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ABSTRACT

Co-movements between Public and Private Wages in the EU: Which Factors Play a Role?*

This paper assesses the relationship between government and manufacturing wages. We find that the long-run relation between the two wages is stronger when the government is a large employer. Manufacturing wages are better aligned with productivity and unemployment when public wages, to which they respond, are set through bargaining. Finally, manufacturing wages react in the same way whether public wages are increased or cut, a relation that seems to hold also under fiscal consolidation provided the public sector is a large employer.

JEL Classification: C32, E24, E62, H59

Keywords: government wages, wage-setting, cost competitiveness, fiscal consolidation, cointegration

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Introduction

The Euro debt crisis has revived interest in the relation between fiscal policy and the labour market. Vulnerable countries face the multiple challenge of fixing distressed public finances, whilst having to improve cost competitiveness so as to reduce external imbalances as well as reabsorb excessive unemployment. These objectives are generally hard to reconcile, especially in high-debt countries where, for example, a fall in prices would come with a rise in real debt levels. Under specific circumstances, though, a fiscal consolidation strategy based on cutting *excessive* government wage expenditures could support cost competitiveness and possibly employment in the traded sector, if changes in public wages spill over to the private sector. This very same transmission channel is evoked in the fiscal-adjustment literature that has tried to quantify the differentiated output effects of consolidations based on their composition (Alesina and Perotti 1997; Lane and Perotti 1998; Alesina et al 2002; Ardagna 2004).¹ In parallel and more generally, a growing body of research has been looking at the long- and short-run relation between government wages and the labour market in "normal" times (Afonso and Gomes 2008, 2014; Perez and Sanchez-Fuentes 2011; Lamo, Perez and Schuknecht 2012; Lamo, Perez and Sánchez-Fuentes 2012).

This paper assesses the relationship between general government and private wages on a sample of 17 European Union (EU) countries from 1980 to 2013 applying to the panel data Dynamic Ordinary Least Squares (DOLS) for the long-run and an Error Correction Model (ECM) for the short-run. Our estimation strategy aims at determining the strength of the relation between the two wages across public sectors of different size and at assessing whether the way in which government compensations are set has any impact on the nature of the interaction with the private sector. We focus specifically on the spill over onto manufacturing wages so as to address the question of the possible effects of certain fiscal policy measures on cost competitiveness via the supply-side. We mainly build on the recent research that has looked at the interaction between public and private

¹ In this paper, we are not concerned with output effects from fiscal consolidation strategies, but simply aim at verifying whether the evoked labour-market channel is actually operating, irrespective of its contribution to the size of fiscal multipliers.

wages over both the long- and short-run but also incorporate theoretical insights from the so-called labour market view of fiscal adjustment mentioned above.

Our focus is on the relation going from government to manufacturing wages, but nonetheless assess also interactions in the opposite direction as a way of validating our results. We add to the existing literature in three important respects. First, we explicitly consider the role of public-sector size and estimate whether government wages exercise a stronger impact on the labour market when the government is a large than when it is a small employer. This would mostly allude to an explicit market mechanism, an issue that has been only tangentially treated in the existing literature. Second, we account for wage-setting modalities in the public sector distinguishing between compensations set by government decision and through collective bargaining. While largely ignored by the literature, the latter seems like a crucial issue because it is an indication of the extent to which changes in government wages are the result of exogenous fiscal policy decisions or rather part of the broader economy-wide wage-setting system. Third, we provide some evidence on whether the spillover from government to private wages is symmetric and whether periods of fiscal consolidation make a difference.

We find that general government compensations exercise a long-term impact on manufacturing compensations that is stronger for large public sectors. The (long-run) sector-size effect disappears when looking at real compensations, independently of whether government compensations rise or fall. This may be alluding to the fact that the long-run relation is crucially affected by second-round effects via inflation. By contrast, in the short-run, there is no size effect in any case, with each 1 percent increase (fall) in government nominal compensations leading on average to 0.25 percent increase (fall) in manufacturing nominal compensations, independently of whether the general government is a large or a small employer, a coefficient that is consistent with results from other studies (Afonso and Gomes 2014).

Having classified countries based on the prevailing public wage-setting mode, we find that the size of the spill over from the public to the tradable sector is not affected by public wage-setting neither in the long- nor in the short-run, but manufacturing wages are better aligned with productivity and more responsive to unemployment when public wages, to which private sector wages respond, are set via bargaining. This result may be allude to

the fact that any bargaining process is “closer to the market” than unilateral government decision and hence closer to what might happen in the private sector.

