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Research Report

Public wages in the euro area - towards securing stability and competitiveness

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NO 112 / JUNE 2010

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PUBLIC WAGES IN THE EURO AREA

TOWARDS SECURING STABILITY AND COMPETITIVENESS¹

by **Fédéric Holm-Hadulla²**, **Kishore Kamath²**,

Ana Lamo³, **Javier J. Pérez⁴**

and **Ludger Schuknecht²**

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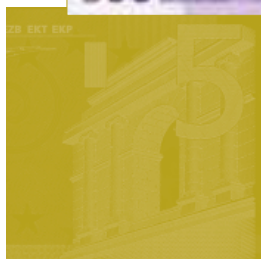
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ABSTRACT

This paper examines the role of government wages in ensuring macroeconomic stability and competitiveness in the euro area. Recent empirical evidence suggests that government wage expenditure is subject to a pro-cyclical bias in most euro area countries and at the euro area aggregate level. Moreover, the evidence points to a strong positive correlation and co-movement between public and private wages in the short to medium term, both directly and indirectly via the price level, in most euro area countries. In a number of countries this interrelation between public and private wages coincided with strong public wage growth and competitiveness losses. These findings underpin the need for prudent public wage policies supported by strong domestic fiscal frameworks and appropriate wage-setting institutions in order to enhance economic stability and competitiveness in Economic and Monetary Union.

Keywords: government wage expenditure, fiscal cyclicity, competitiveness

JEL Classification: E62; E63; J45; H11; H50

SUMMARY

This paper studies the role of government wages as a determinant of macroeconomic stability and competitiveness in the euro area. Recent empirical evidence suggests that real government wage expenditure is subject to a pro-cyclical bias, i.e. it co-moves positively with the business cycle in most euro area countries and at the euro area aggregate level. Thus, it might reinforce rather than mitigate fluctuations in economic activity. Moreover, the evidence points to a strong, positive correlation and co-movement between public and private wages in the short to medium term, both directly and indirectly via the price level. In a number of countries this interrelation has coincided with strong public wage growth and intra-euro area competitiveness losses.

These findings suggest that governments should be cautious that wage-setting and employment policies do not lead to negative repercussions on fiscal and economic performance. First, there appears to be a need to strengthen fiscal discipline and to reduce the risk of pro-cyclicality in government wage expenditure. To this end, strict domestic fiscal rules and medium-term budgetary frameworks could be effective tools to constrain the volatility and pro-cyclicality of this spending item. In addition, reforms to labour market institutions may be needed to avoid institutional biases towards pro-cyclicality, e.g. originating from indexation, which ties government wages to inflation.

Second, given the interrelation between government and private sector wage developments, policy-makers would be well-advised to adopt a prudent approach to government sector wage setting to mitigate the risk of competitiveness losses in the private sector. While the specific reform needs differ across countries, a strengthening of fiscal institutions is likely to facilitate such prudence. Reforms in labour market institutions, for instance towards less coordinated wage bargaining and more decentralised wage setting, as well as product market liberalisation, may

further reduce the risk of adverse government wage spillovers and also facilitate wage adjustment in the private sector.

The implementation of such reforms may well be associated with political opposition. However, the “double dividend” of greater economic stability and a lower risk of intra-euro area competitiveness losses should encourage policy-makers to undertake the necessary adjustments.

I INTRODUCTION

In view of the sharp deterioration in public finances triggered by the financial and economic crisis, fiscal policy in EU Member States will encounter considerable challenges in the years to come. Moreover, disequilibria within the euro area, as manifest in unit labour cost divergence and current account imbalances, will further complicate the economic environment policy-makers are facing.

In this context, public wages¹ play an important role. First, the public wage bill typically accounts for a substantial fraction of overall government spending. In the euro area, compensation of government employees on average amounted to almost a quarter of all general government expenditure over the last decade. Owing to this quantitative prominence, the public wage bill is a crucial determinant of fiscal performance. Second, certain qualitative features of public wage expenditure can exert important feedback effects on a country's macroeconomic performance: the forces shaping public wage setting and employment may reinforce rather than stabilise fluctuations in output. Moreover, since the government competes with firms in the labour market, public and private wage setting is likely to be interdependent. Thus, public wage setting may affect a country's cost competitiveness.

Drawing on related research, this Occasional Paper examines the implications of public wages for these two aspects of macroeconomic performance in Economic and Monetary Union (EMU). Regarding the stabilising role of public spending, it reports evidence that government wage expenditure has typically been subject to a pro-cyclical spending bias. In particular, both real compensation of public employees and its subcomponents, real compensation per public employee and (to a lesser extent) public employment, co-move with the business cycle in a pro-cyclical manner at the euro area aggregate and in most euro area countries.

These results underpin the need to strengthen budgetary discipline by implementing strict domestic fiscal frameworks that effectively constrain the volatility and cyclical nature of government expenditure, in general, and the public wage bill, in particular. In addition, reforms in labour market institutions may be needed to avoid institutional biases towards pro-cyclicality, e.g. originating from indexation, which ties government wages to inflation. While these conclusions are of general interest for economic policy, they are particularly relevant in a monetary union: the delegation of monetary policy to a single central bank implies that macroeconomic adjustment at the national level can only be achieved in the fiscal domain and via structural reform.

As regards labour market interactions, the paper reports evidence of a robust and significant inter-relation between public and private wages. In particular, in most euro area countries and at the euro area aggregate, public and private wages tend to co-move both in the short and the long run. Moreover, the empirical results provide some evidence of a direct causal relationship between these variables. While private wages tend to lead public wages in the very long run, for some countries bi-directional causality (i.e. running from public to private wages and vice versa) is found for the medium and short run. In addition, the evidence documents second-round effects, since public and private sector wages influence each other indirectly via the price level in most countries. Cross-country differences in the degree of public wage spillovers may be partly explained by differences in domestic labour and product market institutions.

This evidence on public-private wage interrelation suggests that generous public wage

¹ For expositional ease, the terms "government" and "public" are used interchangeably throughout the paper. In both cases the text refers to the definition of the "government sector" adopted by the OECD as opposed to the broader concept of the "public sector". For more information see the data appendix.

setting may put pressure on private wages, with potentially adverse effects on a country's intra-euro area competitiveness. In fact, several countries with strong public-private wage interaction have been experiencing sharp unit labour cost growth and public wage increases since the start of EMU. To mitigate the risk of competitiveness losses, public wage restraint emerges as one important policy implication. While the specific reform needs differ across countries, a strengthening of fiscal institutions could generally facilitate the implementation of such policies. Reforms of labour market institutions leading to less coordinated wage bargaining and more decentralised wage setting, as well as product market liberalisation, may reduce adverse public wage spillovers and facilitate wage adjustment also in the private sector.

Tackling these challenges is particularly crucial in a monetary union: the single monetary policy implies that it is even more difficult to respond to wage spillovers across sectors of an economy, which leads to wage costs growing faster than warranted by fundamentals and adversely affects intra-euro area cost competitiveness. Moreover, evidence on the transmission of wage increases via inflation confirms the risk of second-round effects and wage-price spirals. Therefore, generous public sector wage setting may, notably, give rise to divergent price developments across Member States but also raise inflation in the area as a whole.

Countries adopting appropriate policies and institutions to underpin public wage restraint, especially in upturns, and to reduce undue public-private wage spillovers could reap the benefit of a more competitive private sector *and* a more appropriate fiscal stance over the business cycle. This “double dividend” of greater economic stability and a lower risk of intra-euro area competitiveness losses should encourage policy-makers to undertake the necessary adjustments.

The paper is structured as follows. Section 2 provides stylised facts on public wage

expenditure and public wage and employment dynamics. Section 3 examines the cyclical dynamics of government wage expenditure and discusses implications for macroeconomic stabilisation. Section 4 focuses on the interaction between public and private sector wages and addresses implications for economic competitiveness. Section 5 concludes.

2 STYLISED FACTS ON PUBLIC WAGE EXPENDITURE AND WAGE DYNAMICS IN THE EURO AREA

2.1 THE ECONOMIC IMPORTANCE OF PUBLIC WAGES

The government wage bill accounts, on average, for almost a quarter of total public spending in the euro area (see Chart 1).² However, this figure is subject to substantial cross-country variation. Some countries such as Austria and Germany record ratios well below average, while others such as Portugal, Ireland and Finland almost reach 30%.

Given that nearly half of GDP goes through the hands of government, this also implies that public wage expenditure plays an important role in aggregate demand. In the euro area, the government wage bill accounts, on average, for more than 10% of GDP. Here, too, substantial cross-country variation may be observed (see Chart 1). For example, in Germany government wage expenditure of about 7% of GDP amounts to slightly more than one-half of the corresponding ratio in France, Portugal and Finland.

These figures also reflect the importance of the government as an employer: on average, almost 15% of the labour force in the euro area is

employed by the public sector (see Chart 2). While a relatively small public workforce can be found in Germany, with less than 10% of the overall labour force, in France and Finland this share is more than twice as high.³

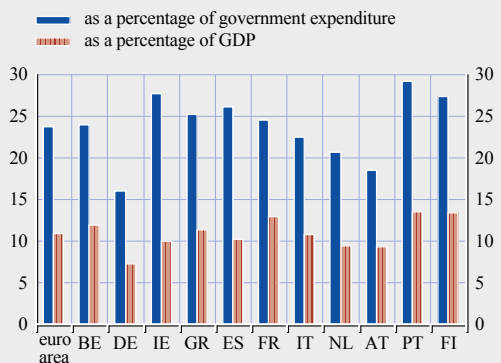
A comparison of public wage expenditure in the first half of the 1990s and in more recent years reveals some interesting patterns. The public wage bill has generally gained in importance relative to overall government spending. In particular, only Germany and Austria achieved a notable reduction in the ratio of the government wage bill to government expenditure (see Chart 3). By contrast, most countries, with the exceptions of Belgium,

2 For data sources and variable definitions see the Appendix. Cyprus, Luxembourg, Malta, Slovenia and Slovakia are not included in the sample owing to a lack of data for these countries. It should be noted that the euro area average included in Charts 1 to 4 refers to the simple average (rather than a weighted average), since this analysis is mainly concerned with the comparison of a country's policies to "typical" (i.e. average) behaviour of governments in the euro area. In Charts 6 to 12 and Tables 1 and 2 in Section 2.2, weighted averages are used because the focus is on the overall development of the respective variable in the euro area as one economic entity.

3 Public employment figures should be interpreted with caution. First, the delineation of public and private employment is very complex and, consequently, country figures are not always fully comparable. Second, for some countries, data had to be imputed due to a lack of data availability. Third, institutional reclassification of certain organisations between the public and private sector can in some cases lead to marked variations between years. For a description see the appendix.

Chart 1 Government wage bill

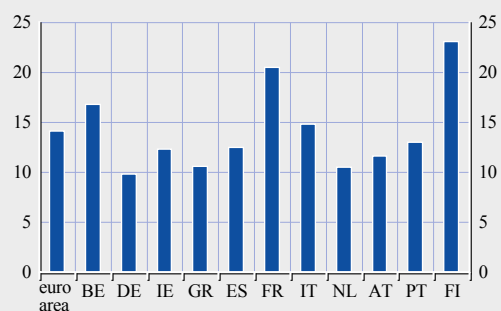
(average 2004 – 2008)



Source: OECD.

