.15	0.05	0.03	0.18	**0.24**
Unemployment rate	0.10	0.14	-0.30	**-0.48**	-0.06	0.17	-0.03	-0.10	**-0.32**	0.14
Intermediate consumption (real)										
Real GDP	-0.20	0.03	**-0.32**	-0.27	0.25	-0.18	0.15	**-0.30**	0.06	**0.28**
Real GDP per capita	-0.15	-0.19	**-0.35**	-0.03	0.25	-0.22	0.13	**-0.32**	0.02	**0.31**
Unemployment rate	0.02	0.40	**0.43**	-0.04	-0.13	0.01	0.04	**0.32**	-0.17	-0.11
Public employment										
Real GDP	0.03	0.07	0.11	0.31	**0.54**	-0.10	-0.06	**0.20**	0.00	**0.19**
Real GDP per capita	0.09	0.06	0.02	0.25	**0.56**	-0.05	-0.03	**0.17**	0.01	**0.17**
Unemployment rate	0.12	**0.33**	0.19	-0.24	**-0.28**	0.10	-0.07	-0.07	0.01	**-0.19**

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 4: Germany: combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	0.08	-0.20	0.27	**0.63**	0.34	-0.03	-0.29	0.06	**0.53**	0.00
Real GDP per capita	0.10	-0.19	0.21	**0.57**	0.28	-0.01	-0.28	0.03	**0.51**	0.02
Unemployment rate	0.15	0.34	-0.11	**-0.35**	0.04	0.14	0.20	-0.05	**-0.35**	0.10
Real compensation per public employee										
Real GDP	0.01	-0.24	0.17	**0.49**	0.17	0.03	-0.28	-0.07	**0.51**	0.01
Real GDP per capita	-0.30	-0.09	**0.37**	0.25	-0.21	-0.01	-0.37	-0.02	**0.53**	-0.10
Unemployment rate	0.15	0.34	-0.11	**-0.35**	0.04	0.14	0.20	-0.05	**-0.35**	0.10
Real government consumption										
Real GDP	-0.02	-0.35	0.29	**0.72**	0.37	-0.19	-0.24	0.17	**0.42**	0.21
Real GDP per capita	0.00	-0.33	0.22	**0.67**	0.35	-0.19	-0.25	0.18	**0.41**	0.22
Unemployment rate	0.28	0.41	-0.12	**-0.54**	0.02	0.36	0.06	-0.11	**-0.53**	0.00
Real government consumption per public employee										
Real GDP	-0.11	-0.46	0.16	**0.59**	0.11	-0.17	-0.28	0.11	**0.39**	0.11
Real GDP per capita	-0.11	-0.47	0.09	**0.52**	0.05	-0.18	-0.27	0.10	**0.37**	0.09
Unemployment rate	0.17	0.30	-0.23	**-0.51**	0.08	0.29	0.03	-0.12	**-0.44**	0.10
Intermediate consumption (real)										
Real GDP	0.13	-0.10	-0.27	0.28	**0.55**	-0.18	-0.12	0.09	0.12	**0.33**
Real GDP per capita	-0.05	-0.01	0.03	0.36	**0.49**	-0.21	-0.02	0.10	0.10	**0.35**
Unemployment rate	0.15	0.10	**0.32**	0.06	-0.16	0.23	0.03	0.08	**-0.34**	-0.21
Public employment										
Real GDP	0.12	0.00	0.07	0.37	**0.47**	-0.01	0.05	0.06	0.06	**0.36**
Real GDP per capita	0.15	0.03	0.07	0.39	**0.56**	0.00	0.03	0.07	0.04	**0.39**
Unemployment rate	0.05	0.39	0.34	-0.28	**-0.40**	0.03	-0.10	0.13	**-0.28**	-0.17

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 5: Germany (pre-Maastricht): combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	0.11	-0.24	0.32	**0.73**	0.50	-0.05	-0.33	0.04	**0.67**	0.02
Real GDP per capita	0.14	-0.23	0.24	**0.65**	0.37	-0.03	-0.28	0.05	**0.65**	0.00
Unemployment rate	0.25	**-0.48**	-0.03	**-0.48**	-0.14	0.27	0.25	-0.06	**-0.54**	0.06
Real compensation per public employee										
Real GDP	0.14	-0.15	0.36	**0.67**	0.33	0.06	-0.33	-0.09	**0.59**	0.06
Real GDP per capita	0.16	-0.16	0.28	**0.57**	0.16	0.05	-0.28	-0.09	**0.57**	0.02
Unemployment rate	0.19	0.34	-0.10	**-0.38**	-0.03	0.17	0.23	0.00	**-0.41**	0.07
Real government consumption										
Real GDP	-0.02	-0.31	0.35	**0.79**	0.50	-0.30	-0.17	0.13	**0.50**	0.29
Real GDP per capita	-0.01	-0.29	0.29	**0.74**	0.44	-0.28	-0.12	0.16	**0.49**	0.27
Unemployment rate	0.34	0.42	-0.17	**-0.61**	-0.08	0.41	0.07	-0.12	**-0.57**	-0.06
Real government consumption per public employee										
Real GDP	0.01	-0.24	0.39	**0.74**	0.33	-0.25	-0.19	0.11	**0.45**	0.21
Real GDP per capita	0.01	-0.27	0.32	**0.70**	0.24	-0.24	-0.14	0.12	**0.45**	0.19
Unemployment rate	0.26	0.32	-0.26	**-0.56**	0.04	0.37	0.06	-0.15	**-0.49**	0.02
Intermediate consumption (real)										
Real GDP	-0.34	0.06	0.01	0.16	**0.61**	-0.29	0.01	0.13	0.07	**0.61**
Real GDP per capita	-0.38	-0.14	0.04	0.40	**0.69**	-0.40	0.13	0.24	0.09	**0.63**
Unemployment rate	0.15	0.10	**0.32**	0.06	-0.16	0.23	0.03	0.08	**-0.34**	-0.21
Public employment										
Real GDP	0.04	-0.10	-0.02	0.39	**0.56**	-0.03	0.10	-0.03	0.15	**0.32**
Real GDP per capita	0.06	-0.08	-0.06	0.35	**0.61**	-0.03	0.10	0.01	0.12	**0.33**
Unemployment rate	0.19	0.33	0.20	-0.30	**-0.41**	0.05	-0.07	0.21	**-0.33**	-0.17