We further look at whether the relationship between government and manufacturing compensations is symmetric. We use an asymmetric ECM as in Granger and Lee (1989) to verify whether the null hypothesis of symmetry is rejected against an alternative of asymmetry. We find evidence of symmetry, with a change in real government compensations leading to the same labour market effect independently of whether the change consists of a rise or a fall in real government wages. Moreover, it appears that public wage consumption and the labour market tend to be decoupled under fiscal stress, unless the government sector is a relatively large employer.

The rest of the paper is structured as follows. Section 1 reviews the literature on the relation between, first, fiscal policy and competitiveness and, second and more generally, on the public-private wage link. Section 2 describes our sample and empirical strategy. Section 3 discusses the results. Section 4 looks at asymmetries and at the role of fiscal consolidation episodes. Section 5 concludes.

1. The public-private wage link in the literature

There is a well-established literature on the relationship between changes in government wage expenditures, competitiveness and external positions. Lane and Perotti (1998) show that a rise in government wage consumption reduces traded sector output via a rise in private sector wages, which would lead to a deterioration in the current account, if there exist adjustment costs that prevent consumption and investment of traded goods from falling rapidly.² Lane and Perotti (2003) find further evidence that higher government wage spending

² A strong assumption underpinning the analysis is that the domestic economy is too small to affect the demand for traded goods, which implies that the domestic traded sector is subject only to foreign demand and that fiscal policy shocks of this kind operate solely via the supply channel.

impacts on the supply side by raising the real product wage, thereby depressing profitability.³ To the extent that a rise in public compensations is financed with resources drawn from the private sector that may take the form of increased labour taxes, the literature on the impact of labour taxes on private sector costs is equally relevant. For example, Alesina and Perotti (1997) look specifically at the effects of changes in labour taxes on unit labour costs and find that higher labour taxes increase unit labour costs, unless negotiations are conducted by a monopoly union that is large enough to internalise the consequences of higher output prices on real consumption and employment.

Focusing on dynamics around fiscal consolidation episodes, Alesina et al (2002) and Ardagna (2004) argue that fiscal adjustments based on a reduction in the government wage bill induce a fall in real wages also in the private sector, thereby improving profitability and investment. Barrios and Langedijk (2010) show that the downsizing of the government wage bill leads to more successful fiscal consolidation under fixed exchange rate regimes, where the internal adjustment relies only on costs and prices, a result that is particularly relevant in the euro area context.

More generally, there is a growing body of research that has looked at the long- and short-run relationship between public and private wages in "normal" times, whether at stake is co-movement, interaction or a clear causal link going from one sector to the other, when for example one of them is a wage leader. This research is less specific about the origin of changes in public/private compensations and mainly devoted to understanding how different sectoral wages relate one to the other using a variety of statistical techniques ranging from cointegration and error correction models to vector autoregressive (VAR) systems or both.

Afonso and Gomes (2014) test the relationship between real general government and private wages on a panel of 18 OECD countries using a simple 2SLS estimation and allowing for an error correction term. Their analysis is mostly about the interaction between public and private wages and provides only indirect evidence on causality.

³ However, it is found that the impact on quantities such as output and employment is smaller, which suggests a limited pass-through from costs to prices in the presence of positive fiscal shocks.

They find that the interaction goes both ways and that each 1 percent increase in real public sector wage growth raises private sector real wage growth by 0.3 percent. Lamo, Perez and Schuknecht (2008, 2012) use different statistical techniques to analyse co-movement in the short-, medium- and long-term as well as causality. They find strong cross-sectoral correlation between public and private compensations, with coefficients as high as 0.8. To test causality, they implement a standard Granger causality test in a VAR framework and find that generally private wages have a stronger impact on public wages than vice versa. More specifically, the public sector acts as a wage leader only in the Netherlands and plays an important role, though not as far as leading, in Greece, Italy, Portugal and Finland. Finally, they juxtapose cross-country heterogeneity in coefficients to institutional settings and find that the role of the public sector is stronger, the greater the government's involvement in collective bargaining, the larger the public sector and the lower the competition from outside. Perez and Sanchez (2011) analyse the short-term relation between public and private wages also in a VAR framework and find evidence of signalling especially by the private sector including during actual wage negotiations.

