II.2. The relationship between government and export sector wages and implications for competitiveness ([26])

In 2012, the general government sector employed on average about 15% of the labour force in the euro area. Since most countries in the euro area are now trying to consolidate public finances, whilst also trying to boost competitiveness for external rebalancing and to reduce unemployment, it is crucial to assess whether there is any wage spillover from the public to the export sector, in particular under conditions of fiscal stress. This section shows that there has been a link between government and manufacturing wages over the long-run, which is much closer when the government employs a large share of the labour force. Government size dimension is especially important during fiscal consolidation. If the government wage bill is inflated due to unjustified wage premia for example, limiting government wage growth is a fiscal strategy that may, among other effects, deliver competitiveness gains that contribute to external rebalancing and help boost employment in the tradable sector.

Introduction

General government employment accounts for a considerable share of the labour force in the euro area. It stood at about 15 % in 2012, with but some cross-country variation. The evolution of government wages is likely to have an impact not only on fiscal variables and on the sustainability of public finances, but also on the labour market, on cost competitiveness and on external rebalancing within the euro area. This section looks at the relationship between public and private sector wages, at a time when most euro area countries are trying to consolidate their public finances, improve competitiveness to support external rebalancing, whilst also having to tackle high unemployment levels. ([27])

Changes in general government compensations may spill over into the private sector through both market-based and institutional channels. For example, excessive government wages may crowd out private sector employment, inflating cost conditions and leading to competitiveness losses. ([28]) There are channels of transmission also in the opposite direction, from the private to the government sector. Wage growth linked to productivity improvements in the private sector can spill over into the public if there is labour mobility across sectors. This can affect governments' capacity to keep wage expenditure growth under control.

Against this background, this section analyses the relationship between general government and manufacturing wages, in order to assess the potential for and conditions of a wage spillover from the insulated government sector to the export sector. The relationship is analysed by looking at a sample of EU countries over the period 1980-2013 in a co-integration framework that makes it possible to distinguish between long-run and short-run effects. The relationship between the two wages is also assessed for different fiscal scenarios, differentiating between normal periods and periods of fiscal adjustment.

The various forms the relationship takes

The relationship between public and private wages takes many forms. It may be influenced by market forces and/or by institutional features of the wage setting system in each country. Changes in private wages can affect government wage growth in the following ways:

- Wage bargaining in the private sector has a demonstration effect on public wage-setters. Perez and Sanchez (2011) find evidence of signalling by the private sector in the negotiation phase in France and Germany before the EMU period. ([29]) Signalling may be motivated by envy effects that reflect the strength of the wage-bargaining position ([30]) or

([26]) Section prepared by Benedicta Marzinotto and Alessandro Turrini.

([27]) Throughout the section, the public sector is referred to alongside general government, which refers to public offices at all levels of government, non-market public owned hospitals, schools, and social security organizations. Thus, the term "public" is used as a synonym for general government.

([28]) See for example Alesina, A. and R. Perotti, (1997), "The welfare state and competitiveness", *American Economic Review*, Vol. 87, pp. 921-939. Alesina A., Ardagna S., Perotti R. and Schiantarelli F., (2002), "Fiscal policy, profits, and investment", *American Economic Review*, Vol. 92(3), pp. 571-589. Ardagna, S., (2004), "Fiscal stabilizations: when do they work and why", *European Economic Review*, Vol. 48, pp. 1047-1074.

([29]) Perez, J.J. and A.J. Sanchez, (2011), "Is there a signalling role for public wages? Evidence of the euro area based on macro data", *Empirical Economics*, Vol. 41(2), pp. 421-445.

([30]) Maffezzoli, M., (2001), "Non-Walrasian labor markets and real business cycles", *Review of Economic Dynamics*, Vol. 4(4), pp. 860-

by the fact that the same trade union negotiates wages for both sectors.

- Wage-bargaining practices may explicitly or implicitly grant wage leadership to the private sector. Under the Scandinavian wage-setting model, the private export sector typically takes the lead, dictating bargaining outcomes to other sectors, including the public sector. ([31])

- There may also be established practices and institutional mechanisms that make public wages responsive to private wage settlements, usually those of the export sector. This is the case if for example there is a formal rule under which the growth rate of private wages is automatically applied to public sector wages. ([32])

It is of course a two-way street. Changes in government wages affect private wage growth in a number of ways:

- Wage adjustment in the public sector causes cross-sector labour shifts and a change in the private sector's labour supply. As the supply of labour changes, so does the *competitive* private sector's equilibrium wage.