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 6: France: combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	0.31	-0.01	0.10	**0.41**	0.38	**0.22**	-0.16	-0.05	0.09	0.06
Real GDP per capita	0.19	0.12	0.17	0.29	**0.34**	**0.21**	-0.10	-0.06	0.11	0.08
Unemployment rate	0.05	**0.45**	0.34	-0.04	-0.09	-0.16	**0.20**	-0.02	0.00	-0.16
Real compensation per public employee										
Real GDP	0.39	0.05	0.21	**0.48**	0.34	**0.26**	-0.13	-0.04	0.11	0.01
Real GDP per capita	0.34	0.21	0.23	**0.37**	0.35	**0.24**	-0.11	-0.05	0.11	0.02
Unemployment rate	-0.04	**0.44**	0.25	-0.17	-0.12	-0.20	**0.21**	-0.01	0.02	-0.16
Real government consumption										
Real GDP	0.14	**0.37**	0.29	0.11	0.27	-0.13	0.13	0.02	-0.13	**0.23**
Real GDP per capita	0.08	0.20	0.28	0.20	**0.29**	-0.15	0.13	0.06	-0.15	**0.24**
Unemployment rate	0.09	0.00	0.08	**0.26**	0.06	-0.01	0.03	-0.07	0.11	-0.10
Real government consumption per public employee										
Real GDP	0.40	**0.49**	**0.49**	0.38	0.30	-0.04	0.16	0.11	-0.07	0.18
Real GDP per capita	0.40	0.34	0.43	**0.46**	0.36	-0.04	0.13	0.12	-0.08	0.19
Unemployment rate	0.08	-0.21	-0.11	**0.27**	0.07	-0.08	0.04	-0.05	0.13	-0.12
Intermediate consumption (real)										
Real GDP	0.04	0.15	-0.02	0.10	**0.25**	0.06	**0.22**	-0.16	0.05	0.16
Real GDP per capita	0.03	0.01	-0.08	0.07	0.19	0.07	0.10	-0.18	0.02	0.14
Unemployment rate	-0.06	-0.09	0.37	**0.43**	-0.15	-0.13	0.00	0.18	0.11	**-0.31**
Public employment										
Real GDP	-0.10	0.20	0.04	-0.09	**0.22**	-0.13	0.01	0.00	-0.05	0.07
Real GDP per capita	-0.18	0.05	0.11	-0.02	0.12	-0.14	0.05	-0.01	-0.05	0.12
Unemployment rate	0.30	-0.10	0.26	**0.56**	0.27	0.16	-0.05	0.02	0.01	0.09

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 7: Italy: combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	-0.14	0.38	**0.52**	0.24	0.13	-0.01	0.06	0.03	0.07	**0.21**
Real GDP per capita	-0.17	0.32	**0.49**	0.24	0.09	0.01	0.11	0.06	0.07	**0.19**
Unemployment rate	-0.36	0.05	**0.43**	0.09	-0.21	-0.02	0.02	-0.03	-0.03	0.09
Real compensation per public employee										
Real GDP	-0.22	0.29	**0.48**	0.16	-0.03	0.01	0.05	-0.02	0.05	**0.25**
Real GDP per capita	-0.20	0.25	**0.44**	0.18	-0.02	0.02	0.08	0.01	0.06	**0.24**
Unemployment rate	-0.39	0.07	**0.46**	0.11	-0.20	**-0.35**	0.06	0.29	-0.09	-0.16
Real government consumption										
Real GDP	0.32	**0.51**	0.27	0.22	0.47	-0.02	0.19	-0.01	0.07	0.18
Real GDP per capita	0.26	**0.44**	0.28	0.27	0.39	0.02	0.20	-0.05	0.09	0.13
Unemployment rate	0.03	0.21	-0.21	**-0.34**	0.15	-0.07	0.04	-0.17	-0.01	0.11
Real government consumption per public employee										
Real GDP	0.56	0.33	0.11	0.44	**0.56**	0.05	0.16	-0.05	0.07	**0.27**
Real GDP per capita	0.47	0.27	0.05	0.36	**0.47**	0.07	0.15	-0.06	0.08	**0.21**
Unemployment rate	0.43	-0.08	**-0.55**	0.02	**0.55**	-0.17	0.05	-0.10	-0.08	0.13
Intermediate consumption (real)										
Real GDP	0.02	**0.52**	-0.09	-0.35	0.01	-0.15	0.13	**-0.23**	0.13	-0.21
Real GDP per capita	-0.03	**0.21**	-0.12	-0.05	0.01	-0.11	0.11	**-0.28**	0.15	-0.20
Unemployment rate	-0.04	**0.37**	0.11	-0.25	0.01	-0.10	**0.25**	-0.05	-0.01	0.02
Public employment										
Real GDP	-0.14	0.37	**0.45**	0.15	0.12	-0.08	0.07	0.15	0.03	-0.12
Real GDP per capita	-0.21	0.28	**0.43**	0.14	0.03	-0.07	0.11	0.14	0.00	-0.12
Unemployment rate	-0.23	0.04	0.26	-0.08	**-0.31**	-0.09	-0.14	0.07	0.12	**-0.21**