These studies are generally not explicit about the exact transmission channel from one sector to the other and tend to capture different dynamics that are at play at the same time. Results can be interpreted more easily if one or more potential transmission channels are first identified and then modelled in the empirical analysis. We isolate potential market-driven and institutional channels, some of which would be more relevant for the interaction going from the government to the private sector; some others for movements in the opposite direction.

As concerns the possibility of changes in public wages impacting on the private sector, various channels may operate. First, large swings in public wages alter the supply of labour available to the labour market, inducing a change in the equilibrium wage if the labour market is perfectly competitive and in the absence of impediments to mobility. This is likely to be always true in the long-run with the two wages expected to be co-integrated with a slope coefficient of one. Second, rising public wages may crowd out private employment, increasing average productivity and thus wages in the private sector (Algan, Cahuc and Zylberger 2002). Third, changes in public wages affect the outside option of unionised private sector workers, putting pressures on the bargaining process

(Afonso and Gomes 2014), even when public and private employment remain separate. Fourth, changes in public wages that are compensated by an adjustment in labour taxation would mechanically alter private labour costs (Holmlund 1993, 1997; Forni and Giordano 2003). Indirectly, they may even alter wage demands if the wage bargaining system is such that wage setters have no incentive to internalise the consequences of their actions - i.e. where there is no centralization in wage bargaining (Alesina and Perotti 1997).

Similar albeit not identical transmission channels may be identified for the potential spill over going in the opposite direction, namely from the private to the public sector. First, wage bargaining in the private sector can have demonstration effects, whether it is the same union negotiating both wages or whether there are two different unions (Maffezzoli 2001; Ardagna 2007). Confirming this hypothesis, Perez and Sanchez (2011) find evidence of signalling by the private sector already in the negotiation phase for France and Germany in the period before 1999. Second, numerous EU countries have wage bargaining practices that grant wage leadership to the private sector. This is the case of the so-called Scandinavian wage determination model, with the exposed sector acting as leader or pattern-setter for all other sectors including the government (see also Holm-Hadulla et al 2010). Third, established practices can make public wages responsive to private ones. For example, in the Netherlands, there is a formal rule imposing that the growth rate of private wages is automatically applied to public sector wages (Hartog and Oosterbeek 1993).

We propose to isolate any market-driven mechanism simply by accounting for public-sector size, where the assumption is that the larger the role of the government sector as an employer, the stronger the impact on the labour market via both prices and quantities. When it comes to institutional channels, however, we expect much greater cross-country heterogeneity. Wage-setting practices would formally or informally grant wage leadership to one or the other sector, where the most common practice is that the exposed sector acts as a pattern-setter for the rest of the economy. The institutional context should play some role either when imitation effects induce private sector unions to follow public sector unions or when fairness effects induce an “all-sector” union to negotiate similar increases for their affiliates in different sectors. Against this background, a crucial dimension is likely to be the nature of public wage-setting, namely whether general government wages are set by government

decision or by collective bargaining, with the institutional transmission channels described above operating in the case of bargaining only. Distinguishing between public wages set by the government itself and those agreed through collective bargaining is thus our strategy for, amongst others, trying to isolate the operation of institutional transmission channels.