- Adjustments to government wages affect the outside option of unionised private sector bargainers, putting pressures on the bargaining process ([33]) with, for example, private sector workers tempted to move to the general government sector due to large public wage increases.

- Changes in public wages may be fully compensated in government budgets by changes in labour taxation that alter labour costs in the private sector ([34]) and might also affect union behaviour. ([35])

Co-movements between government and private wages may also take place in the absence of direct links, when driven by factors common to both sectors. For example, public wages may be pro-cyclical and change in a manner similar to private wages over the cycle. ([36]) Co-movements in aggregate wage series could be linked to developments common to both factors, relating to the composition of the labour force.

Testing the relationship between government and manufacturing wages

To analyse more systematically the long- and short-term effects of government wages on the export sector, a cointegration approach is used linking manufacturing compensations to a number of determinants, including compensation in the government sector. The long-term relationship is analysed in terms of levels, while the Error Correction Mechanism (ECM) equation makes it possible to estimate the short-term relation between export sector wage growth, shocks in explanatory variables, and their deviation from the long-term relationship. The long-term relationship in also analysed in terms of levels using a dynamic ordinary least squares (DOLS) model, and the results incorporated in an ECM model.

Estimates were made on a sample of 17 EU countries for which data are available over the period 1980-2013. This has not only has the advantage of gaining degrees of freedom and reinforcing the results. It also makes it possible to

892. Ardagna S., (2007), "Fiscal policy in unionized labor markets", *Journal of Economic Dynamics and Control*, Vol. 31(5), pp. 1498-1534.

([31]) For a review, see Lindquist, J. and R. Vilhemsson, (2006), "Is the Swedish central government a wage leader?", *Applied Economics*, Vol. 38, pp. 1617-1625. Friberg, K., (2007), "Intersectoral wage linkages: the case of Sweden", *Empirical Economics*, Vol. 32, pp. 161-184. Traxler, F. and B. Brandl, (2012), "Collective bargaining, inter-sectoral heterogeneity and competitiveness: a cross-national comparison of macroeconomic performance", *British Journal of Industrial Relations*, Vol. 50(1), pp. 73-98. Ramskloger, P., (2012), "Is there a European wage leader? Wage spillovers in the European Monetary Union", *Cambridge Journal of Economics*, Vol. 36(4), pp. 941-962; and (2013), "The national–transnational wage-setting nexus in Europe: What have we learned from the early years of monetary integration?", *Journal of Common Market Studies*, Vol. 51(5), pp. 916-930.

([32]) For evidence on the Netherlands, see Hartog, J. and H. Oosterbeek, (1993), "Public and private sector wages in the Netherlands", *European Economic Review*, Vol. 37(1), pp. 97-114.

([33]) Afonso, A. and P. Gomes, (2008), "Interactions between private and public sector wages", ECB Working Paper No. 971.

([34]) Holmlund, B., (1993), "Wage setting in private and public sectors in a model with endogenous government behaviour", *European Journal of Political Economy*, Vol. 9(2), pp. 149-162.

([35]) The spillover from the public to the private sector is likely to be mediated by the structure of wage-setting systems. Alesina and Perotti (1997) find that increases in labour taxation do not necessarily lead to higher wage demands by unions in highly centralised bargaining systems, as large wage setters would internalise the consequences from higher labour costs on employment.

([36]) For instance, Lane (2003) and Lamo et al (2007) find that public wages are pro-cyclical because of discretionary fiscal expansion in good times. Lane, P., (2003), "The cyclical behaviour of fiscal policy: evidence from the OECD, in: *Journal of Public Economics*, Vol. 87, pp. 2661-2675. Lamo, A., Perez J.J., Schuknecht L., (2007), "The cyclicality of consumption, wages and employment of the public sector in the euro area", *ECB Working Paper* No. 757.

investigate the role of framework conditions in bringing the impact of general government to bear on manufacturing wages by means of appropriate sample splits. Box II.2.1 shows the estimation methodology and the results.