Chart 2 Government employment as a percentage of the labour force

(average 2004 – 2008)

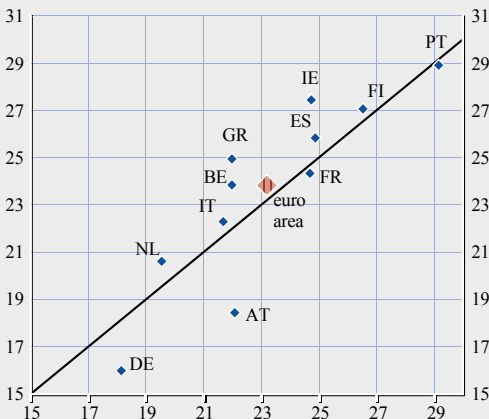


Source: OECD.

Chart 3 Public sector wage bill as a percentage of general government expenditure

(early 1990s and recent years)

x-axis: average 1991-1995
y-axis: average 2004-2008



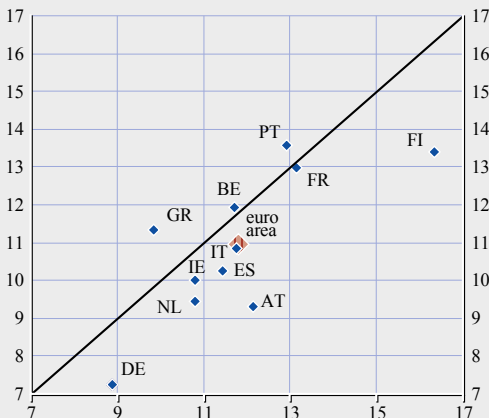
Source: OECD.

Greece and Portugal, reduced government wage expenditure relative to GDP (see Chart 4). Thus, while governments were generally able to scale down the public sector relative to the overall size of the economy, the adjustment burden borne by public employees was often smaller than that borne by other types of spending.

Chart 4 Public sector wage bill as a percentage of GDP

(early 1990s and recent years)

x-axis: average 1991-1995
y-axis: average 2004-2008

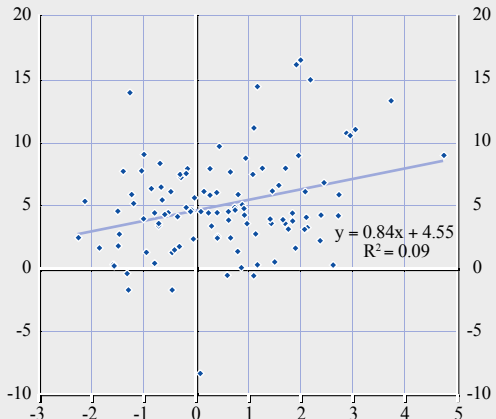


Source: OECD.

Chart 5 Annual growth in the public sector wage bill and cyclical conditions in individual euro area countries

(1999-2008)

x-axis: output gap
y-axis: annual growth rate of public wage bill



Sources: OECD and own calculations.

Given its size, the government wage bill is a key ingredient in a country's fiscal stance. As a first step in exploring its cyclical patterns, Chart 5 plots annual growth in government wage expenditure against the output gap for the period 1999-2008. A positive relationship between the change in the government wage bill and the output gap can be detected. This implies that the growth in public wage expenditure tended to be stronger in times of favourable economic conditions.⁴ Of course, the causal interpretation of this observation should not be over-emphasised. However, it may be viewed as suggestive evidence of a pro-cyclical, rather than stabilising, role of public wage expenditure. This finding will be discussed in more detail in Section 3.

4 The relative scaling of the axes in Chart 5 may partly conceal the relationship between the two variables, since the range of values on the y-axis greatly exceeds the range of values on the x-axis. The slope of the regression line indicates that an increase of 1 percentage point in the output gap was, on average, associated with an increase of approximately 0.8 percentage point in the growth rate of the public wage bill. However, as evident from the low value of the R-squared statistic, the explanatory power of the regression is rather limited, i.e. variation in the output gap only explains around 9% of the variation in the growth rate of the public wage bill.

2.2 PUBLIC WAGE AND EMPLOYMENT DEVELOPMENTS IN THE EURO AREA

A comparison of public and private sector wages for the euro area as a whole reveals that the average public wage has always been noticeably higher than the average private wage (see Chart 6). This is consistent with the notion of the public sector wage premium that is generally found in developed economies.⁵

The ratio of euro area public to private wages per employee fell during the 1970s and 1980s, as nominal wages in the private sector tended to grow at a faster pace than in the public sector (see Chart 7). Public wages per employee were one-third higher than private wages in 1970 (see Chart 6), but the ratio fell to just above 1.1 by 1989. Since 1989, the downward trend in this ratio has reversed decisively.

Since the beginning of EMU, among the euro area countries included in the sample two groups can broadly be distinguished. The first group, comprising Ireland, Greece, Spain, Italy and Portugal, has seen significantly faster public wage growth than private wage growth,

(see Chart 8a), and to a greater extent than for the euro area aggregate. This goes some way to explaining the rise in the euro area ratio. Ireland has seen the largest increase since the start of EMU (31%). By contrast, the second group, consisting of Belgium, Germany, France, the Netherlands, Austria and Finland, has seen relatively little change in the ratio since 1999 (see Chart 8b).

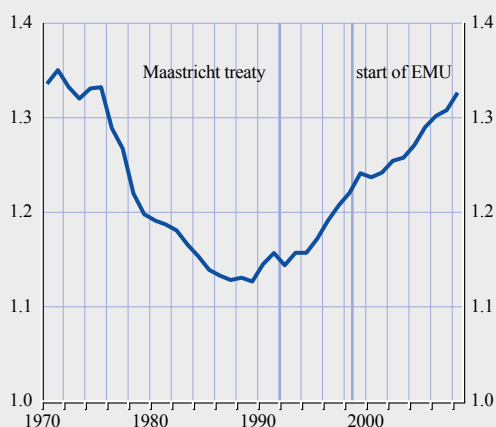
The downward trends in public and private sector wage growth, as well as their volatility, are also striking (see Chart 7).⁶ These patterns are displayed for the euro area countries and different time periods in Table 1. The period after 1992 saw relatively low and stable wage growth. This is likely to be due to the benign, low-inflation economic environment following

5 The two most common explanations for the public sector wage premium are: a) differences in the productive characteristics of workers; b) economic rents accruing to government workers from political and “vote producing” activities that are not relevant in the private sector (see Bender (2003)).

6 The trends in public and private sector wage growth broadly follow trends in inflation, which are shown for the private consumption deflator in Chart 7. In this case the deflator is used as a measure of inflation, but it is also used in Section 4 to deflate nominal wages per employee.

Chart 6 Ratio of public to private wages per employee

(euro area aggregate)



Source: OECD. Last observation: 2008.

Chart 7 Annual growth rates of nominal wages per employee

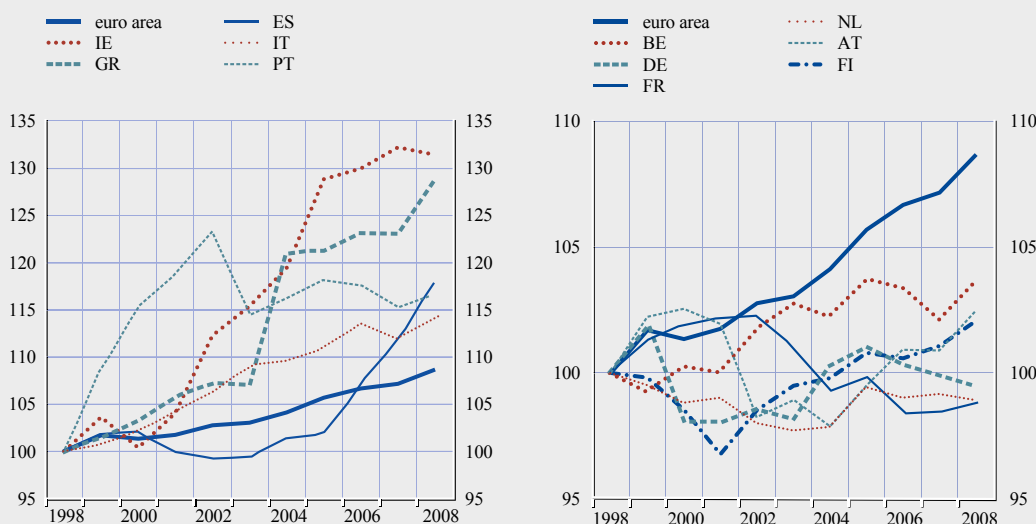
(euro area aggregate)



Source: OECD. Last observation: 2008.

Chart 8 Ratio of public to private wages per employee since the start of EMU

(1998 = 100)



Source: OECD. Last observation: 2008.

the start of the convergence period leading to EMU.⁷

stand out as having particularly volatile public wage growth relative to the private sector.

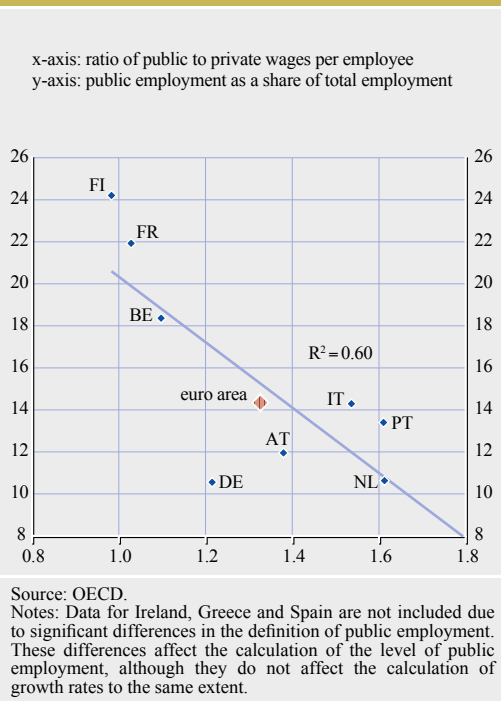
The standard deviation of public wage growth, especially since the start of EMU, has been larger than that of private wage growth in several euro area countries. Ireland, Spain, Italy and Portugal (as well as Austria) again

7 See, for example, Stock and Watson (2002), who show that fluctuations in wages have moderated considerably in the United States since 1984. In fact, OECD data reveal that the reduction in the average and standard deviation of wage growth in both the public and private sectors in the United States has been much less pronounced than in the euro area.