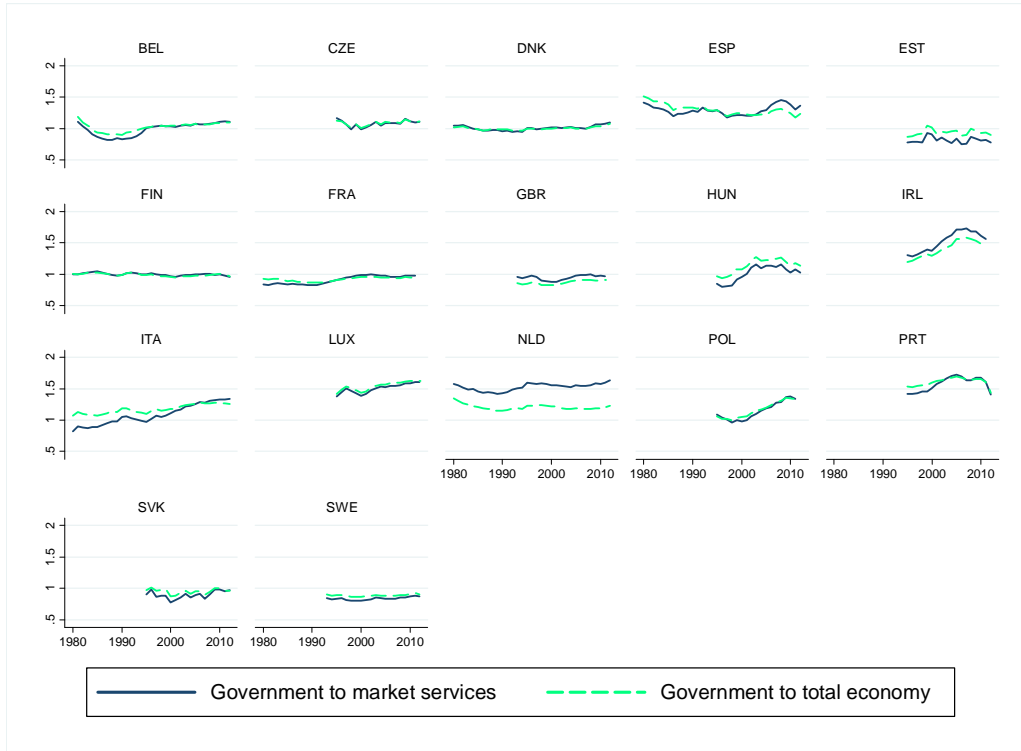
2. Data and empirical strategy

For public wages, we use general government compensations from the OECD Economic Outlook constructed by dividing government final wage consumption expenditures (CGW) by government employees (EG).⁴ Figures on general government are drawn from the System of National Accounts (SNA) and refer to public offices at all levels of government, non-market publicly owned hospitals, schools and social security organizations. We obtain comparable data for a sample of 17 EU countries over 1980-2013.⁵ We approximate the traded sector by manufacturing. Graph 1 shows the ratio between general government and manufacturing compensations per employee over 1980-2013 as well as the ratio between general government and market services. In a number of EU countries, these ratios have been rising ahead of the crisis, most notably in Portugal, Ireland, and Italy, but also in Poland and Hungary.

⁴ This is obviously an approximation of the average wage in the general government sector. Yet, disaggregation by type of occupation, hours worked, etc. as well as the public wage distribution relative to that of the private sector are not expected to interfere with our two-fold research questions, i.e. whether public-sector size and wage bargaining modes bear an impact on the interaction between public and private wages.

⁵ The only exception is Ireland, where general government data include public enterprises.

Graph 1: Level of nominal compensations per employee. Ratios of general government to market services and manufacturing compensations, EU 1980-2013



Source: OECD's

Economic Outlook and AMECO.

In the long-run nominal compensations in the different sectors should be cointegrated with a slope coefficient of one. To systematically analyze long- and short-run effects of government wages on the tradable sector, a cointegration approach is developed in a panel-data setting linking manufacturing wages to a number of determinants, including compensations in the general government sector. The long-run relation is estimated in levels using dynamic ordinary least squares (DOLS), while the Error Correction Mechanism (ECM) representation allows estimating the short-run relation between wage growth, shocks in explanatory variables, and the deviation from the dynamic long-run relation.

The long-run wage equation should be interpreted as an equilibrium relation and is specified as:

$$\ln w_{it} = \alpha_i + \beta_1 \ln wp_{it} + \beta_2 \ln pr_{it} + \beta_3 u_{it} + \beta_4 \ln cpi_{it} + \varepsilon_{it} \quad (1)$$

where i and t index country and time respectively, w denotes the level of nominal compensation per employee in the manufacturing sector; wp is the level of nominal compensation per general government employee; pr is real value added per person employed in the manufacturing sector; u is the unemployment rate; cpi is the consumer price index, and ε is the error term. All variables are in logs except for the unemployment rate. Compensations in the manufacturing sector are expected to be positively related to government wages, prices and labour productivity and negatively related to unemployment. Cointegration is tested using DOLS with one lag and one lead for each regressor. We include country fixed effects not only to control for time-invariant country-specific factors, but also because some variables are expressed as index numbers and would thus not be comparable across countries unless they are transformed.

Given equation (1), the short-run (error-correction) wage equation is specified as follows:

$$\Delta \ln w_{it} = \delta_i + \theta_1 \Delta \ln wp_{it} + \theta_2 \Delta \ln pr_{it} + \theta_3 \Delta u_{it} + \theta_4 \Delta \ln cpi_{it} + \gamma \hat{e}_{it-1} + \varepsilon_{it} \quad (2)$$

where \hat{e} is the lagged error correction term and all other variables except unemployment are expressed in log changes. A significant and negatively signed error correction term is taken as evidence of cointegration between government and manufacturing wages; its coefficient captures the speed of adjustment back to equilibrium (see Table 1 for a list of variables).