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 8: Spain: combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	0.24	0.28	0.24	0.27	**0.46**	0.09	**-0.37**	0.23	0.23	-0.20
Real GDP per capita	0.06	0.03	0.33	**0.38**	0.27	0.11	**-0.29**	0.23	0.18	-0.18
Unemployment rate	-0.18	0.16	0.32	-0.10	**-0.35**	0.12	0.16	**-0.24**	-0.11	0.22
Real compensation per public employee										
Real GDP	0.31	**0.40**	0.27	0.10	0.31	0.12	**-0.28**	0.27	0.04	-0.33
Real GDP per capita	0.21	0.23	**0.29**	0.22	0.24	0.16	**-0.24**	0.24	0.01	-0.27
Unemployment rate	0.19	-0.03	-0.19	-0.04	0.07	-0.07	-0.04	0.04	-0.09	0.09
Real government consumption										
Real GDP	0.18	-0.03	0.18	**0.45**	0.42	0.09	**-0.27**	0.23	0.18	-0.03
Real GDP per capita	-0.03	-0.02	0.30	**0.37**	0.25	0.07	**-0.29**	0.28	0.17	-0.07
Unemployment rate	0.19	0.50	-0.06	**-0.56**	0.01	-0.08	-0.01	0.01	-0.17	0.11
Real government consumption per public employee										
Real GDP	**0.44**	0.26	0.06	0.09	0.33	0.09	-0.17	**0.28**	-0.07	**-0.29**
Real GDP per capita	0.23	0.19	**0.27**	0.16	0.15	0.13	-0.17	**0.25**	-0.08	**-0.25**
Unemployment rate	-0.32	-0.01	0.11	-0.35	**-0.42**	0.00	**-0.21**	0.12	-0.05	0.04
Intermediate consumption (real)										
Real GDP	-0.20	0.09	0.45	**0.53**	0.33	-0.25	**0.36**	0.14	-0.20	0.08
Real GDP per capita	-0.34	0.00	0.38	**0.39**	0.15	-0.28	**0.32**	0.11	-0.25	0.03
Unemployment rate	0.14	-0.13	**-0.24**	-0.16	-0.23	0.04	-0.10	-0.06	0.04	-0.04
Public employment										
Real GDP	-0.24	**-0.41**	0.02	**0.42**	0.06	-0.03	0.04	-0.11	0.18	**0.30**
Real GDP per capita	-0.19	**-0.23**	-0.07	0.22	0.08	-0.11	0.06	-0.06	0.15	**0.24**
Unemployment rate	0.37	**0.43**	-0.10	-0.14	0.37	0.20	0.09	**-0.36**	0.17	0.13

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 9: The Netherlands: combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	0.24	0.35	0.29	0.40	**0.67**	0.16	-0.05	0.09	**0.22**	0.10
Real GDP per capita	0.13	0.21	0.19	0.30	**0.55**	0.14	-0.05	0.10	0.19	0.08
Unemployment rate	-0.02	0.32	0.19	-0.37	**-0.38**	-0.16	0.13	0.05	**-0.23**	-0.18
Real compensation per public employee										
Real GDP	0.51	0.38	0.08	0.30	**0.49**	0.14	-0.04	0.09	0.14	-0.13
Real GDP per capita	0.46	0.35	0.08	0.28	**0.48**	0.11	-0.02	0.10	0.10	-0.12
Unemployment rate	-0.12	-0.11	**-0.33**	-0.26	-0.06	-0.03	0.08	**-0.25**	-0.05	0.06
Real government consumption										
Real GDP	-0.03	-0.39	-0.35	0.15	**0.40**	-0.13	-0.10	-0.17	-0.01	**0.21**
Real GDP per capita	0.01	-0.39	-0.39	0.16	**0.45**	-0.11	-0.12	-0.17	0.00	**0.22**
Unemployment rate	0.19	0.28	-0.01	**-0.28**	-0.16	0.16	0.19	0.07	-0.05	**-0.22**
Real government consumption per public employee										
Real GDP	**0.43**	0.01	-0.06	0.24	0.18	-0.05	0.04	-0.02	0.04	0.01
Real GDP per capita	**0.39**	-0.01	-0.05	0.28	0.26	-0.06	0.03	-0.04	0.03	0.03
Unemployment rate	-0.11	-0.29	**-0.55**	-0.41	-0.16	0.15	0.08	**-0.23**	-0.02	0.00
Intermediate consumption (real)										
Real GDP	0.08	0.38	-0.11	**-0.60**	-0.25	0.12	-0.04	0.11	-0.08	-0.15
Real GDP per capita	0.15	0.40	-0.14	**-0.58**	-0.20	0.14	-0.04	0.11	-0.08	-0.15
Unemployment rate	**-0.37**	-0.14	0.29	0.27	-0.09	-0.14	0.05	-0.14	0.05	0.16
Public employment										
Real GDP	-0.09	-0.37	-0.35	0.17	**0.45**	0.13	-0.08	-0.13	0.04	**0.26**
Real GDP per capita	0.01	-0.34	-0.43	0.10	**0.45**	0.14	-0.08	-0.14	0.05	**0.25**
Unemployment rate	0.09	0.40	**0.45**	-0.12	-0.29	-0.17	0.14	0.28	-0.18	**-0.28**