Much of the variance in manufacturing wages is explained by variables usually used when estimating wage equations (i.e., the price level, labour productivity, and the unemployment rate) and by general government wage levels. Both the long- and short-term elasticity of manufacturing wages with respect to government wages is estimated to be around 0.3-0.4. This tallies with the results of similar studies (e.g., Afonso and Gomes, 2008). It works both ways: general government wages also react to manufacturing wages. They have a long-term elasticity of 0.8 and a short-term elasticity of 0.4. ([37]) This is consistent with the fact that it is more usual for the private sector than for the government to take the lead in terms of wages, as the available literature also shows. ([38]). The DOLS cointegration estimation delivers qualitatively identical results. The results are still valid when the sample is restricted to just the euro area. ([39]) The relationship tested on real wages is symmetrical, because manufacturing wages respond to government wages, whether they are increased or reduced.

One hypothesis tested here is whether the size of the government sector determines the extent to which changes to government wages affect average conditions on the private market if for example there is cross-sector mobility. In order to test how this market-based channel works, the same EU sample is split into two groups of countries: those in which the average share of government to total employment is above the whole EU sample's median and countries in which it is below the median. Results show that, in the long-run, the impact of public on manufacturing wages is considerably higher in the case of large public sectors. This divide disappears in the short-run. In the opposite direction going from manufacturing to public wages, the split does not produce differentiated results. This confirms that government size matters when it comes to the public sector's long-term impact on the labour market. The DOLS methodology confirms these results. ([40])

Another hypothesis that is tested is whether the way wages are set in the public sector increases the chances of manufacturing wages reacting to government wages. Broadly speaking, two wage-setting systems may be identified:

- This first is that wages are mainly set on the basis of *collective bargaining*.
- The second is that wages are set on the basis of *unilateral decision by the government*. ([41])

The results show that the way wages are set does not fundamentally alter the relation between government and manufacturing wages in the long- or the short-term. It is however interesting to note that across all methodologies used, the relationship between manufacturing wages and labour productivity is weaker in countries characterised by a "unilateral decision" wage-setting system. This is probably because in such a case the spillover from public to private wages is such that private wages tend to be misaligned with sectoral productivity. This is not the case when government wages are set through a "collective bargaining" wage-setting system, possibly because bargaining processes, even in a particular type of insulated sector such as the public one, reflect market forces more than a unilateral government decision.

The relationship between government and manufacturing wages under fiscal stress

Most countries in the euro area have recently been trying to cut government wage bills, by freezing wages, cutting or retrenching specific indemnities or benefits (including bonuses and/or holidays), or blocking turnover. As a result, the share of government compensations in total government spending has fallen. Between 2008 and 2012, this fall was particularly sharp for Latvia, Portugal, and Romania, followed by Hungary, Spain, Denmark, and Estonia (Graph II.2.1).

([37]) The results are not shown.
([38]) Perez, J.J. and A.J. Sanchez, (2011).
([39]) Still, it should be noted that the sample used excludes some key countries in the euro area.
([40]) The results from the DOLS are not shown.
([41]) For a classification of EU wage-setting systems in the government sector, see European Commission, Directorate for Economic and Financial Affairs (2014), "Government wages, and labour market outcomes", *Occasional Paper, forthcoming*.

Box II.2.1: The long-run relationship between manufacturing and general government compensations per employee: size and institutions matter

The long-term relationship between manufacturing and general government wages is analysed within a cointegration framework using an unbalanced sample of 17 EU countries over the period 1980-2013. (1) It should be seen as an equilibrium relationship rather than a causal one.

The long-term wage equation is specified as:

$$lnw_{it} = \alpha_i + \beta_1 lnwp_{it} + \beta_2 lnpr_{it} + \beta_3 u_{it} + \beta_4 lncpi_{it} + \varepsilon_{it} \quad (1)$$

The letters i and t denote country and time respectively. The letter w denotes the level of the nominal compensation per employee in the manufacturing sector; wp is the level of the nominal compensation per employee in the general government sector; pr is real value added per person employed in the manufacturing sector; u is the unemployment rate and cpi is the consumer price index, and ε is the error term. (2) 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.

Given equation (1), the dynamic (error-correction) wage equation is:

$$\Delta lnw_{it} = \delta_i + \theta_1 \Delta lnwp_{it} + \theta_2 \Delta lnpr_{it} + \theta_3 \Delta u_{it} + \theta_4 \Delta lncpi_{it} + \gamma \hat{e}_{it-1} + \varepsilon_{it} \quad (2)$$

where ê is the lagged error correction term.