3. Results

3.1. The long-run effects of public sector size

Table 2 shows the results of the long-run (Column 1) and short-run (error-correction) wage equation (Column 2) estimated on the whole sample. With the exception of the unemployment rate, all the variables exhibit the expected sign and are statistically significant. The ECM equation shows that deviations from the long term relation are corrected over time, as indicated by the negative and significant coefficient of the error correction term, which is indeed supportive of co-integration among the variables. Moreover, the short-term response of manufacturing wage growth has the expected sign for all the variables and is significant also for the

unemployment rate. It is found that every 1 per cent increase in general government compensations is associated, in the long-run, with a 0.4 per cent increase in manufacturing compensations.⁶ Short-run effects are slightly weaker at almost 0.25 per cent. Our results are in line with those of analyses that have used similar estimation techniques (Afonso and Gomes 2014).

Our first hypothesis is that the relationship between nominal compensations in the government and those in the manufacturing sector is importantly conditioned by size, here measured by the ratio of general government to total employment. The greater the importance of the government sector as an employer, the more likely that changes to government wages affect average conditions on the market and mostly so in the long-run when inter-sectoral mobility can be considered to be unconstrained. In order to test for the operation of this market-based channel, the EU sample is split in two groups: countries in which the average share of government to total employment is above the whole sample's median and countries where it is below the median.⁷ Table 3 provides results for the two groups. It is found that manufacturing and government compensations share a significant long-run relationship especially in large government sectors: for each 1 per cent rise in government wages, manufacturing compensations grow by 0.7 when the government is a large employer, but by only 0.2 per cent when it is a small employer.

⁶ The multivariate setting possibly explains a coefficient that is significantly lower than one.

⁷ The existing literature has analysed the issue of size only in a cursory fashion. For example, Lamo, Perez and Schuknecht (2008, 2012) include public-sector size amongst the variables that may affect the odds of public wage leadership and find that the government is more likely to Granger-cause private wages when it is a large employer. We differ from their approach in two respects. First, we are merely concerned with the relation (or interaction) between the two wages not with leadership (or causality). Second, we go beyond probability analysis and quantify the spill over from the public to the export-oriented sector by estimating separate wage equations for large and small public sectors.

Table 2: Long-run and short-run relation between manufacturing and general government compensations per employee, EU countries 1980-2013

	(1)	(2)
	Dynamic long-run relation	Error Correction Model
Dependent variable: log of manufacturing compensation per employee, level (long-run relation) and change (ECM)		
Δ log government compensations p.e.		0.249*** [7.117]
Δ log productivity in manufacturing		0.188*** [5.426]
Δ unemployment rate		-0.00162* [-1.578]
Δ log consumer price index		0.693*** [19.51]
Log of consumer price index	0.687*** [9.410]	
Log of government compensations p.e.	0.435*** [7.968]	
Log of productivity in manufacturing	0.209*** [9.004]	
Unemployment rate	0.0057*** [3.421]	
Lagged error correction term		-0.122*** [-3.140]
Constant	-1.087*** [-7.009]	0.00715*** [3.273]
Observations	407	407
R-squared	0.98	0.631
Number of countries	17	17

Robust t-statistics in brackets: *** p<0.01, ** p<0.05, * p<0.1

Estimation method: dynamic OLS with fixed effects and Newey West standard errors and ECM with standard errors robust with respect to heteroskedasticity and non-independence within country clusters. Sample: EU countries, except AT, BG, CY, DE, EL, HR, LT, LV, MT, RO, SI.

Table 3: Long-run and short-run relation between manufacturing and government compensations per employee, conditional on the size of the government sector, EU countries 1980-2013

	(1)	(2)	(3)	(4)
	Dynamic long-run relation		Error Correction Model	
	Large government sector	Small government sector	Large government sector	Small government sector
Dependent variable: log of manufacturing compensation per employee, level (long-run relation) and change (ECM)				
Δ log government compensations p.e.			0.214*** [4.186]	0.288*** [8.236]
Δ log productivity in manufacturing			0.193*** [4.037]	0.178*** [3.411]
Δ unemployment rate			-0.00193** [-2.456]	-0.00137 [-1.177]
Δ log consumer price index			0.638*** [9.429]	0.709*** [17.90]
Log of consumer price index	0.416*** [4.695]	0.938*** [11.09]		
Log of government compensations p.e.	0.679*** [10.65]	0.204*** [3.706]		
Log of productivity in manufacturing	0.172*** [5.724]	0.214*** [5.181]		
Unemployment rate	0.00983*** [5.592]	0.00318 [1.436]		