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 10: United Kingdom: combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	0.02	0.19	-0.09	-0.15	**0.37**	0.05	0.06	-0.26	-0.01	**0.47**
Real GDP per capita	0.00	0.23	-0.10	-0.25	**0.30**	0.05	0.03	-0.25	-0.01	**0.45**
Unemployment rate	-0.03	0.15	0.23	-0.01	**-0.29**	-0.11	0.09	0.17	-0.09	**-0.24**
Real compensation per public employee										
Real GDP	0.00	0.09	-0.04	-0.12	0.12	0.07	0.06	-0.29	-0.08	**0.38**
Real GDP per capita	-0.03	0.10	0.00	-0.15	0.05	0.07	0.04	-0.28	-0.07	**0.38**
Unemployment rate	-0.12	-0.02	0.09	0.08	-0.11	-0.10	0.05	0.07	0.00	**-0.23**
Real government consumption										
Real GDP	0.02	0.15	-0.04	-0.14	**0.38**	-0.09	-0.03	0.06	-0.20	**0.27**
Real GDP per capita	0.03	0.25	-0.10	-0.32	**0.34**	-0.08	-0.06	0.05	-0.20	**0.27**
Unemployment rate	0.09	0.25	0.16	-0.14	**-0.33**	0.09	0.03	0.14	0.03	**-0.35**
Real government consumption per public employee										
Real GDP	**0.30**	-0.03	-0.21	-0.03	0.22	0.06	-0.18	0.13	**-0.21**	0.02
Real GDP per capita	**0.42**	-0.03	-0.35	-0.06	0.33	0.04	**-0.21**	0.13	-0.19	0.01
Unemployment rate	-0.01	0.05	-0.08	-0.08	0.01	0.05	0.13	-0.06	0.14	**-0.23**
Intermediate consumption (real)										
Real GDP	**0.41**	0.17	0.11	0.24	0.32	**0.36**	0.01	0.06	0.19	-0.13
Real GDP per capita	**0.27**	0.09	0.20	0.22	0.13	**0.36**	-0.01	0.05	0.18	-0.14
Unemployment rate	**-0.44**	0.02	-0.03	-0.41	-0.37	**-0.21**	-0.02	-0.06	-0.05	-0.04
Public employment										
Real GDP	-0.08	0.21	0.02	-0.14	**0.28**	0.03	-0.02	0.04	0.02	**0.22**
Real GDP per capita	-0.10	**0.32**	-0.01	-0.30	0.23	0.05	-0.04	0.02	0.04	**0.24**
Unemployment rate	0.03	0.18	0.23	-0.08	**-0.30**	0.02	-0.05	0.08	-0.15	-0.13

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 11: United States: combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	0.30	0.26	0.30	**0.59**	-0.04	0.03	0.12	**0.33**	-0.08	-0.16
Real GDP per capita	0.06	0.30	0.30	**0.30**	0.13	0.00	**0.20**	0.16	-0.02	-0.17
Unemployment rate	0.09	**-0.40**	-0.10	0.34	-0.02	0.01	-0.15	-0.03	0.03	0.18
Real compensation per public employee										
Real GDP	0.13	**0.45**	0.32	-0.27	-0.37	0.12	0.03	0.13	-0.07	**-0.46**
Real GDP per capita	0.12	**0.46**	0.32	-0.27	-0.37	0.12	0.04	0.15	-0.08	**-0.46**
Unemployment rate	-0.06	**-0.40**	-0.20	0.36	0.19	-0.11	-0.05	-0.07	0.12	**0.31**
Real government consumption										
Real GDP	0.39	0.06	-0.10	0.42	**0.67**	0.10	0.05	-0.08	0.11	**0.34**
Real GDP per capita	0.37	0.03	-0.14	0.40	**0.65**	0.12	0.07	-0.07	0.11	**0.34**
Unemployment rate	-0.14	0.12	0.16	-0.28	**-0.41**	-0.19	-0.09	0.24	-0.15	**-0.28**
Real government consumption per public employee										
Real GDP	**0.45**	0.01	-0.30	0.10	0.42	**0.22**	-0.03	-0.19	0.07	0.19
Real GDP per capita	**0.46**	0.02	-0.28	0.12	0.44	**0.23**	-0.03	-0.17	0.06	0.21
Unemployment rate	**-0.33**	0.06	0.09	-0.30	-0.32	**-0.31**	-0.01	0.22	-0.11	-0.18
Intermediate consumption (real)										
Real GDP	0.52	-0.09	-0.57	0.07	**0.60**	0.17	0.00	-0.25	0.04	**0.32**
Real GDP per capita	0.53	-0.03	-0.44	0.14	**0.56**	0.20	0.00	-0.23	0.05	**0.33**
Unemployment rate	-0.16	0.26	**0.30**	-0.08	-0.13	-0.08	-0.07	**0.36**	-0.07	-0.14
Public employment										
Real GDP	0.18	0.00	-0.04	0.57	**0.74**	-0.19	0.17	0.17	0.11	**0.27**
Real GDP per capita	0.18	-0.04	-0.12	0.53	**0.74**	-0.17	0.17	0.16	0.10	**0.26**
Unemployment rate	0.00	0.19	0.16	-0.38	**-0.43**	0.14	-0.16	0.03	-0.13	**-0.20**

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 12: Sweden: combination of correlations across all methods