Table 1 shows the results of the long-term (1) and the dynamic (error-correction) wage equation (2) estimated for the whole sample. All the variables except unemployment show the expected sign and are statistically significant. The error correction model (ECM) in Column 2 shows that deviations from the long term relationship are corrected over time (as the negative and significant coefficient of the error correction term shows). This confirms the findings with regard to co-integration between manufacturing compensations and all other variables, including government compensations. The short-term response of manufacturing wage growth also shows the expected sign and is significant for all the variables except the unemployment rate. Cointegration is also tested using dynamic ordinary least squares (DOLS), to account for the possibility that the error may itself include a stochastic trend (3), and the estimated relationship is applied to an ECM model (4). (3) The quality and interpretation of the results remain unchanged and confirm that there is a long-term relationship between manufacturing and general government compensations.

Table 2 shows results after splitting the sample between countries in which the ratio of government to total employment is above the EU median and those in which it is below. The results show that the elasticity of manufacturing to public wages is much greater in large than in small government sectors. The error correction term is not significant for countries with a relatively small government in the case of the linear estimation. This would indicate lack of co-integration (i.e. a weak relationship between government and manufacturing wages), yet it becomes significant when the long-term relationship is estimated using DOLS. (4)

(1) Due to the lack of sufficiently long data series, the following EU countries are not included: Austria, Bulgaria, Croatia, Cyprus, Germany, Greece, Latvia, Lithuania, Malta, Romania, and Slovenia.

(2) Nominal compensations per employee in the manufacturing sector are calculated as the ratio of total compensations to manufacturing employment. Nominal compensations per employee in the general government are calculated as the ratio of government wage consumption expenditures to government employment. Productivity is gross value added at 2005 prices per person employed.Tthe consumer price index is the national consumer price index for all times (2005=100). The data are taken from DG ECFIN's AMECO database, except for general government compensations per employee for which OECD statistics are used.

(3) The DOLS methodology is applied to the same sample with fixed country effects, one lead and one lag. Fixed effects are necessary because some variables are expressed as index numbers and therefore cannot be compared across countries. They are also useful to control for time-invariant country-specific factors. The results obtained using DOLS are not shown.

(4) The results from the DOLS are not shown.

(Continued on the next page)

Box (continued)

Another hypothesis tested here is whether the way in which government wages are set has an impact on their capacity to spill over to the manufacturing sector. Table 3 shows the results differentiating between countries in which government wages are set through collective bargaining and those in which the government unilaterally sets wages. There is no major difference between the two systems apart from the fact that manufacturing wages appear to be considerably less reactive to productivity in countries in which the government sets public wages. This could be because public sector wages unilaterally set by the government are less likely to reflect market forces and more likely to weaken the link between manufacturing wages and labour productivity. The results are confirmed and in fact slightly reinforced when the relationship is analysed using the DOLS methodology. ([5])

Table 1: Long-term and dynamic (short-term) relation between manufacturing and general government compensations per employee, EU countries 1980-2013

	(1)	(2)	(3)	(4)
	Long-term relation	Error correction model	Dynamic long-term relation	Error correction model
Dependent variable: log of manufacturing compensation per employee, level (long-term relation) and change (ECM)				
Δ log government compensations p.e.		0.293***		0.249***
		[11.92]		[7.117]
Δ log productivity in manufacturing		0.200***		0.188***
		[5.186]		[5.426]
Δ unemployment rate		-0.00146		-0.00162*
		[1.578]		[-1.967]
Δ log consumer price index		0.716***		0.693***
		[13.65]		[19.51]
Log of consumer price index	0.690***		0.687***	
	[6.609]		[9.410]	
Log of government compensations p.e.	0.377***		0.435***	
	[4.019]		[7.968]	
Log of productivity in manufacturing	0.232***		0.209***	
	[5.238]		[9.004]	
Unemployment rate	0.0017		0.00570***	
	[1.326]		[3.421]	
Error correction term		-0.112**		-0.122***
		[-2.404]		[-3.140]
Constant	-1.774***	0.00406*	-1.087***	0.00715***
	[-8.115]	[1.773]	[-7.009]	[3.273]
Observations	458	441	407	407
R-squared	0.989	0.736		0.631
Number of countries	17	17	17	17

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

Estimation method: fixed effects ordinary least squares (OLS), standard errors robust with respect to heteroskedasticity and non-independence within country clusters (1-2-4) and dynamic OLS with fixed country effects and Newey West standard errors (3). Sample: 17 EU countries over the period 1980-2013.