Lagged error correction term			-0.176**	-0.150**
			[-3.022]	[-2.401]
Constant	-1.018***	-3.082***	0.0128***	0.00308
	[-6.271]	[-11.37]	[4.651]	[0.995]
Observations	193	214	193	214
R-squared	0.9	0.991	0.514	0.740
Number of countries	8	9	8	9
Robust t-statistics in brackets: *** p<0.01, ** p<0.05, * p<0.1				

Estimation method: dynamic OLS with fixed effects and Newey West standard errors and ECM with standard errors robust with respect to heteroskedasticity and non-independence within country clusters. Sample: EU countries, except AT, BG, CY, DE, EL, HR, LT, LV, MT, RO, SI.

The relation goes both ways but when testing it in the other direction, namely from manufacturing to general government compensations, it is found that the long-run elasticity of government with respect to manufacturing wages is of 0.8, thus much stronger than the 0.4 elasticity of manufacturing with respect to general government wages. This confirms results from, for example, Lamo, Perez and Schuknecht (2008, 2012), where it is found that the private sector is more likely to have an impact on the public sector than vice versa, including in the long-run when co-variables are accounted for. Secondly, in line with expectations, we find no difference between large and small government sectors; in fact, this dimension should be relevant only when it comes to assessing the impact of the public on the private sector.⁸

3.2. *The role of public wage-setting*

The second proposition we put to the test is that public wage-setting may potentially have a bearing on the nature of the relationship between government and manufacturing compensations. We distinguish between wages set by government decision and those set through collective bargaining. In the case of the former, we would be mostly capturing the effects of a fiscal policy decision or shock on the labour market, which should be independent of

⁸ Results of the response of government to manufacturing wage levels and growth rates are not shown. The estimated wage equation includes general government compensations per employee as dependent variable and, as regressors, compensations per employee in manufacturing, a proxy for labour productivity in the government sector, the consumer price index and the unemployment rate.

whether the labour market is competitive or uncompetitive (Jackman, Layard and Nickell 1991). In the case of the latter, the relation between public and private wages should rather reflect features of the wider wage-setting system in each country. Here, there is likely to be high cross-country variation. In some cases, public and private wages are negotiated by the same union; in other cases, they are negotiated by different unions but each tends to imitate the other, for example, through envy effects (Maffezzoli 2001; Ardagna 2007); in some other cases, there is an explicit institutional mechanism in place that grants wage leadership to one or the other sector, resulting in high overall bargaining coordination. But we limit ourselves to distinguishing between wages set unilaterally by the government and those agreed by government and employees' representatives in a bargaining framework against the assumption that, for example, mechanisms such as imitation or envy effects are present only in the case of bargained wages.

To test for this hypothesis, the sample is split in two groups: countries where government wage setting takes place via collective bargaining and where government wages are set by legislative decisions. Countries are classified based on the predominant wage determination regime.⁹ Table 4 displays the results. Whilst there is no major difference across the two regimes in the short-run, manufacturing wages appear to be considerably less reactive to productivity and to unemployment over the long-run in countries where public wages are set by the government. This result could be linked to the fact that public sector wages set unilaterally by the government are less likely to reflect market forces weakening the link between manufacturing wages, labour productivity and unemployment dynamics.

⁹ For a description of national public wage-setting systems, see European Commission (2014), p. 11. It should be noted though that the classification aims at capturing the predominant regime, while some countries have in fact hybrid systems, with for example the government setting wages by decree but only after extensive consultations with unions (e.g. Austria).