	Detrended					Pre-whitened				
k (lags)	-2	-1	0	1	2	-2	-1	0	1	2
Real compensation of public employees										
Real GDP	-0.05	-0.13	0.32	0.18	**0.33**	0.15	**-0.35**	0.06	0.19	0.16
Real GDP per capita	-0.14	-0.10	0.19	0.25	**0.32**	0.14	**-0.37**	0.07	0.18	0.15
Unemployment rate	0.06	0.38	0.01	-0.42	**-0.43**	-0.22	**0.33**	-0.01	-0.21	-0.25
Real compensation per public employee										
Real GDP	0.23	-0.15	-0.20	0.06	**0.42**	0.24	**-0.36**	-0.09	0.06	0.09
Real GDP per capita	0.13	-0.22	-0.17	0.03	**0.31**	0.27	**-0.38**	-0.14	0.03	0.10
Unemployment rate	0.09	**0.44**	0.12	-0.23	-0.32	-0.22	**0.32**	0.12	0.00	-0.21
Real government consumption										
Real GDP	-0.10	0.23	**0.42**	0.14	0.14	0.02	**-0.29**	0.21	0.14	-0.08
Real GDP per capita	-0.07	0.08	**0.26**	0.16	0.16	-0.01	**-0.30**	0.23	0.12	-0.09
Unemployment rate	0.05	**0.30**	-0.01	-0.26	-0.15	-0.09	**0.36**	-0.20	-0.19	0.01
Real government consumption per public employee										
Real GDP	**0.35**	0.06	-0.26	-0.23	0.16	0.15	**-0.41**	0.03	-0.01	-0.23
Real GDP per capita	0.30	-0.21	-0.28	-0.09	0.05	0.18	**-0.40**	0.01	-0.04	-0.23
Unemployment rate	**0.33**	0.29	-0.09	0.25	0.32	-0.01	**0.22**	-0.10	0.20	0.12
Intermediate consumption (real)										
Real GDP	-0.40	0.20	-0.13	**-0.60**	-0.19	**-0.27**	-0.07	0.06	-0.18	-0.11
Real GDP per capita	-0.35	0.28	-0.14	**-0.63**	-0.16	**-0.31**	-0.08	0.09	-0.17	-0.13
Unemployment rate	0.06	**0.28**	0.15	-0.11	-0.12	0.26	0.21	**-0.32**	0.05	0.08
Public employment										
Real GDP	-0.52	0.16	**0.61**	0.31	-0.09	-0.16	0.12	0.15	0.16	0.12
Real GDP per capita	-0.38	0.15	**0.50**	0.30	0.04	**-0.24**	0.11	0.21	0.19	0.09
Unemployment rate	-0.11	0.04	-0.04	**-0.41**	-0.40	-0.03	0.09	-0.03	**-0.28**	-0.20

Notes: Based on Fisher transformations. Bold figures mark the highest correlation coefficient.

Table 13: Survey of results I. All countries and euro area aggregate.

	Real compensation of public employees	Real compensation per public employee	Real government consumption	Real gov. consumption per public employee	Intermediate consumption (real)	Public employment
Euro area (D)	pro-cyclical, lag, 1, s	pro-cyclical, lag, 1, s	pro-cyclical,lag,1,s	pro-cyclical, lag, 1, s	pro-cyclical, lag, 2, w	pro-cyclical, lag, 2, m
Euro area (PW)	pro-cyclical, lag, 1, m	pro-cyclical, lag, 1, m	pro-cyclical,lag,2,w	pro-cyclical, lag, 2, w	pro-cyclical, lag, 2, w	pro-cyclical, lag, 2, w
Germany(D)	pro-cyclical, lag, 1, s	pro-cyclical, lag, 1, m	pro-cyclical,lag,1,s	pro-cyclical, lag, 1, s	pro-cyclical, lag, 2, s	pro-cyclical, lag, 2, m
Germany(PW)	pro-cyclical, lag, 1, s	pro-cyclical, lag, 1, s	pro-cyclical, lag,1,m	pro-cyclical, lag, 1, m	pro-cyclical, lag, 2, w	pro-cyclical, lag, 2, w
France(D)	pro-cyclical, lag, 1, m	pro-cyclical, lag, 1, m	pro-cyclical, w	pro-cyclical, con, m	inconclusive	inconclusive
France(PW)	pro-cyclical, lead, 2, w	pro-cyclical, lead, 2, w	pro-cyclical, lag, 2, w	a-cyclical	pro-cyclical, w	a-cyclical
Italy(D)	pro-cyclical, con, s	pro-cyclical, con, m	pro-cyclical, lead, 1, m	pro-cyclical, lag, 2, s	pro-cyclical, lead, 1, m	pro-cyclical, con, m
Italy(PW)	pro-cyclical, lag, 2, w	pro-cyclical, lag, 2, w	a-cyclical	pro-cyclical, lag, 2, w	count-cyclical,con,w	a-cyclical
Spain (D)	pro-cyclical, lag, 2, m	pro-cyclical, lead, 1, m	pro-cyclical, lag, 1, m	pro-cyclical, lead, 2, m	pro-cyclical, lag, 1, m	inconclusive
Spain (PW)	count-cyclical, lead, 1, w	count-cyclical, lead, 1, w	count-cyclical, lead, 1, w	inconclusive	pro-cyclical, lag, 1, m	pro-cyclical, lag, 2, w
Netherlands(D)	pro-cyclical, lag, 2, s	pro-cyclical, lag, 2, m	pro-cyclical, lag, 2, m	pro-cyclical, lead, 2, m	count-cyclical, lag, 1, s	pro-cyclical, lag, 2, m
Netherlands(PW)	pro-cyclical, lag,1, w	a-cyclical	pro-cyclical, lag, 2, w	a-cyclical	a-cyclical	a-cyclical
Austria(D)	pro-cyclical, lead, 1, w	pro-cyclical, lead, 1, m	pro-cyclical, lag, 2, m	a-cyclical	count-cyclical, lag, 1, m	pro-cyclical, lead, 1, w
Austria(PW)	pro-cyclical,lead,1,w	pro-cyclical, lead, 1, w	pro-cyclical, con, w	a-cyclical	pro-cyclical, con, w	a-cyclical
Belgium(D)	pro-cyclical,lead,2,m	pro-cyclical, lead, 2, m	pro-cyclical, lag, 2, s	pro-cyclical, lead, 2, m	count-cyclical, con, w	pro-cyclical, lag, 2, w
Belgium(PW)	count-cyclical, lead, 2, w	count-cyclical, lead, 2, w	a-cyclical	pro-cyclical, con, w	count-cyclical, con, bord	pro-cyclical, lag, 2, w