Table I Average and standard deviation of annual growth in wages per employee

	Whole sample 1971-2008				Post-Maastricht 1992-2008				EMU 1999-2008			
	Average		St dev		Average		St dev		Average		St dev	
	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private
Euro area	5.8	5.8	3.2	3.8	3.4	2.6	1.0	1.4	3.0	2.2	0.5	0.4
Belgium	4.2	3.8	2.9	2.1	3.8	2.7	1.7	1.3	3.2	2.8	1.1	1.0
Germany	3.8	4.3	3.6	3.3	2.5	2.1	2.5	2.4	1.2	1.3	1.2	1.0
Ireland	10.8	9.4	6.5	6.9	7.1	4.7	2.8	1.7	7.8	4.8	3.1	1.6
Greece	14.2	13.8	7.1	7.4	9.1	7.2	4.5	4.0	7.7	5.0	3.1	3.2
Spain	8.7	10.0	6.7	7.4	4.2	3.7	3.4	2.4	4.4	2.7	2.2	0.8
France	6.9	6.7	5.4	5.2	3.1	2.4	0.7	0.9	2.8	2.9	0.6	0.6
Italy	9.8	9.5	7.4	7.6	3.6	2.9	2.6	1.6	3.6	2.2	1.1	0.5
Netherlands	4.4	5.0	4.0	4.9	3.6	3.1	1.4	1.3	3.3	3.4	0.8	1.2
Austria	5.4	5.4	3.1	3.7	3.2	2.6	2.4	1.1	2.6	2.4	1.8	0.5
Portugal	13.4	13.2	8.9	9.4	6.3	4.9	4.3	3.6	4.8	3.1	4.1	1.1
Finland	7.2	8.3	5.2	6.1	2.9	3.3	1.6	1.2	3.6	3.3	1.1	1.1
United Kingdom	9.7	8.4	6.7	6.1	5.0	4.0	2.0	1.4	5.2	4.0	1.0	1.2
United States	5.1	5.2	2.2	2.2	3.6	3.8	1.3	1.4	4.4	3.9	1.1	1.2

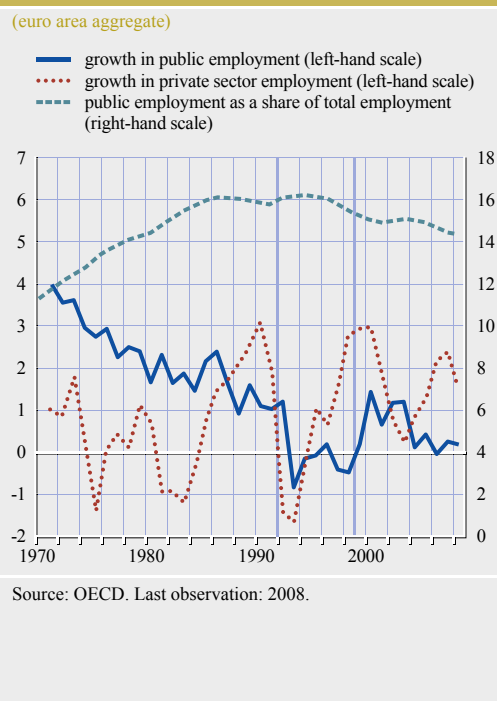
Chart 9 Ratio of public to private wages per employee and the share of public employment in 2008



Furthermore, despite overall lower wage growth, a number of euro area countries have recorded public wage growth far in excess of both domestic private wage growth and the average public wage growth in the euro area. Again, Ireland, Greece, Spain, Italy and Portugal are prominent examples. In most of these countries, *private* wage growth has also been much higher than the euro area average. Overall, public wage growth seems to have become more volatile and dynamic compared with wage growth in the private sector since the start of EMU, at the euro area level and notably in a few of its members. While this is only illustrative evidence, a more in-depth discussion will follow in the coming sections.

The public to private wage ratio tends to be greater in countries with a smaller share of their workforce in the public sector (see Chart 9). At one extreme are the relatively large but (compared with their private sectors) low-paid French and Finnish public sector workforces. At the other extreme lies the Netherlands, with

Chart 10 Annual growth rates of public and private employment and the share of public employment in total employment



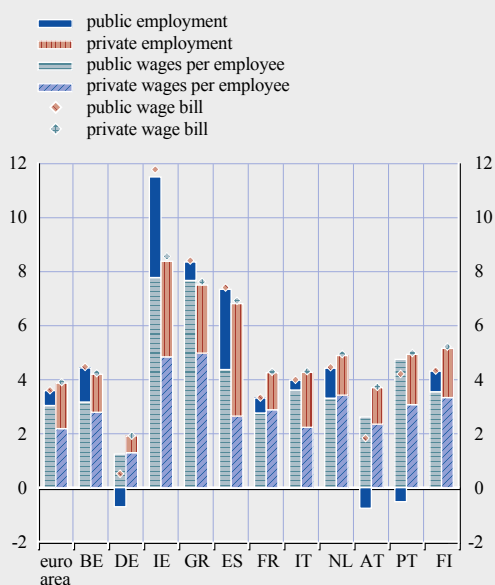
its relatively small and (relative to its private sector) very well-paid public sector workforce.

It is also worth briefly reviewing public employment trends (see Chart 10).⁸ Public employment grew strongly until the mid-1980s; by contrast, private employment was very volatile and grew much less overall. After 1987, however, public employment grew more slowly (and again in a less volatile manner) than private employment, with the exception of the years 1992-93 and 2002-03 (periods of economic weakness, during which the private sector is, naturally, more affected).

⁸ Chart 10 shows public employment as a share of total employment, whereas Chart 2 expresses public employment as a fraction of the labour force (which also includes unemployed persons). This distinction is made since the focus of each chart differs: Chart 2 illustrates the portion of a country's labour input that is devoted to its public sector, which is more accurately captured by the labour force. By contrast, Chart 10 compares employment and wage trends, and since wage data for unemployed persons are not available, total employment is the more accurate point of reference.

Chart 11 Average annual growth in public and private wage bills, employment and wages per employee

(1999 – 2008)

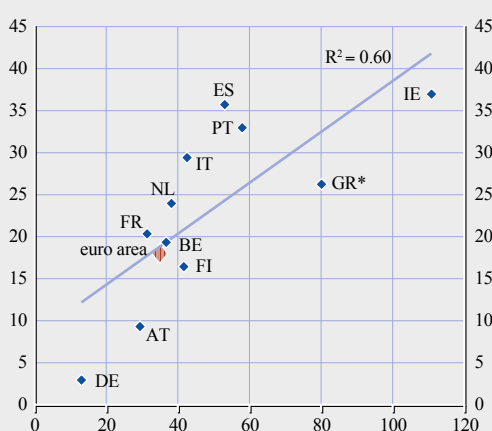


Source: OECD.

Chart 12 Cumulative growth of public sector wages per employee and whole economy unit labour costs

(1999 – 2008)

x-axis: public sector wages per employee (percentage growth in nominal terms)
y-axis: ULC (percentage growth in nominal terms)



Sources: OECD and Eurostat.

*Data for Greece begin in 2001. Developments of labour productivity in Greece are strongly affected by the structural decline of self-employed persons in the agricultural sector. Looking at dependent employment, the cumulated unit labour cost growth between 1999 and 2008 amounted to 45.0%.

Chart 11 gives a country-by-country breakdown of the average annual growth in public and private sector wage bills during the post-EMU period into its “price” (compensation per employee) and “quantity” (employment) components. It allows for a comparison of developments in the wage bill across component, country and sector. Several messages can be taken from this chart:

- In the euro area as a whole, public wages per employee grew faster than those in the private sector in the post-EMU period. However, the total public wage bill rose more slowly. This reflects more subdued public (than private) employment growth.
- Two out of the three countries with the highest average growth in public sector wages per employee (Spain and Ireland) also experienced the strongest public employment growth of all the euro area countries.

- In Greece, Italy and Portugal, public wages per employee also grew rapidly over the decade. However, these countries saw modest employment growth (a slight fall in employment in the case of Portugal), limiting the increase in their public wage bill.
- Germany and Austria restricted growth in their public wage bill much more successfully than all the other countries, in the dimension of both employment and wages per employee. Public employment fell in both countries over this period;⁹ they also reported the smallest average increases in public wages per employee.

⁹ The employment dynamics in the two countries are somewhat different. German public employment shrank every year since the start of EMU (indeed, since 1993), while Austrian employment developed more unevenly.

Table 2 Cumulative growth of public and private sector wages per employee

(1999 – 2008)

	Public sector	Private sector
Euro area	34.9	24.2
Belgium	36.6	31.7
Germany	13.1	13.7
Ireland	110.8	60.3
Greece	108.7	62.0
Spain	53.1	29.9
France	31.3	32.9
Italy	42.5	24.8
Netherlands	38.5	40.0
Austria	29.3	26.2
Portugal	58.0	35.3
Finland	41.7	38.8

Source: OECD.

Public wage setting can potentially have an important effect on a country's cost competitiveness through its effects on private wage setting. A common method of assessing competitiveness is to consider productivity-adjusted wage growth in the whole economy, i.e. unit labour costs. A first illustrative impression of the relationship between public wage growth and unit labour costs in the post-EMU period can be seen in Chart 12, which indicates that there was a reasonably strong association. In the decade under review, Ireland, Greece, Spain, Italy and Portugal posted strong unit labour cost growth while wages in their public sectors grew rapidly. Table 2 underlines the significant cross-country divergence, with these five countries clearly seeing a greater increase in public as opposed to private wages.

Section 4 will examine the issue of competitiveness and the role of public-private wage interaction in more detail.

3 PUBLIC WAGE EXPENDITURE OVER THE CYCLE: STABILISING OR PRO-CYCLICAL?

3.1 THEORY AND EVIDENCE FROM THE RELATED LITERATURE

There are two main views on how public spending in general, and public wage expenditure in particular, should behave over the business cycle. The more extreme “demand management” perspective suggests that the fiscal stance be inversely related to the cyclical position of the economy. Accordingly, increased government expenditure should mitigate downturns by partly compensating for falling private demand and investment during such periods. In upturns, expenditure cuts could curb economic dynamics so as to prevent the economy from “overheating”. By contrast, the prescriptions from the tax smoothing literature suggest a more passive, stabilising role for public spending: fiscal policy responses to changes in cyclical conditions should mainly be confined to the free operation of automatic stabilisers.¹⁰ By implication, most spending items should not react to fluctuations in economic activity, except for unemployment and other social benefits, which, owing to an increase (decrease) in the number of recipients during downturns (upturns), display an in-built counter-cyclical reaction.

Active demand management is subject to a number of problems. In particular, lags between the identification of a downturn and the implementation of measures severely hamper their effectiveness and often result in de-stabilising policies.¹¹ Moreover, while fiscal expansion might still be relatively easy to implement in the case of most spending items, the phasing-out of the respective programmes usually meets fierce political opposition. This may lead to a gradual increase in the government sector after each expansionary episode rather than symmetric expenditure expansions and contractions over the cycle.

In view of these risks, public wage spending does not emerge as a good candidate for counter-cyclical macroeconomic policy.

First, to adjust this spending item, changes in public employment and/or re-negotiations of existing wage contracts are necessary, both of which are associated with lengthy administrative processes that imply substantial implementation lags. Second, and even more importantly, temporary expansions of the public wage bill would be difficult to reverse given the high degree of coordination among public employees (e.g. through unionisation) which facilitates political opposition. Hence, policy-makers should not react to short-run fluctuations in economic activity via public wage expenditure. Following a constant long-term path in line with a prudent forecast of economic trends, the public wage bill, as a demand component that is unaffected by upturns and downturns, would then automatically help to stabilise the economy.

Given the size of public wage expenditure and employment, one would expect the cyclical nature of government wage expenditure to be addressed extensively in the related empirical literature. Yet, while a lot of empirical research examines cyclical patterns of broad government spending variables (as well as certain sub-items, such as government investment), evidence on public wage expenditure is sparse. With respect to broad definitions of government expenditure, several studies support the notion of a pro-cyclical spending bias. In an early contribution to this literature, Galí and Perotti (2003) find a significant positive reaction of cyclically adjusted primary spending in several EU countries to changes in the output gap for the period before the adoption of the Maastricht Treaty.¹² This result is further corroborated by recent literature. Turrini (2008), for example, documents

10 For the classic argument underlying the former view, see Keynes (1936). The latter view is based on Barro (1979). While spending is treated as exogenous in Barro’s analysis, Talvi and Végh (2005), as well as Büttner and Wildasin (2009), show that under standard assumptions governments should also choose a smooth expenditure path over the cycle. For an overview of the main arguments, see ECB (2002) and European Commission (2004, 2006).

11 See, for example, Feldstein (2002), Fatás and Mihov (2003, 2006), Lane (2003) and Cimadomo (2008). For an overview, see ECB (2004).