Table 4: Long-run and short-run relation between manufacturing and government compensations per employee, conditional on government wage setting model, EU countries 1980-2013

	(1)	(2)	(3)	(4)
	Dynamic long-run relation		Error Correction Model	
	Bargaining	Decision	Bargaining	Decision
Dependent variable: manufacturing compensations, level and change (log)				
$\Delta \log$ government compensations p.e.			0.360*** [6.745]	0.215*** [5.980]
$\Delta \log$ productivity in manufacturing			0.156** [3.324]	0.218*** [4.935]
Δ unemployment rate			-0.00210* [-2.199]	-0.00155 [-1.405]
$\Delta \log$ consumer price index			0.629*** [6.781]	0.705*** [24.51]
Log of consumer price index	0.458*** [5.945]	0.705*** [7.019]		
Log of government compensations p.e.	0.528*** [9.669]	0.481*** [5.083]		
Log of productivity in manufacturing	0.241*** [11.28]	0.0941** [2.191]		
Unemployment rate	-0.00676*** [3.875]	0.00166 [0.621]		
Lagged error correction term			-0.146*** [-3.670]	-0.142** [-2.891]
Constant	-0.753*** [-5.667]	-2.367*** [-6.757]	0.00593* [1.905]	0.00639** [2.456]
Observations	224	183	224	183
R-squared	0.993	0.987	0.637	0.643
Number of countries	8	9	8	9

Robust t-statistics in brackets: *** p<0.01, ** p<0.05, * p<0.1

Estimation method: dynamic OLS with fixed effects and Newey West standard errors and ECM with standard errors robust with respect to

heteroskedasticity and non-independence within country clusters. Sample: EU countries, except AT, BG, CY, DE, EL, HR, LT, LV, MT, RO, SI.

4. Fiscal consolidation and asymmetries

Understanding the relationship between government wage dynamics and the labour market is especially relevant in the current European context. Pre-crisis macroeconomic imbalances have been driven by prices and costs in the non-tradable sector spilling onto the exposed sector, especially in countries such as Ireland and Portugal (Blanchard 2007). In the bust, in almost all euro area countries under stress, fiscal consolidation plans rested on a reduction or freeze in the government wage bill, whether achieved via wage and/or employment cuts or freezes.

It is likely that under conditions of fiscal distress not only are wage setting practices in the government sector affected under a sense of urgency, but it may also be that the interplay between government and private sector wages is altered. Table 5 displays correlations between nominal government wage growth and manufacturing

wage growth under alternative fiscal conditions.¹⁰ This preliminary evidence suggests that government and manufacturing wages are less closely correlated in periods where major consolidations take place. The interpretation may be that during consolidations government wage dynamics are mainly dictated by the objective of reducing government deficits, and therefore less likely to co-move with private wages. However, the evidence also shows that in countries with a relatively large government sector the correlation remains strong also during episodes of fiscal consolidation.

Table 5: Correlation between government and manufacturing compensations' growth under alternative fiscal conditions, EU 1980-2013

Consolidation	0.40*
Non-consolidation	0.82*
Consolidation	
Large public employer	0.81*
Small public employer	0.20
Non-consolidation	
Large public employer	0.79*
Small public employer	0.83*

Note: Pearson correlation coefficients. Sample: EU countries (excluding AT, BG, CY, DE, EL, LT, LV, MT, RO, SI) over 1980-2012 (1995-2012 in the case of CZ, EE, HU, SK). Fiscal consolidations are defined as a change in the structural balance of at least 1.5 % of GDP in one year or of at least 3 % of GDP over a three year period, with at least 0.5% improvement in each year. For the years where structural balance data are not available in the AMECO database, the primary cyclically-adjusted budget balance is used. Countries are split according to their government size on the basis of the average share of government to total employment (countries with an average value above the median are classified with a large government sector). Source: OECD Economic Outlook.

The evidence presented above is but only suggestive. So as to derive more robust information about how different sectoral wages relate to one another in good versus bad times, we introduce an asymmetric ECM as in Granger and Lee (1989) to determine whether the response of manufacturing wages to changes in general government compensations is asymmetric, varying depending on whether government wages are increased or

¹⁰ By convention, episodes of fiscal consolidation are defined as those where the structural primary balance improves by at least 1.5 per cent of GDP in 1 year or at least 3 per cent in 3 years, with a minimum of 0.5 per cent improvement in each year. Such a definition permits to isolate both cases of "cold-shower" consolidation episodes and more gradual consolidation episodes.

cut. To do so, we use real instead of nominal compensations so as to have a sufficient number of negative values. We apply the same methodology as for previous specifications but split the error correction term into positive and negative values and run two separate (short-run) wage equations. The null hypothesis of symmetry would be rejected if the coefficients on the positive and negative values of the error correction term are significantly different. Table 6 presents the results. The coefficients on the positive and the negative values of the error correction term are not significantly different, which implies that a cut in real government compensations is transmitted to the labour market in the same way as an increase.¹¹ We further split the group with negative values of the errors into large and small government sectors and find that, at least in normal times, the strength at which government wage cuts spill over to the export sector is not conditional on the size of the public sector.¹²