Note: D=Detrended; PW=Pre-Whitened; con=contemporaneous; 1/2 number of lags/leads; w/m/s=weak/modearte/strong correlation; acyclical=[0,0.2); weak=[0.2,0.4); moderate=[0.4, 0.5); strong $\geq$ 0.5; bord=borderline.

Table 14: Survey of results II (continued). All countries and euro area aggregate.

	Real compensation of public employees	Real compensation per public employee	Real government consumption	Real gov. consumption per public employee	Intermediate consumption (real)	Public employment
Greece(D)	pro-cyclical, lag, 1, s	pro-cyclical, lag, 1, w	pro-cyclical, lag, 1, s	pro-cyclical, con, s	inconclusive	pro-cyclical, lead, 2, s
Grecee(PW)	pro-cyclical, lead, 1, w	pro-cyclical, lead, 1, w	a-cyclical	a-cyclical	a-cyclical	a-cyclical
Ireland(D)	pro-cyclical, lag, 2, s	inconclusive	pro-cyclical, lag, 2, s	pro-cyclical, con, s	pro-cyclical, lag, 1, s	pro-cyclical, lag, 2, s
Ireland(PW)	count-cyclical, lead, 1, m	inconclusive	pro-cyclical, con, w	pro-cyclical, con, w	a-cyclical	inconclusive
Portugal(D)	pro-cyclical, lag, 1, s	pro-cyclical, lag, 1 m	pro-cyclical, lag, 2, m	pro-cyclical, lag, 1, w	inconclusive	pro-cyclical, con, bord
Portugal(PW)	pro-cyclical, lag, 1, w	pro-cyclical,lag,1,w	pro-cyclical, lag, 1, w	a-cyclical	inconclusive	a-cyclical
Findland(D)	pro-cyclical, lag, 2, s	pro-cyclical, lag, 2, s	pro-cyclical, lag, 2, s	pro-cyclical, lag, 1, w	pro-cyclical, con, w	pro-cyclical, lag, 2, m
Findland(PW)	pro-cyclical, lag, 2, w	count-cyclical, lead, 1, w	pro-cyclical, con, w	count-cyclical, lead, 1, w	count-cyclical, lead, 1, w	inconclusive
Sweden(D)	pro-cyclical, lag, 2, w	pro-cyclical, lag, 2, m	pro-cyclical, con, w	pro-cyclical, lead, 2, w	count-cyclical, lag, 1, s	pro-cyclical, con, s
Sweden(PW)	count-cyclical, lead, 1, w	count-cyclical, lead, 1, w	count-cyclical, lead, 1, w	count-cyclical, lead, 1, m	count-cyclical, lead, 2, w	a-cyclical
Denmark(D)	count-cyclical, lag, 1, w	count-cyclical, con, w (lag)	inconclusive	count-cyclical, lead, 2, w	pro-cyclical, lag, 1, w	pro-cyclical, lag, 2, w
Denmark(PW)	count-cyclical, lag, 1, w	a-cyclical	inconclusive	inconclusive	a-cyclical	a-cyclical
UK(D)	pro-cyclical, lag, 2, w	a-cyclical	pro-cyclical, lag, 2, w	pro-cyclical, lead, 2, w	pro-cyclical,lead,2,m	pro-cyclical, lag, 2, w
UK(PW)	pro-cyclical, lag, 2, m	pro-cyclical, lag, 2, w	pro-cyclical, lag, 2, w	count-cyclical, lag, 1, bord	pro-cyclical,lead,2,w	pro-cyclical, lag, 2, w
Japan(D)	pro-cyclical, lag, 2, m	pro-cyclical, lag, 2, w	count-cyclical, lag, 1, s	count-cyclical, lag, 1, m	count-cyclical,lag,1,m	count-cyclical, lead,1/ 2, w
Japan(PW)	inconclusive	a-cyclical	pro-cyclical, con, w	pro-cyclical, con, w	count-cyclical,lag,1,w	count-cyclical, lead, 2, w
USA(D)	pro-cyclical, lag, 1, s	pro-cyclical, lead, 1, m	pro-cyclical, lag, 2, s	pro-cyclical, lead, 2, m	pro-cyclical, lag, 2, s	pro-cyclical, lag, 2, s
USA(PW)	pro-cyclical,l ag, 1, w	count-cyclical, lag, 2, m	pro-cyclical, lag, 2, w	pro-cyclical, lead, 2, w	pro-cyclical, lag, 2, w	pro-cyclical, lag, 2, w

Note: D=Detrended; PW=Pre-Whitened; con=contemporaneous; 1/2 number of lags/leads; w/m/s=weak/modearte/strong correlation; acyclical=[0,0.2); weak=[0.2,0.4); moderate=[0.4, 0.5); strong $\geq$ 0.5; bord=borderline.