12 For recent reviews of the literature on the cyclical nature of government spending, see Turrini (2008) and Beetsma et al. (2009).

a significant pro-cyclical response in cyclically adjusted primary expenditure in euro area countries for the period 1980-2005. Similarly, for a panel of EU countries Holm-Hadulla et al. (2010) find that governments respond to positive surprises in cyclical conditions by exceeding the spending targets laid out in their stability and convergence programmes. The few studies that do analyse public wage expenditure separately reach different conclusions. Lane (2003) finds strong pro-cyclicality in a sample of OECD countries over the period 1960-1998. By contrast, Hallerberg and Strauch (2002) detect weak counter-cyclical patterns of government wage expenditure for a sample of EU Member States over the period 1970-97.

This literature leaves a number of loose ends. First, findings on overall expenditure cannot be translated directly to individual government spending items since they are subject to different technical and political constraints. To capture systematic differences in the stabilising role of spending categories, a separate analysis of public wage expenditure is needed. While the above literature contributes to this aim, further analysis that also takes into account more recent developments in EU Member States is warranted. Second, the comparison of estimates across studies on fiscal cyclicality, in general, indicates that results are highly sensitive to differences in econometric methodology. These robustness concerns suggest that the conclusions from existing empirical evidence should be scrutinised carefully. Finally, in a monetary union, policy-makers need to be aware of public spending patterns and their demand effects, not only for single euro area countries but also for the euro area as a whole. Nevertheless, empirical evidence on the euro area as a separate economic region is scarce.

The next section reports results from a study that addresses these three issues. In particular, it analyses the cyclicality of the public wage bill and its subcomponents, applying a large number of different empirical methods to a panel for the euro area aggregate and individual countries over the period 1960-2005.

3.2 EVIDENCE FOR THE EURO AREA

In a recent study, Lamo, Pérez and Schuknecht (2007) analyse the cyclical patterns of three variables that are of interest in the context of government wage expenditure: the public sector wage bill, compensation per public employee (both in real terms), and the number of public employees. The empirical analysis examines the co-movement of these variables with three indicators of economic activity: real GDP, real GDP per capita and unemployment. Consistent with the related empirical literature, the study uses statistical procedures that remove the long-run trend from the variables to focus on their business cycle properties, defined as the recurrent fluctuations of a time series around its long-run trend (see Lucas, 1977). Moreover, the study makes two further distinctions. First, it analyses co-movements between the above variables, removing solely the long-term trend. These are co-movements of all the fluctuations around trend, including both systematic responses of the fiscal variables to economic conditions and irregular fluctuations due to unpredictable shocks. Second, it considers the co-movement patterns of these variables, removing all the inertia of the series therefore isolating the pure “irregular component”. Co-movements, in this case, are between unpredictable fluctuations due to shocks. For simplicity, we call the former “cyclical co-movements” and the latter “co-movements of shocks”.

More intuitively, systematic relationships between government wage expenditure and cyclical conditions might originate, for example, from indexation practices that tie government wages to inflation, so that demand pressures in upswings are reflected in higher growth in nominal wages per employee. Furthermore, if governments display a tendency to allow for a higher (lower) growth in the number of public employees in upturns (downturns), this would also give rise to systematic co-movement patterns. The co-movement of shocks might result, for example, from discretionary changes in the government’s fiscal policy stance when

Table 3 Cyclicity of public wage and employment variables for the euro area aggregate

Lags of wage/employment variable	Cyclical co-movements					Co-movements of shocks				
	-2	-1	0	1	2	-2	-1	0	1	2
Entire sample period										
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
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
Pre-Maastricht period										
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
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

Sources: Lamo, Pérez and Schuknecht (2007).

Notes: Annual data. Sample period: 1960-2005 for upper panel; 1960-1992 for lower panel. Bold figures indicate dominant correlation, i.e. the estimated correlation coefficient with the highest absolute value. A dominant correlation at a positive (negative) value for the lag in the respective wage or employment variable indicates that it is lagging (leading) the business cycle.

unexpected changes in cyclical conditions (“shocks”) occur. For instance, a “pro-cyclical” co-movement of shocks takes place when the hiring of additional civil servants or an unusually high wage increase coincides with higher than expected growth.

The results from Lamo, Pérez and Schuknecht (2007) for the euro area aggregate are shown in Table 3. The first five columns refer to the overall cyclical co-movements and the remaining columns to those attributed to shocks and discretionary policies. For each year, correlations of the public wage and employment variables with contemporaneous values of the economic indicators and with the values from the two preceding and subsequent periods are shown. The overall assessment of co-movement patterns for each pair of variables is based on the dominant correlation, i.e. the estimated correlation coefficient with

the highest absolute value (see bold figures).¹³ A fiscal variable is considered as lagging (leading) if the dominant correlation occurs between its current value and a value of the economic indicators from a preceding (subsequent) year.

¹³ A large number of statistical procedures (“filters”) are used in Lamo, Pérez and Schuknecht (2007) to both extract the overall cyclical fluctuations from time series data and to isolate the shock or discretionary fluctuations. Empirical findings may differ substantially depending on which specific set-up is chosen. Thus, instead of choosing one preferred empirical set-up, the results reported here synthesise a large number of different methods into one estimate for the cyclical co-movements and the co-movements of shocks respectively. For a motivation and detailed description of all procedures applied in this context, see Lamo, Pérez and Schuknecht (2007) pp. 11-18. By convention, co-movement patterns are considered acyclical if the dominant correlation ranges between 0 and 0.20 in absolute value; values between 0.20 and 0.39 (-0.20 and -0.39) and between 0.40 and 0.49 (-0.40 and -0.49) are considered weakly and moderately pro-cyclical (counter-cyclical) respectively. Strong pro-cyclicality (counter-cyclicality) is reflected in a value above 0.50 (below -0.50),

For the euro area aggregate, government wage expenditure and compensation per employee follow a distinct pro-cyclical pattern in response to the three economic indicators. In particular, they are positively correlated with the business cycle at a one-year lag and the degree of pro-cyclicality is strong. The results for the irregular component are somewhat weaker but still sizeable. This suggests that countries' discretionary policy measures may have actively contributed to the pro-cyclical co-movements between economic activity and the public wage variables found for the euro area aggregate.

The response of public employment to changes in cyclical conditions is more sluggish. In particular, it follows real GDP and GDP per capita pro-cyclically with a two-year lag. However, the patterns are generally less pronounced than for the compensation variables, pointing only to moderate pro-cyclicality. Moreover, employment shocks still display a positive co-movement with GDP variables with a two-year lag, but the coefficient only points to weak correlation. These results may reflect that, owing to rigidities in labour markets and the associated transaction cost of employing or releasing workers, governments tend to respond more strongly via the wage rather than the employment component of the public wage bill. Stated differently, pro-cyclicality appears to derive mainly from wage-setting behaviour as opposed to employment decisions.

From a policy perspective it is also interesting to see whether spending and employment patterns have changed over time and, in particular, whether the EU fiscal framework enshrined in the Maastricht Treaty and the Stability and Growth Pact has influenced policies in this regard. Unfortunately, the need for sufficiently long time series inhibits an in-depth analysis of the post-Maastricht period. Instead, the analysis was repeated for the pre-Maastricht period and thereby indirectly examines whether there may be a difference between the two periods. While the co-movement patterns are relatively similar to those for the entire sample period, the results

point to a slightly more pronounced pro-cyclicality for the pre-Maastricht period (see Table 3, lower panel). However, although differences in the general fiscal stance have also been found in related literature,¹⁴ this observation does not provide conclusive evidence that the EU fiscal framework has reduced the pro-cyclicality of government wages and employment in the euro area.

The above patterns reflect broadly similar findings for individual euro area countries (see Table 4). The public wage bill, in real terms, shows moderate to strong pro-cyclicality in all countries with one or two lags (except for Italy, where the dominant correlation is contemporaneous, as well as Austria and Belgium, where economic activity lags the public wage bill). Wage bill and GDP growth shocks also tend to co-move in a positive manner, suggesting that policy-induced dynamics tend to reinforce fiscal pro-cyclicality. Yet, in several countries correlations are weak. Moreover, in Spain, Belgium, and Ireland the co-movements in the irregular component point to weak counter-cyclicality. Furthermore, the timing of the co-movements of shocks is less homogenous than for cyclical fluctuations. While in some countries the public wage variables follow the economic indicators (e.g. in Germany and the Netherlands with a one-year lag, and in Italy and Finland with a two-year lag), in others they take the lead (e.g. two years in France and one in Spain).

Real compensation per employee follows patterns similar to those of the real public wage bill. In particular, co-movements with the economic indicators show the same direction for both overall cyclical fluctuations and shocks. The only exceptions are the Netherlands, where discretionary policy has not added to pro-cyclicality, and Finland, where discretionary policies may have had a (weak) counter-cyclical contribution. In Ireland, results are inconclusive given that correlation coefficients differ

¹⁴ For example, Gali and Perotti (2003) and Annett (2006) find that fiscal policy in euro area countries was less pro-cyclical in the post-Maastricht period than in the pre-Maastricht period.

Table 4 Cyclicity of public wage and employment variables for selected euro area countries

Countries	Type of co-movement pattern	Direction	Real compensation of public employees	
			Timing	Degree of correlation
Belgium	cyclical fluctuations	pro-cyclical	two leads	moderate
	shocks and policy changes	counter-cyclical	two leads	weak
Germany	cyclical fluctuations	pro-cyclical	one lag	strong
	shocks and policy changes	pro-cyclical	one lag	strong
Ireland	cyclical fluctuations	pro-cyclical	two lags	strong
	shocks and policy changes	counter-cyclical	one lead	moderate
Greece	cyclical fluctuations	pro-cyclical	one lag	strong
	shocks and policy changes	pro-cyclical	one lead	weak
Spain	cyclical fluctuations	pro-cyclical	two lags	moderate
	shocks and policy changes	counter-cyclical	one lead	weak
France	cyclical fluctuations	pro-cyclical	one lag	moderate
	shocks and policy changes	pro-cyclical	two leads	weak
Italy	cyclical fluctuations	pro-cyclical	contemporaneous	strong
	shocks and policy changes	pro-cyclical	two lags	weak
Netherlands	cyclical fluctuations	pro-cyclical	two lags	strong
	shocks and policy changes	pro-cyclical	one lag	weak
Austria	cyclical fluctuations	pro-cyclical	one lead	weak
	shocks and policy changes	pro-cyclical	one lead	weak
Portugal	cyclical fluctuations	pro-cyclical	one lag	strong
	shocks and policy changes	pro-cyclical	one lag	weak
Finland	cyclical fluctuations	pro-cyclical	two lags	strong
	shocks and policy changes	pro-cyclical	two lags	weak

Countries	Real compensation per public employee			Public employment		
	Direction	Timing	Degree of correlation	Direction	Timing	Degree of correlation
Belgium	pro-cyclical	two leads	moderate	pro-cyclical	two lags	weak
	counter-cyclical	two leads	weak	pro-cyclical	two lags	weak
Germany	pro-cyclical	one lag	moderate	pro-cyclical	two lags	moderate
	pro-cyclical	one lag	strong	pro-cyclical	two lags	weak
Ireland	inconclusive	-	-	pro-cyclical	two lags	strong
	inconclusive	-	-	inconclusive	-	-
Greece	pro-cyclical	one lag	weak	pro-cyclical	two leads	strong
	pro-cyclical	one lead	weak	a-cyclical	-	-
Spain	pro-cyclical	one lead	moderate	inconclusive	-	-
	counter-cyclical	one lead	weak	pro-cyclical	two lags	weak
France	pro-cyclical	one lag	moderate	inconclusive	-	-
	pro-cyclical	two leads	weak	a-cyclical	-	-
Italy	pro-cyclical	contemporaneous	moderate	pro-cyclical	contemporaneous	moderate
	pro-cyclical	two lags	weak	a-cyclical	-	-
Netherlands	pro-cyclical	two lags	moderate	pro-cyclical	two lags	moderate
	a-cyclical	-	-	a-cyclical	-	-
Austria	pro-cyclical	one lead	moderate	pro-cyclical	one lead	weak
	pro-cyclical	one lead	weak	a-cyclical	-	-
Portugal	pro-cyclical	one lag	moderate	pro-cyclical	contemporaneous	borderline
	pro-cyclical	one lag	weak	a-cyclical	-	-
Finland	pro-cyclical	two lags	strong	pro-cyclical	two lags	moderate
	counter-cyclical	one lead	weak	inconclusive	-	-

Sources: Lamo, Pérez and Schuknecht (2007). Sample period: 1960-2005.

strongly in size and direction between economic indicators.