Table 6: Asymmetric short-run relation between manufacturing and government compensations per employee, EU countries 1980-2013

	(1)	(2)	(3)	(4)
	Error correction model		Error correction model (-)	
	Positive	Negative	Large government sector	Small government sector
Dependent variable: manufacturing compensations, change (log)				
Δ real government compensations p.e.	0.412** [7.392]	0.409** [6.114]	0.386* [3.078]	0.413** [7.143]
Δ productivity in manufacturing	0.285** [3.497]	0.300** [3.852]	0.347** [4.409]	0.222 [1.547]
Δ unemployment rate	-0.00226* [-2.205]	-0.00234 [-1.641]	-0.00347* [-2.414]	-0.000848 [-0.469]
Lagged error correction term (+)	-0.314** [-2.963]			
Lagged error correction term (-)		-0.330** [-4.296]	-0.253+ [-2.257]	-0.354** [-4.276]
Constant	0.0228** [5.549]	0.00974** [4.193]	0.0135** [5.669]	0.00825 [1.826]

¹¹ This is generally true also in the normal ECM. When running estimations (1) and (2) on real instead of nominal compensations, we do not obtain significantly different results except for the fact that there is no public-sector size effect neither in the long- nor in the short-run, which may allude to the fact that the long-term elasticity of manufacturing to government wages is significantly driven by second-round effects via inflation.

¹² Under fiscal stress, however, government and manufacturing wages tend to be better aligned when the public sector is relatively large (see Table 4).

Observations	407	407	193	214
R-squared	0.314	0.319	0.429	0.255
Number of countries	17	17	8	9

Robust t-statistics in brackets

** p<0.01, * p<0.05, + p<0.1

Estimation method: dynamic OLS with fixed effects and Newey West standard errors (not shown) and ECM with standard errors robust with respect to heteroskedasticity and non-independence within country clusters. Sample: EU countries, except AT, BG, CY, DE, EL, HR, LT, LV, MT, RO, SI.

5. Conclusions

We have found that there are significant inter-linkages between compensations in the general government and in the manufacturing sector both in the long- and in the short-run. The long-run relation between public and private wages is much stronger when the government is a large employer, a result that appears to be driven mainly by second-round effects via inflation. The other important finding is that in countries where government wages are set by collective bargaining, manufacturing wages tend to be better aligned with productivity and to be more responsive to unemployment, possibly because bargaining processes are generally closer to the market than unilateral government decisions. Finally, the reaction of manufacturing wages to changes in public wages is found to be symmetric. Such symmetry is unaffected by the size of the public sector. Nevertheless, under fiscal consolidation episodes, the two nominal wages are correlated only when the government is a large employer, possibly alluding to the effect on prices and wages of some types of expenditure-based fiscal consolidations.

The linkages highlighted here are not meant to capture causality, nevertheless they still offer some insights into understanding the possible labour market impact of changes in the government wage bill. Our evidence is suggestive of the fact that wage-bill-based fiscal consolidations can affect the external sector leading to competitiveness improvements and possibly to an adjustment of macroeconomic imbalances. By contrast, our analysis is unfit to quantify the extent to which the composition of budget consolidation contributes to cushioning negative output effects of fiscal adjustment via the demand channel. One secondary implication is that the sequencing of fiscal consolidations in a monetary union should be set in such a way to allows each member state to fully benefit from potential supply-side effects via the labour market.

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Appendix

Table 1: List of variables

Variable	Definition	Source
Nominal compensations per employee in the general government	Calculated as the ratio of government final wage consumption expenditures (CGW) to government employment (EG)	OECD Economic Outlook
Real compensations per employee in the general government	Deflated by the price deflator of GDP at market prices	AMECO
Nominal compensations per employee in the manufacturing sector	Calculated as the ratio of total compensations of employees to total employees in the manufacturing industry	Eurostat
Real compensations per employee in the manufacturing sector	Deflated by price deflator of gross value added in the manufacturing industry	AMECO
Productivity	Gross value added at 2005 prices per person employed	Eurostat
Consumer price index	National consumer price index for all items	AMECO
Unemployment rate	Standardized unemployment rate	Eurostat
Government sector size	Ratio of general government to total employment	OECD Economic Outlook