Figure 1: Some facts about public wage expenditure I (average 2000-2005)

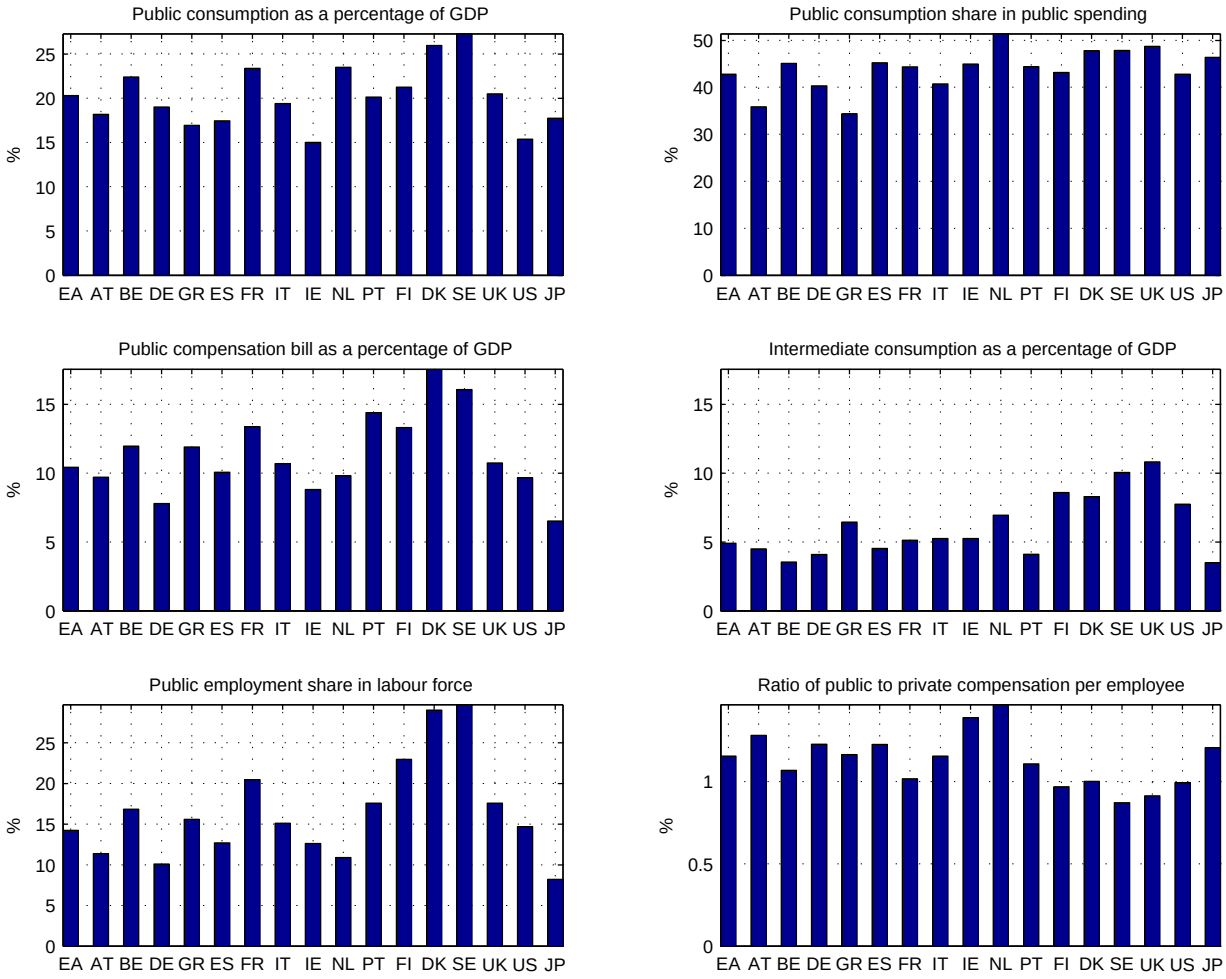


Figure 2: Some facts about public wage expenditure II

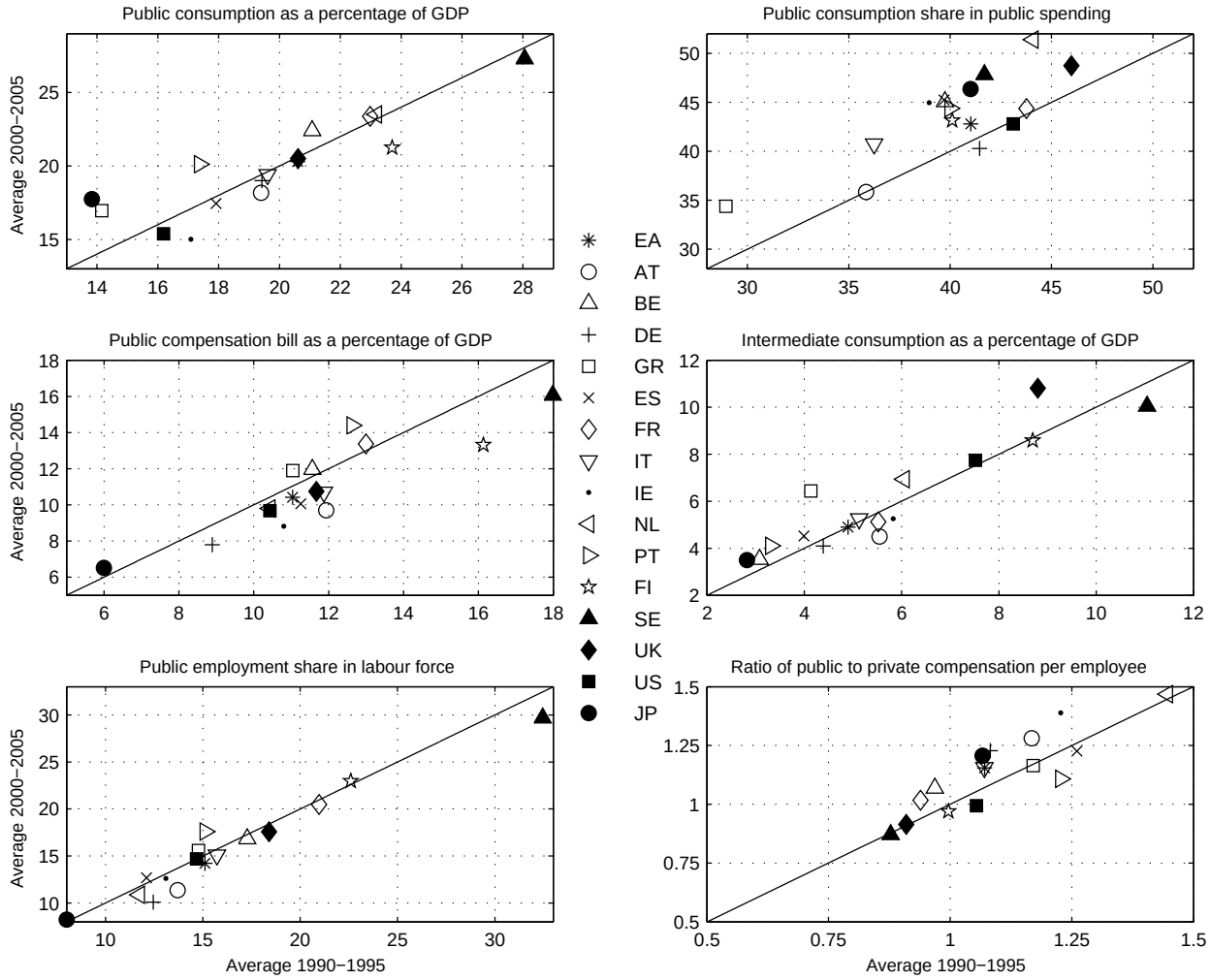
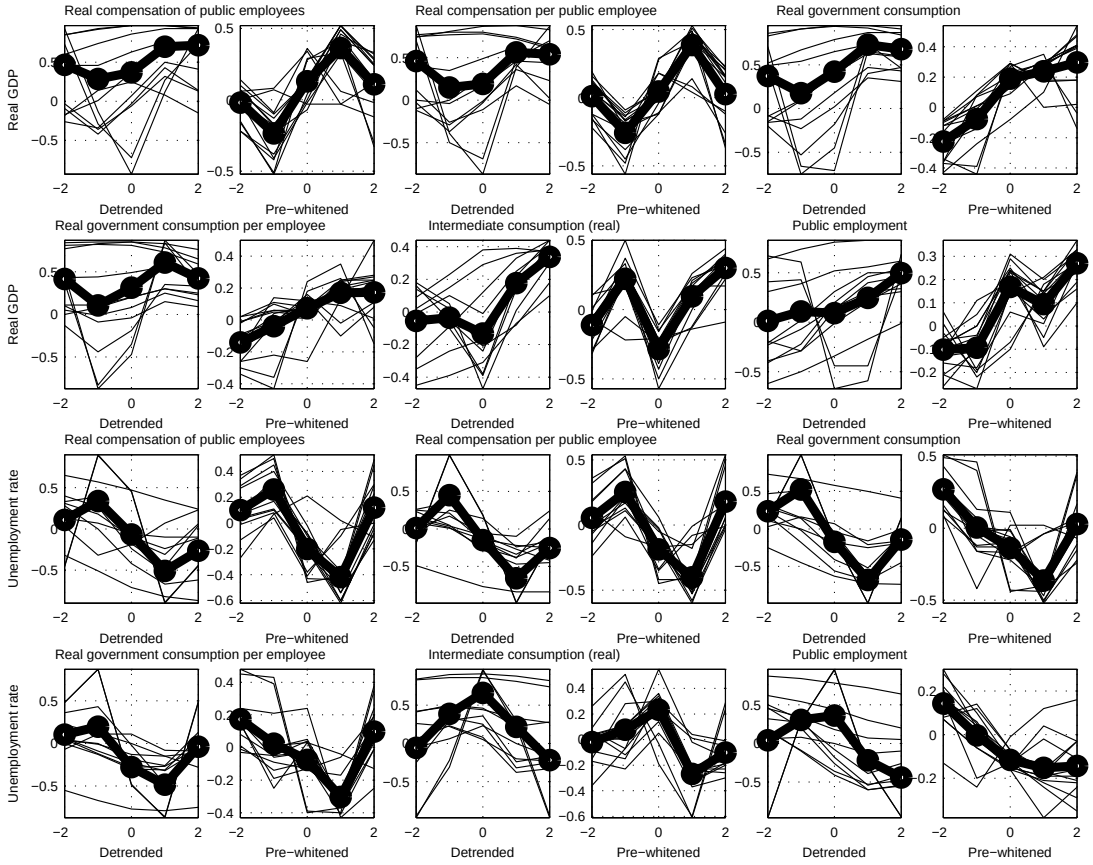


Figure 3: Euro area: correlation between real GDP and the unemployment rate with the six fiscal variables. CCFs computed with all detrending/prewhitening methods (thin lines) and summary Fisher transformation (thick line).



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