For public employment the picture is very mixed. While for some series results are inconclusive or point to acyclicity, in several

instances pro-cyclical behaviour with two lags is found. Again, this may reflect the transaction cost associated with changes in the number of employees, which inhibits adjustments in the size of the public workforce to changes in economic conditions.

3.3 REMEDIES FOR PRO-CYCLICALITY

The findings described above suggest that government wage expenditure in the euro area and its member countries has mostly been pro-cyclical in recent decades. Besides reinforcing economic fluctuations, such pro-cyclical patterns may have an adverse effect on the quality of public finances. On the one hand, expansionary spending episodes during upturns bear the risk of remaining entrenched, thus inducing a secular growth of the public sector. On the other hand, cyclicity of government spending may also change the expenditure composition. During upturns it is often transfer and government wage expenditure that rise, while much of the burden of adjustment in consolidation periods tends to fall on public investment.¹⁵ Finally, pro-cyclical changes in public compensation per employee may put pressure on private wages in upswings, which would contribute to undermining competitiveness (for a detailed discussion see Section 4).

What should be done? As an immediate upshot, these findings call for more fiscal prudence with respect to government wages and, in particular, a more acyclical stance in line with the automatic stabilisation objectives. However, in order for governments to change their policies successfully, behavioural incentives of politicians and wage negotiations may need to be improved through a suitable institutional environment. Here, two aspects deserve particular attention: rules-based fiscal frameworks and public sector wage-setting institutions.

Properly designed fiscal rules can provide a useful commitment device for policy-makers, allowing them to overcome common pool problems in fiscal policy.¹⁶ For example, if governments are legally bound to respect certain spending limits, it will be easier for them to resist political pressures for budgetary expansion, since they are “tied to the mast”. While the Maastricht Treaty and the Stability and Growth Pact provide a general fiscal framework for the EU, these legal and institutional provisions should

be complemented by appropriate domestic fiscal rules. In fact, a widespread consensus on the beneficial role of rules to restrict government expenditure has emerged, as summarised, for example, by the European Commission’s assessment that “Enforced national expenditure rules [...] help to counteract forces leading to pro-cyclical fiscal policy in good times and thus prevent the need to retrench in bad times”.¹⁷

However, these effects on overall spending discipline do not provide a guarantee that pro-cyclicity in government wage expenditure is also mitigated. For example, the strong bargaining position of public employees could be largely unaffected by rules restricting broad spending aggregates, since adjustment efforts could be redirected to other types of spending. Hence specific provisions, such as multi-year ceilings on the growth rate of the government wage bill, might be helpful to address the problem of pro-cyclicity in this spending item. In addition, such rules may support fiscal consolidation efforts by containing growth of this expenditure item and fostering competitiveness.

The effectiveness of fiscal frameworks in reducing pro-cyclicity is closely linked to public wage-setting institutions. In particular, in several euro area countries (e.g. Belgium, Cyprus and Luxembourg) public wages are explicitly indexed to inflation.¹⁸ This indexation could complicate the task of adopting a sound fiscal stance. First, it establishes a direct positive link between cyclical conditions and

¹⁵ See Alesina and Perotti (1995) and European Commission (2006). Interestingly, in those countries that achieved substantial and sustainable improvements in fiscal positions, consolidation also involved sizeable reductions in government wages and employment (see Hauptmeier, Heipertz and Schuknecht (2006)).

¹⁶ The definition of fiscal rules proposed by Kopits and Symansky (1998) is used. According to this definition, fiscal rules are “a permanent constraint on fiscal policy, expressed in terms of a summary indicator of fiscal performance”. For a discussion of the political economy considerations in the design and workings of fiscal rules, see Schuknecht (2004) and Hallerberg, Strauch and von Hagen (2007). For empirical analyses documenting a favourable role of expenditure rules in reducing pro-cyclical spending bias, see Turrini (2008), Wierdsma (2008), Afonso and Hauptmeier (2009) and Holm-Hadulla (2010).

¹⁷ See European Commission (2004), p. 37.

¹⁸ For more information on labour market institutions in European countries see Du Caju et al. (2008).

the public sector wage bill, since demand pressures in upswings will be reflected in higher growth in nominal wages per employee. In a similar vein, if public wages have a wage leadership role, it virtually guarantees cascading developments between private and public sector wages: indexation automatically ensures that in upturns, higher private wages and the associated inflationary pressures will be reflected in an increase in public wages, which in turn spills over to the private sector. Consequently, competitiveness losses and second-round effects on inflation also become more likely (see Section 4).¹⁹ Finally, wage indexation may hamper the operation of fiscal rules to the extent they are formulated in nominal terms. In particular, it incorporates an “exogenous” component to developments in the overall compensation of employees which is beyond government control.

These arguments speak against the indexation of government wages.²⁰ Moreover, the findings suggest that public wage leadership in negotiations is particularly detrimental if public wages tend to be pro-cyclical. Multi-annual wage expenditure rules could help to reduce both fiscal pro-cyclicality and the interference of public wages with private sector competitiveness. Moreover, if the targets of such rules are sufficiently ambitious they can also support fiscal consolidation by containing public wage expenditure growth.

This discussion illustrates the close interrelation between the cyclicity of public wages and their interaction with private sector wages, which will be examined in the next section.

¹⁹ For a similar argument, see ECB (2008a). For a theoretical overview on the impact of indexation on inflation persistence, see Levin and Moessner (2005). Further information both on related theoretical literature and country studies is provided in ECB (2008c).

²⁰ Of course, there are also compelling arguments against private sector wage indexation especially in EMU.

4 PUBLIC AND PRIVATE WAGE INTERACTION: IMPLICATIONS FOR COMPETITIVENESS?

4.1 THEORY AND EVIDENCE FROM THE RELATED LITERATURE

In the very long run, both private and public wages are driven by trends in prices and productivity. In the medium run and, in particular, the short run, deviations from the long-run trend are possible. In this context, the interrelation between public and private wages in the euro area is considered in this section, taking into account its implications for economic growth and stabilisation. If public wages rise disproportionately and spill over to the private sector in certain countries, imbalances may arise since the unit labour costs of these countries could increasingly diverge from those of other countries. There may be adverse effects on their competitiveness, export performance and economic growth, which may be unsustainable in the medium to long run. Disequilibria may be hidden in an overall favourable environment during upturns, but they may precipitate and reinforce downturns, notably if downward wage rigidities in these countries prevent wages from adjusting. Given the absence of country-specific monetary and exchange rate policies, the cost in terms of employment could be even larger than if countries were able to partly accommodate such trends via these policy instruments. Loss of export market share, delocalisation of labour and higher regional unemployment could be the result. Such persistent losses of competitiveness, leading to an accumulation of imbalances, should not be confused with adjustment to country-specific shocks, which in EMU requires temporary differences in inflation and growth.²¹

Until recently, the literature has paid limited attention to the correlation between public and private wages, and the consequences of

government wage decisions for private sector wages, labour markets and economic performance.²²

The main theoretical reference regarding the *direction* of expected causality is the so-called Scandinavian model of inflation. This model, developed by Aukrust (1977) for the case of a small open economy, assumes that a) different sectors of the economy are either exposed to or sheltered from international competition (the sector that is most affected by international competition is commonly thought of as the manufacturing sector or other parts of the private sector, whereas the public sector is assumed to be largely protected from competition), b) wage decisions in different sectors are staggered (i.e. wages in different sectors are set at different points in time), and c) exchange rates are fixed. The model stipulates that the traded-goods sector is the wage leader in that wages in the traded-goods sector are determined by productivity and prices. Wage increases in the traded-goods sector are then

²¹ See, for instance, ECB (2008b).

²² As explained by Demekas and Kontolemis (2000), among others, this implicitly reflects the assumption that these decisions do not merit separate consideration, either because a) public wages are typically assumed to be exogenous or to be determined in the same way as private wages (i.e. they are the outcome of a bargaining process between the government and public employees' unions) (Quadri and Trigari (2007), Ardagna (2007), Holmlund (1993) and Calmfors and Horn (1986)), or b) they do not influence the labour market and the economy as a whole. Perhaps the most relevant reference is Lane and Perotti (2003), who, in a panel study, find that public wage consumption can influence a country's international competitiveness by altering unit labour costs and profitability. The remaining existing empirical work tends to focus on quantity links (employment) rather than price links (wages) between the public and private sectors. For example, Alesina et al. (2002) find a sizeable negative effect of public spending, and particularly its wage component (the total wage bill), on private sector profits and on business investment. Ardagna (2007) claims that the latter results are consistent with the different theoretical models in which government employment creates wage pressure for the private sector, and thus can be used as anecdotal evidence supporting the notion that the direction of causality would go from public sector wages and employment to private sector wages and employment. This study claims that this supports the theoretical assumption of exogenous public wages and employment. See also, for instance, Algan, Cahuc and Zylberberg (2002), Forni and Giordano (2003) and Gregory and Borland (1999), and the literature quoted therein.

transmitted to the sheltered sector (the public sector, where productivity growth is lower), which is possible since wage decisions are staggered.²³ This happens through central, intermediate and local wage formation.²⁴

Alternatively, however, it is possible that the direction of spillovers could be opposite to that hypothesised by the Scandinavian model. Wage setting in sheltered sectors operates in a less competitive environment and so may result in higher outcomes, all other things being equal. In an integrated labour market, higher wages in the sheltered sectors may be transmitted to higher wages in the exposed sectors, eventually above the level of productivity. As the public sector is one of the most sheltered sectors, public wages may assume a leadership role, at least in the short to medium run (as per some of the findings in the Box).

Additional channels for the sources of wage linkages from the public to the private sector are identified by Afonso and Gomes (2008), who use a macroeconomic model to analyse the effects of public sector employment and wages. In this model, public sector wages influence private sector wages in three ways. First, public sector wages affect the outside option of the unemployed by increasing the value of being employed in the public sector. Therefore, they put pressure on wage bargaining. Second, public wages have to be financed by an increase in taxes, which will reduce the overall gain from a worker accepting a private sector job and increase the wage paid by the firm. Third, higher public sector wages crowd out private sector employment which, because the marginal worker is less productive, raises average productivity and therefore the average private sector wage. The authors also suggest that public sector wage growth may carry a signal to the private sector about the government's inflation expectations.

Fernández-de-Cordoba, Pérez and Torres (2009) develop a dynamic general equilibrium model in which the public and private sectors interact in the labour market and wages in both sectors

are determined endogenously. Thus, they depart from the standard approach of assuming exogenous rules for public wages and public employment. Within that framework, they find that the response of wages to a technology shock (which can be thought of as an increase in productivity in the economy) is consistent with an observed positive correlation between public and private sector wages. More interestingly, even a private sector-specific productivity shock spills over to the public sector, increasing public wages. The model is also, however, consistent with the notion of the private sector having a wage-leading role if technology shocks are, on average, the main drivers of business cycle fluctuations. Nevertheless, public wages would lead private wages in certain episodes.

It is also worth briefly reviewing the institutional settings in the euro area, which overall point to a lead role for the private sector and some indicators of bi-directional causality. In many euro area countries, a norm of comparison or reference point plays an important role in public sector wage setting, although rarely through formalised arrangements.²⁵ Ireland is the only country where the pay of public servants is benchmarked with private sector comparators. In several other countries, private sector pay increases are taken as reference points, at least unofficially. In Germany, private sector bargaining outcomes usually set a pattern for pay increases in the public sector. In Austria, where no official benchmarking exists either, the metalworking industry agreement is an important reference point. In Finland, government agencies make pay

23 Strom (1997) assumes that government wages are determined as a mark-up on private sector pay, where changes in the mark-up might be associated with changes in the bargaining power of government sector workers.

24 Central negotiations refer to wage negotiations between the central organisations of a national labour market, whereas intermediate negotiations refer to wage negotiations between employer and employee organisations. Local wage formation refers to wage setting at individual workplaces. Further supporting the idea of private wage leadership, Forni and Giordano (2003) explain another key way in which private sector developments can influence public wages; resources to pay public employees are largely drawn, through taxation, from private sector labour earnings.

25 See Wage Dynamics Network findings (for instance Du Caju et al (2008)).

comparisons between the private and public sectors to help draft the pay policy of central government. In the Netherlands, public sector pay increases are based on an index calculated by the Ministry of the Interior, which takes into account pay developments in the private sector. Some forms of benchmarking with the private sector are also present in Belgium and Portugal. These benchmarking institutions, official or not, would suggest that the public sector has more of a follower role when it comes to wage setting.

From a normative viewpoint, public wage leadership need not necessarily have adverse effects. In a recession, it could exert a moderating influence by acting as a good example in the presence of downward wage

rigidities in the private sector. Similarly, in a boom, as it is a more sheltered sector, the public sector could potentially moderate private sector wage growth if it has a lead role. However, it is not clear that such positive outcomes would be easy to achieve.

As regards empirical evidence, the existing findings for various countries generally confirm a lead role for the private sector. However, there are a number of cases of bi-directional causality (i.e. running from public to private wages and vice versa), but limited evidence that the public sector exerts a fully fledged leadership role (see the Box). Note that none of these refer to the euro area or indeed individual euro area countries in the period since the start of EMU.

Box

PREVIOUS STUDIES FOR INDIVIDUAL COUNTRIES¹

For *Sweden*, three studies (Jacobson and Ohlsson (1994), Andersson and Isaksson (1997) and Lindquist and Vilhelmsson (2004)) find evidence in favour of the Scandinavian model, i.e. that private sector wages lead public wages. The results of three further studies differ, demonstrating no evidence of a clear wage-leading role for the private sector. Of these studies, Holmlund and Ohlsson (1992) report bi-directional causality. Tagtstrom (2000) finds that the manufacturing sector is a wage leader for government wages and that government wages lead the rest of the private sector. Friberg (2007), who considers several sub-sectors of the economy, finds that central government wages lead wages in a) the manufacturing sector, b) the private sector as a whole and c) the financial sector. He also observes the reverse causality for a) and b).

Overall, evidence of public wage leadership is limited, with only Tagtstrom and Friberg showing, respectively, that government wages lead non-manufacturing wages and financial sector wages. However, it is important to note that the structure of the Swedish labour market differs from other European countries. For example, unionisation is higher in Sweden than in all other OECD countries, while the wage bargaining system is lengthier and covers a greater number of workers.

Demekas and Kontolemis (1999) find that, for *Greece*, real government wages are weakly exogenous for private sector wages, i.e. higher government wages lead, through worker flow dynamics, to higher private sector wages (and to higher unemployment).

Mizala and Romaguera (1995) find bi-directional causality between the private and public sectors in *Chile* prior to labour market liberalisation in the early 1980s. After this, once the labour market is no longer under state control, private wages lead public wages.

¹ See Chart 14 in the appendix for more detailed results and definitions of certain terms.

In the case of *Romania*, the Christou, Klemm and Tiffin (2007) report that private sector wages lead government wages over the period 1993-2006. Since 1998, however, the authors find bi-directional causality: since Romania has become a market economy and labour market conditions have become tighter, government wage policy seems to influence private sector wage settlements. Wages in the state-owned enterprise sector also affect private sector wage developments.

For *Canada*, Bemmels and Zaidi (1990) look at many sub-industries (both in manufacturing and non-manufacturing) and find confirmation of the Scandinavian model. They first identify wage-leading sectors to be a) the mining and primary metals industries and b) the petroleum and coal industries (i.e. the tradable sectors). They then show that wage increases in these leading sectors cause wage increases in the non-leading industries, but not vice versa.

4.2 EVIDENCE FOR THE EURO AREA

4.2.1 EVIDENCE USING ANNUAL DATA

A number of recent studies aim to shed light on the interaction between public and private sector wages in the euro area. Lamo, Pérez and Schuknecht (2008) conduct time series analyses of the co-movement and causality of public and private sector wages for 11 euro area countries and the euro area aggregate over the period 1960-2007 using annual data. Moreover, the study looks at the relationship between these correlation and co-movement patterns and institutional features of countries' labour and product markets, notably countries' wage-setting institutions. When examining the co-movement between public and private wages, emphasis is placed on generating robust findings by applying a large number of statistical techniques to various definitions of wages and synthesising the results.²⁶

The empirical findings for the euro area and its member countries show a strong, positive correlation over the business cycle for both real and nominal wages. The correlation is mostly of a contemporaneous nature. Correlation coefficients are significant and typically very high (in most cases above 0.8; see Table 5), indicating a common pattern of private and public wage correlation across countries. These findings are consistent with both the stylised facts and

the theoretical arguments presented above and point to strong cross-sectoral linkages in wage setting, as public and private wage developments do not diverge significantly (in other words they do not decouple) even in the short run.

Wages in both sectors also share a common long-run trend. Statistically, this is shown by two approaches.²⁷ First, correlation coefficients between forecast errors of public and private wages tend to become larger over time. This is indicative of an even stronger co-movement of public and private wages in the medium to long term (Germany is an exception, with a slightly declining correlation coefficient) as illustrated in Chart 13.

26 For a motivation and detailed description of all procedures applied in this context, see Lamo et al. (2008) p. 12.

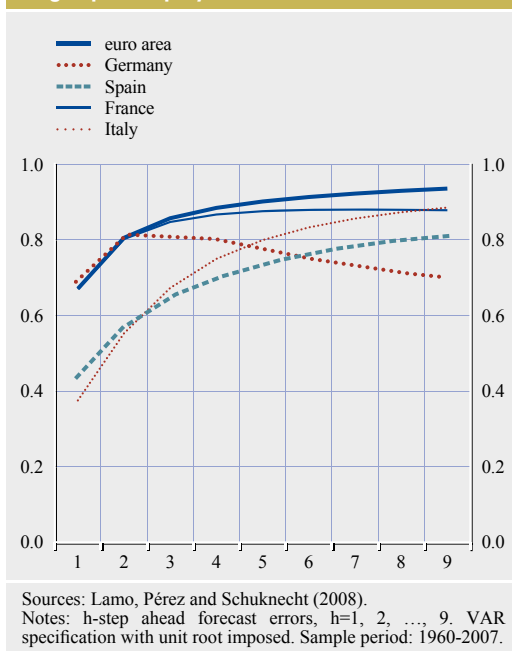
27 The existence of a long-run relationship between public and private sector wages is shown via well-established cointegration techniques and with the help of correlation coefficients of forecast errors from vector autoregressive (VAR) systems at different forecast horizons, following Den Haan (2000).

Table 5 Contemporaneous correlations of nominal private and public sector wages per employee

(1980 – 2007)

Euro area	0.87
Germany	0.86
Spain	0.71
France	0.88
Italy	0.91

Chart 13 Correlation of forecast errors from VARs between nominal public and private wages per employee



The study then examines whether developments in private sector wages in one year have a causal influence on public sector pay the year after and/or whether “causation” goes from public sector wage developments to private wages.²⁸ There are three main findings. The first refers to the direct interaction between private and public sector nominal wages on the basis of a bivariate vector autoregressive (VAR) analysis (see Table 6, column 1) where rather heterogeneous results are found. The private sector seems to lead public sector wage developments across years in Germany, Spain, France, Austria and Belgium and at the euro area aggregate. An important role of the public sector can be found in Greece, Italy, Portugal and Finland, which show bi-directional causality, and in the Netherlands, where only the public sector appears to lead. In Ireland there is no significant econometric evidence of causality with this approach.

However, this analysis leaves out the potentially very important indirect interaction between public and private wages via the price level. Prices are, therefore, taken explicitly into account in a

trivariate VAR analysis. Moreover, this analysis examines (as a “by-product”) whether second-round effects tend to emerge from the interaction between public and private wages and prices. In this set-up, a significant public sector role is found in a number of countries for the direct relationship between private and public wages (column 2). In particular, there is a bi-directional relationship between public and private wages for Ireland, France, Italy, Netherlands and Finland. Private wages lead in Germany, Greece, Portugal and the euro area aggregate. For the other euro area countries no causality is found.

The VAR analysis also shows significant indirect spillover effects from private wages to the price level for all countries and the euro area aggregate (column 3). This influence can also be found for public wages in most countries, although the evidence is, in many cases, weaker and depends on the price level indicator. Price level changes are, in turn, found to affect private and public wages (column 4). This causality analysis can also be interpreted as showing that the wage-price spiral (including via the public sector) is a significant source not only of wage spillovers but also of second round effects on inflation in most member countries and for the euro area aggregate.

The question of whether the heterogeneity of the public-private causality results is related to differences in labour and product market institutions – and notably wage-setting institutions – between countries is also addressed in Lamo, Pérez and Schuknecht (2008). They examine the role of institutional features in raising the probability of Granger causality from public to private wages. In those instances where public sector wage leadership was statistically significant

²⁸ The underlying criterion applied here is that of Granger causality. The study runs Granger causality tests looking, first, at VARs between detrended variables (using eleven detrending methods), and thus focusing on the Granger causal links over the business cycle. Second, VARs in levels (logs) of the variables aim to look beyond the business cycle. In a recent paper Lamo, Pérez and Schuknecht (2010) explore, for several OECD countries, a concept of public wage leadership based on vector error correction models (VECM), similar to the one used in Lindquist and Vilhelmsson (2004).

Table 6 Direction of causality (VARs in levels)

	Nominal wage causality without inflation	Nominal wage leadership/causality and interaction with inflation		
	Bivariate analysis	Trivariate analysis		
	(Public-private wages)	Causality between public-private wages	Causality from private/public wages to prices	Causality from prices to private/public wages
	(1) Leading sector	(2) Leading sector	(3) Sector affecting prices	(4) Sector affected by prices
Euro area	Private	Private	Both, weaker public	Both
Belgium	Private		Both, weaker public	
Germany	Private	Private, weak	Private	Both
Ireland		Bi-directional, weak	Both, weak	Both
Greece	Bi-directional	Private	Private	Both, weaker public
Spain	Private		Both	Both
France	Private	Bi-directional	Both, weaker public	Both
Italy	Bi-directional	Bi-directional, weak	Both, weaker public	Both
Netherlands	Public	Bi-directional	Both, weaker public	Both
Austria	Private			Both, weaker public
Portugal	Bi-directional	Private	Both, weak	Both, weaker public
Finland	Bi-directional	Bi-directional, weak	Both	Both, weaker public

Source: Lamo, Pérez and Schuknecht (2008).

Notes: In columns 2-4, weak causality implies significance of only one of the two price indicators. “Bi-directional” refers to causality going from public to private wages and vice versa. “Both” in columns 3 and 4 refers to causality going from both private and public sector to prices and vice versa. The price level is measured by the GDP deflator. Sample period 1990-2006.

(i.e. public sector wages caused private sector wages), the dependent variable takes the value of 1 (183 observations), otherwise it is set as zero (249 observations). Explanatory variables include a set of standard OECD-based variables of labour and product market institutions, a set of variables on wage-bargaining institutions in the euro area generated from the information collected within the European System of Central Banks Wage Dynamics Network (WDN), plus a measure of globalisation and size of government (public employment ratio).

The findings confirm the importance of certain labour and product market institutions in making public wage leadership more likely (see Table 9 in the appendix), although the robustness of results is not uniform and the analysis encounters problems of multicollinearity. First, stronger *bargaining coordination between negotiating parties*, which includes state-sponsored and state-imposed coordination, *government involvement in collective bargaining* and *higher union membership*, suggest a strong role for a wage negotiation benchmark, and this may most easily be in the public sector owing to the higher degree of unionisation. Second, stronger *product market regulation* facilitates

public sector leadership. Stronger exposure to competition, by contrast, would result in market forces being more dominant in wage setting. Third, a larger *share of public employment*, proxying the size and “weight” of the public sector is correlated with a higher probability of public wage leadership.

The following factors were confirmed to reduce the likelihood of public sector wages causing private wages. First, stricter *employment protection legislation* gives unions greater bargaining power in the private sector, independent of public sector outcomes and therefore coincides with a weaker influence of public wages. Second, a higher degree of (private sector) *price indexation* is less likely to be positively correlated with public than with private sector wage leadership, since private wages – by comprising about 80% of countries’ wage bills – are a key driver of inflation. This, in turn, determines the next round of wage increases (wage-price spiral). Third, a prevalence of *occupational and company-level wage setting* is likely to focus negotiations on the specific (private) occupation or firm situation and therefore less likely to coincide with a strong lead role for the public sector.

4.2.2 EVIDENCE USING INTRA-ANNUAL DATA

Pérez and Sánchez (2010) focus especially on the short-term interaction between public and private wages. They analyse causality between public and private sector wages for Germany, Spain, France and Italy. First, they construct a dataset of quarterly government wages and employment by applying mixed-frequency time series models to monthly, quarterly and annual information from 1981 onwards. With this dataset, the study conducts a VAR analysis that incorporates public wages, private wages and the price level. The VARs also include, as control variables, productivity and a number of institutional variables.

This approach addresses three shortcomings in the previous study. First, contemporaneous intra-annual causality between public and private wages can be analysed. Second, the dataset contains sufficient observations so as to permit separate examinations for the pre and post-Maastricht periods. Third, the larger number of observations allows the inclusion of more control variables, such as productivity.

The main results are as follows. When intra-annual information is included, the leading role of the public sector is reinforced. The main conclusion of the analysis is the existence of robust cross-country empirical evidence of mostly direct signals (intra-annual links) between wages in the public and the private sectors. The results are broadly similar across the two samples selected. They are reinforced in a restricted VAR estimation, i.e. some quarterly information is left out in order to isolate “purely within-the-year” interactions between wages in both sectors. The results show strong linkages between wages in both sectors, with a predominance of bi-directional links in the cases of Germany and Spain. In addition, leadership of public wages in France in the 1991-2007 sample, and in the case of Italy for within-the-year estimations, are quite robust features of the data. This suggests that public sector wage setting has a particularly important role in the short run, i.e. within annual wage negotiation rounds.

Table 7 Percentage of models/observations suggesting public/private wage leadership

	1981-2007	1991-2007 (post-Maastricht)
Public wage causation to private wages	0.75	0.8
Private wage causation to public wages	0.85	0.6

Source: Pérez and Sánchez (2010).

Notes: Models/observations can suggest both private and public wage causation, i.e. bi-directionality.

Meanwhile, productivity does not play a central role as a channel for private/public wage causation at the short-term/quarterly frequency. Moreover, they find robust evidence of the existence of a complex structure of indirect links via institutional control variables.

One way of illustrating and synthesising the strong result of bi-directionality is to look at the results of the VAR model analysis in terms of public and private leadership across four countries, but extended to account for two price level variables and six model specifications. For each episode (1981-2007 and 1991-2007), there are therefore 48 observations. For the longer period, 85% of the models/observations suggest private wages causing public wages and 75% suggest public wages influencing private wages at the 90% confidence level (see Table 7). For the most recent episode, about 60% of the observations suggest private wage causation while 75% confirm public wages causing private ones.

4.2.3 EVIDENCE USING PANEL DATA

The previous results on the importance of public sector wage developments to the private sector are broadly confirmed by another study for the “average” of their sample countries (it does not examine public-private wage interaction at the individual country level). Afonso and Gomes (2008) conduct a pooled analysis of public and private sector wage growth, including the estimation of a relationship between private sector wage growth and its determinants. They use the same OECD wage dataset for OECD and European Union countries for the period between

1970 and 1998/2006 as the other two studies. Nominal and deflated compensation per public sector employee display a statistically significant positive contemporaneous correlation with private sector wages. In terms of causality, they estimate that a 1% increase in public sector wages increases contemporaneous private sector wage growth by around 0.3%. Divergences between public and private wages, or other shocks to the public/private wage ratio, tend to correct over time, albeit at a very slow pace. While this study provides a less direct measure of causality in the euro area than the previous two studies, it complements them by underlining the role of the public sector in influencing private sector wages.

4.3 REMEDIES FOR SPILLOVERS INTO COMPETITIVENESS

The above findings indicate that public and private wages do not decouple. For the most part, private sector wages seem to exert a stronger influence on public wages than vice versa. However, for the euro area aggregate, and in many individual countries, results of correlation and causality analysis also suggest an important influence from the public sector on private sector wages, both directly and indirectly via prices. In some countries, the issue of public wage spillovers is particularly important. For example, in Section 2, it was identified that since the start of EMU, certain countries (Ireland, Greece, Spain, Italy and Portugal) have experienced high and volatile public wage growth and rapid increases in unit labour costs. Section 4 shows that, in all of these countries, there is at least some causality from public to private wages. There are direct and indirect bi-directional links in Ireland and Italy, and linkages to a lesser extent in Greece, Spain and Portugal.²⁹ In addition, France the Netherlands and Finland exhibit bi-directional causality.

Several mechanisms have been identified which make public sector wage leadership more likely, including (from Section 4.1): wage setting operating in a less competitive environment and resulting in higher outcomes before being transmitted to more exposed

sectors; higher public wage growth raising the bargaining power of private sector employees; and higher public wage growth reducing private sector employment and therefore raising average private sector productivity/wages. The response of wages to a technology shock is also relevant, given that expectations of permanently higher productivity growth may have contributed to the boom periods in some countries, as well as the subsequent bust. Furthermore, in Section 4.2, several features of domestic labour and product market institutions were confirmed as influencing the likelihood of public sector wage leadership.

These findings have important policy implications. First, public wage restraint could be a crucial factor in maintaining a country's competitiveness. As second-round effects from prices to wages seem to be a key driver of wage and price dynamics in virtually all countries (with strong effects on public wages in most countries), it reinforces the potential role for public wage restraint to help maintain price stability. The importance of public wage restraint is particularly salient where the public sector exerts a signalling role. Second, the reform of institutions that induce public wage leadership may be warranted if they are prone to causing imbalances via public wage causality.³⁰ For example, less coordinated and more decentralised wage bargaining, measures to increase competition in product markets (instilling greater discipline in the private sector) and a smaller public sector workforce would be beneficial in this context. To that effect, some of the remedies identified in Section 3.3 (such as decoupling public sector wages from private sector benchmarks and the abolition of

29 Of those countries identified in Section 2 as experiencing large increases in public wages and unit labour costs over the last decade, both Ireland and Spain have seen much larger rises in unemployment in the current recession than might have been expected by considering the fall in GDP (see ECB (2009), p. 53). This reflects, to a significant extent, the imbalanced growth experienced in the preceding years, of which strong public wage growth is one phenomenon.

30 Of course, even if direct spillovers are reduced, the public sector still has an important role to play by setting an example to the private sector and building a constituency for restrained wage growth and low inflation.

indexation) would not only reduce pro-cyclicality but would have the additional benefit of reducing spillovers into competitiveness.

Third, wage expenditure rules or ceilings on public wage growth could be an appropriate policy strategy. As discussed in Section 3.3, such rules are useful in limiting pro-cyclical tendencies in public wage expenditure, thereby improving the overall cyclical stance of fiscal policy. In addition, permanent rules for public sector wage setting can serve to align long-term government wage dynamics with general economic trends. Policy-makers face a trade-off when defining the targets or ceilings of government wage dynamics for such a rule: if compensation in the public sector is above the private sector (accounting for differences in skill composition, working conditions, job security and other relevant factors), competitiveness losses may be induced via the channels discussed above. If the opposite holds true, this may lead to a risk of impairing the recruitment and retention of skilled public sector workers. Assuming that, at the time of adopting a wage rule, such problems do not exist, the rule for nominal public wage growth should be based on a prudent forecast of productivity growth in the private sector, as well as the expected inflation rate that is in line with price stability. By contrast, if, at the outset of adopting such a rule, prevailing levels of public wages are already subject to a misalignment, a (temporary) deviation from this path may be warranted.³¹ In particular, in countries in which past public wage setting has already contributed to private sector competitiveness losses, a period of real public sector wage growth below productivity trends would be necessary.

Fiscal policies should not stoke imbalances and losses of competitiveness, but rather facilitate competitive adjustment where needed. The strong public wage growth in a number of euro area countries, particularly in those where competitiveness problems and macroeconomic and fiscal imbalances have been greatest in recent years, needs to be followed by significant adjustment. This, in turn, should facilitate the correction of private sector wages and improvements in competitiveness.

³¹ Structural unemployment levels may be another factor to consider in the definition of public wage rules. In particular, higher structural unemployment may warrant more prudence in constraining public wage developments.

5 CONCLUSIONS AND POLICY IMPLICATIONS

This paper addresses the role of government wages as a determinant of macroeconomic stability and competitiveness in the euro area. Recent empirical evidence suggests that real government wage expenditure is subject to a pro-cyclical bias, i.e. it co-moves positively with the business cycle in most euro area countries and at the euro area aggregate level. Thus, it may reinforce rather than mitigate fluctuations in economic activity. Moreover, the evidence points to a strong, positive correlation and co-movement between public and private wages in the short to medium term, both directly and indirectly via the price level. In a number of countries this interrelation has coincided with strong public wage growth and intra-euro area competitiveness losses.

These findings suggest that governments should be cautious that wage-setting and employment policies do not lead to negative repercussions on fiscal and economic performance. First, there appears to be a need to strengthen fiscal discipline and to reduce the risk of pro-cyclicality in government wage expenditure. To this end, strict domestic fiscal rules and medium-term budgetary frameworks could be effective tools to constrain the volatility and pro-cyclicality of this spending item. In addition, reforms in labour market institutions may be needed to avoid institutional biases towards pro-cyclicality, e.g. originating from indexation that ties government wages to inflation.

Second, given the interrelation between government and private sector wage developments, policy-makers would be well-advised to adopt a prudent approach to government sector wage setting to mitigate the risk of competitiveness losses in the private sector. While the specific reform needs differ across countries, a strengthening of fiscal institutions is likely to facilitate such prudence. Reforms in labour market institutions, for instance towards less coordinated wage bargaining and more decentralised wage setting, as well as product market liberalisation,

may further reduce the risk of adverse government wage spillovers and facilitate wage adjustment in the private sector.

The implementation of such reforms may well be associated with political opposition. However, the “double dividend” of greater economic stability and a lower risk of intra-euro area competitiveness losses should encourage policy-makers to undertake the necessary adjustments.

ANNEX

DATA SOURCES AND DEFINITIONS

For the stylised facts in Section 2, the cyclical study in Section 3 and the co-movement study using annual data in Section 4, the OECD Economic Outlook database Autumn 2009 issue is used. Missing variables for some specific time periods/variables in this issue of the OECD have been completed with information from the Spring 2006, the Spring 2007 and the Spring 2008 issues.

The euro area aggregate includes eleven countries, while it excludes Cyprus, Luxembourg, Malta, Slovenia and Slovakia owing to lack of data for these countries. German series have been built up on the basis of (i) from 1991 onwards, unified Germany; (ii) for the period 1960-90, back-casted unified Germany levels using the growth rates of the corresponding West German variables. Similarly, missing data for public sector compensation of employees in Belgium in the 1970s necessitates the use of back-casting using the European Commission Ameco database to fill the gaps.

The terms “government” and “public” sector are used interchangeably. In both cases, the text refers to the definition of the “government sector” adopted by the OECD (see <http://stats.oecd.org/glossary/detail.asp?ID=1139>) and not the broader concept of the “public sector” (see <http://stats.oecd.org/glossary/detail.asp?ID=2199>). In the context of public wages and employment, this distinction is relevant since the latter concept also includes public corporations, which in some cases might give rise to ambiguities on how to differentiate between public and private wages and employment. Only in the case of Ireland the data includes also the employees of public enterprises. For additional statistical issues regarding the definition of government employment see OECD (1997).

Compensation per employee is computed using compensation of employees and employment data. 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).

Total compensation of employees in the government sector 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 (in line with the European System of National Accounts (ESA95) methodology). EU Member States do not yet report standardised employment figures to Eurostat for the general government sector. Thus, it is necessary to resort to national sources, raising concerns over the homogeneity of data. The figures referred to in this paper are taken from the OECD database that presents the best choice as regards cross-country availability and homogeneity of data in this respect. Since the most recent vintages of the OECD Economic Outlook do not report public employment figures for Germany, Greece and Austria, the latest available data (referring to the spring 2007 vintage) are used for these countries. For statistical issues regarding the definition of government employment see OECD (1997).

For the annual data study in Section 4, wages, compensation of employees and compensation per employee are considered in both nominal and real terms. Given that deflators have been pointed out as a source of disparity of results in the empirical literature on cyclical wages (Abraham and Haltiwanger (1995)), two different indices are used to deflate nominal wages, namely the private consumption deflator and the GDP deflator. Real fiscal variables have been computed using the private consumption deflator.



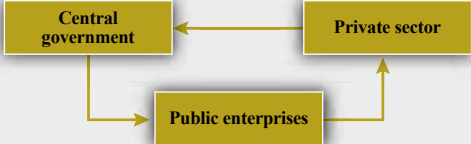
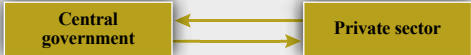

As for the intra-annual data study in Section 4, the European System of Accounts (ESA 95) provides only limited published time series and/or time coverage on public sector wages and employment. Eurostat recently started to disseminate quarterly series of compensation of

government sector employees fully consistent with the existing annual figures (see the discussion in Pedregal and Pérez (2009)). Nevertheless, the starting point of these series is relatively short, ranging for the countries in question from the first quarter of 1991 in the case of France to the first quarter of 1999 in the cases of Germany and Italy. At the same time, the ESA 95 framework provides related quarterly series under the heading “Compensation of employees in other services”, the basis of which is compensation in non-market services whose main part is the government sector. This information can be used as an indication of the target concept of “general government compensation of employees”. Furthermore, it is possible to obtain monthly and quarterly information on personnel expenditures by some sub-sectors of the general government sector, typically the central or federal government sectors. For government employment, the OECD only publishes interpolated series on a quarterly basis, which seem to be based on mechanical interpolation procedures. Nevertheless, as in the case of compensation of government employees, it is possible to resort to ESA 95 figures on “employment in other services”, the bulk of which are related to government activities. To the greatest extent possible, official information is used in this paper, especially as regards recently available quarterly series on employee compensation. Given the limitations of the information available, extensive use is made of available partial information, in particular related to non-market services. To use all this information in the most efficient way, mixed-frequency time series models have been set up. These models allow for the fact that Eurostat does not provide seasonally adjusted series for newly available government sector variables to be addressed; the series are seasonally adjusted within the selected time series models. Finally, whole economy unit labour cost data are provided by Eurostat.

Chart 14 Individual country studies into wage leadership

Study	Estimation details / Empirical method	Empirical results
Holmlund and Ohlsson (1992)	1966-91, Sweden/Granger causality tests ¹⁾ in single equations	<pre> graph TD PS[Private sector] --> CG[Central government] PS --> MC[Municipalities and county councils] CG <--> MC </pre>
Jacobson and Ohlsson (1994)	1968-88, Sweden/Weak exogeneity tests ²⁾ in a restricted Vector Error Correction (VEC) model ³⁾	<pre> graph TD PS[Private sector] --> CG[Central government] PS --> MC[Municipalities and county councils] CG <--> MC </pre>
Andersson and Isaksson (1997)	1970-95, Sweden/Granger causality tests in a single equation	<pre> graph TD PS[Private sector, white collar workers] --> CG[Central government] </pre>
Tagtstrom (2000)	1972-98, Sweden/Granger causality tests in single equations	<pre> graph TD Mfg[Manufacturing] --> CG[Central government] Mfg --> NMP[Non-manufacturing private sector] NMP --> MC[Municipalities and county councils] CG --> MC </pre>
Lindquist and Vilhelmsson (2004)	1970-2002, Sweden/Weak exogeneity tests in a VEC model	<pre> graph TD PS[Private sector, white collar workers] --> CG[Central government] </pre>
Friberg (2007)	1980-2002, Sweden/Granger causality tests in restricted VEC models (N.B. The linkages between different parts of the private sector are also tested, but not shown.)	<pre> graph TD WRT[Wholesale and retail trade] --> CG[Central government] WRT --> MC[Municipalities and county councils] PS[Private sector (as a whole)] --> CG PS --> MC Mfg[Manufacturing] --> CG Mfg --> MC Const[Construction] --> CG Const --> MC FS[Financial services] --> CG FS --> MC CG <--> MC </pre>
Demekas and Kontolemis (1999)	1971-93, Greece/Weak exogeneity tests in a VEC model	<pre> graph TD PS[Private sector] --> CG[Central government] </pre>

Chart 14 Individual country studies into wage leadership (cont'd)

Study	Estimation details / Empirical method	Empirical results
Mizala and Romaguera (1995)	1976-90, Chile/Granger causality tests in single equations	<p>1976-1982:</p>  <p>1983-1990:</p> 
IMF, Christou, Klemm and Tiffin (2007)	1993-2006, Romania/Granger causality tests in single equations	<p>1993-2006:</p>  <p>1998-2006:</p> 
Bemmels and Zaidi (1999)	1973-83, Canada/Granger causality tests in single equations	

1) A *Granger causality test* is a technique for determining whether one time series is useful in forecasting another. A time series Y (e.g. private sector wages) is said to Granger-cause X (public sector wages) if it can be shown (and with lagged values of X also known) that those Y values provide statistically significant information about future values of X.

2) A *vector error correction* (VEC) model is an econometric technique capturing the evolution and interdependencies between multiple time series (i.e. a vector auto regression or VAR) with an error correction feature. This feature means the short-run dynamics of the relationship between the variables depend on the deviation of the current state of the relationship from its long-run state.

3) *Weak exogeneity* refers to whether a variable can be considered as given, or whether it depends on other variables. If two variables X (e.g. private sector wages) and Y (public sector wages) are cointegrated (i.e. there is a long-run relationship or co-movement between them), and if X is weakly exogenous while Y is not, then Y adjusts to changes in X in order to maintain the long-run equilibrium. In this case, X is the “leader” and Y is the “follower”.

Table 8 Institutional determinants of public wage leadership

Dependent variable: takes value 1 if public wages cause private wages

Method: Probit

Independent variables

	Specification (1)	Specification (2)	Specification (3)	Specification (4) GDP deflator	Specification (5) Private cons. def.
OECD labour market indicators					
1) Index of bargaining coordination	0.231 [2.73]**	-0.083 [0.66]	0.167 [1.07]	-0.255 [1.37]	0.125 [0.71]
2) Index of bargaining centralisation	-0.022 [0.26]				
3) Employment protection legislation	-0.318 [3.16]**	-0.838 [4.97]**	-1.24 [5.25]**	-0.929 [3.61]**	-0.873 [3.77]**
4) Union membership/employment	0.003 [1.33]	0.022 [3.60]**	0.011 [1.59]	0.026 [2.72]**	0.02 [2.52]*
Product market regulation index					
5) Product market regulation index	0.434 [1.76]	1.119 [3.84]**	1.857 [4.39]**	1.309 [3.22]**	1.112 [2.58]**
Other control variables					
6) KOF index of globalisation	-0.011 [2.85]**	-0.002 [0.49]	-0.005 [1.05]	0 [0.05]	-0.006 [0.82]
7) Public employment ratio			5.645 [2.47]*		
Wage Dynamic Network variables					
8) Government involvement in collective bargaining	0.415 [2.67]**	0.676 [4.31]**	0.103 [0.28]	0.801 [4.03]**	0.643 [3.38]**
9) High coverage by indexation mechanisms (76-100%)	-0.214 [1.51]	-0.626 [4.96]**	-0.552 [2.85]**	-0.623 [4.15]**	-0.695 [3.65]**
10) Dominant level of collective bargaining: sectoral		0.374 [1.70]	0.505 [2.40]*	0.533 [1.81]	0.112 [0.35]
11) Dominant level of collective bargaining: occupational		-0.442 [3.25]**	-0.45 [3.48]**	-0.423 [2.38]*	-0.473 [2.30]*
12) Dominant level of collective bargaining: national		0.365 [1.43]	0.473 [1.97]*	0.475 [1.32]	0.266 [0.68]
13) Dominant level of collective bargaining: regional		0.341 [2.38]*	0.325 [2.22]*	0.378 [1.75]	0.335 [1.72]
14) Dominant level of collective bargaining: company-level		-0.469 [4.69]**	-0.521 [5.25]**	-0.376 [2.84]**	-0.629 [4.57]**
<i>Number of observations (maximum possible 432)</i>	360	360	360	180	180

Sources: Lamo, Pérez and Schuknecht (2008).

Notes: Robust z statistics in brackets: * significant at 5%; ** significant at 1%. The estimated coefficients shown in this table yield the marginal effect of a change in independent variables on the probability of public wage causation. The estimations include method dummies and deflator dummies in columns 1 and 2.

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