Table 2: Long-run and dynamic (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)
	Long-term 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-term relation) and change (ECM)				
Δ log government compensations p.e.			0.308***	0.300***
			[7.727]	[9.891]
Δ log productivity in manufacturing			0.205***	0.187***

([5]) The results obtained using DOLS are not shown.

(Continued on the next page)

Box (continued)

			[3.769]	[3.542]
Δ unemployment rate			-0.00176*	-0.00118
			[-2.287]	[-0.601]
Δ log consumer price index			0.666***	0.745***
			[9.838]	[10.06]
Log of consumer price index	0.430**	0.922***		
	[3.191]	[8.904]		
Log of government compensations p.e.	0.568***	0.187*		
	[6.179]	[2.144]		
Log of productivity in manufacturing	0.223**	0.228***		
	[3.239]	[3.766]		
Unemployment rate	0.00286	0.000408		
	[1.033]	[0.313]		
Error correction term			-0.175***	-0.107
			[-3.352]	[-1.756]
Constant	-1.122***	-2.287***	0.00685**	0.00119
	[-3.679]	[-12.38]	[2.381]	[0.295]
Observations	217	241	209	232
R-squared	0.991	0.991	0.684	0.793
Number of countries	8	9	8	9

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

Estimation method: fixed effects ordinary least squares (OLS), standard errors robust with respect to heteroskedasticity and non-independence within country clusters. Sample: 17 EU countries over the period 1980-2013.

Table 3: Long-run and dynamic (short-run) relation between manufacturing and government compensations per employee, conditional on government wage setting model, EU countries 1980-2013

	(1)	(2)	(3)	(4)
	Long-term relation		Error correction model	
	Bargaining	Decision	Bargaining	Decision
Dependent variable: log of manufacturing compensation per employee, level (long-term relation) and change (ECM)				
Δ government compensations p.e.			0.384***	0.260***
			[8.201]	[8.840]
Δ productivity in manufacturing			0.171***	0.222***
			[3.542]	[4.289]
Δ unemployment rate			-0.00197**	-0.00113
			[-2.394]	[-0.871]
Δ consumer price index			0.594***	0.763***
			[7.776]	[11.11]
Consumer price index	0.746***	0.659***		
	[5.017]	[3.968]		
Government compensations p.e.	0.326**	0.435**		
	[3.162]	[2.996]		
Productivity in manufacturing	0.283***	0.131*		
	[5.848]	[2.095]		
Unemployment rate	-0.00196	0.00161		
	[0.732]	[1.200]		
Error correction term			-0.147**	-0.124*
			[-3.340]	[-2.046]
Constant	-1.908***	-1.613***	0.00531*	0.00229
	[-6.431]	[-5.798]	[2.132]	[0.614]
Observations	248	210	240	201
R-squared	0.993	0.987	0.723	0.752
Number of countries	8	9	8	9

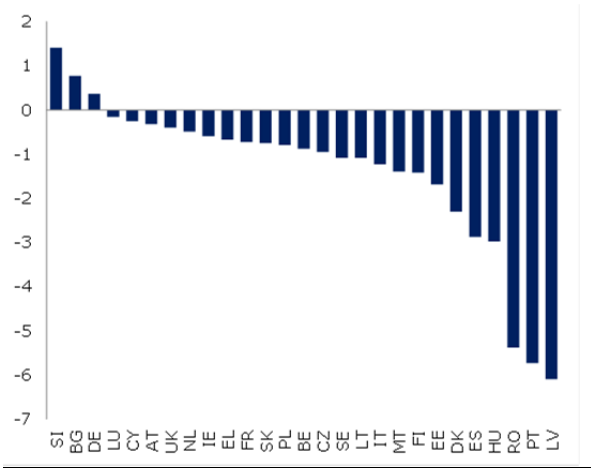
Robust t-statistics in brackets: *** p<0.01, ** p<0.05, * p<0.1

Estimation method: fixed effects ordinary least squares (OLS), standard errors robust with respect to heteroskedasticity and non-independence within country clusters. Sample: 17 EU countries over the period 1980-2013.

The recent crisis marked a watershed in the evolution of public compensations. Between 1999 and 2007, *relative* government wage growth did not vary from "cold-shower" periods (or periods of more gradual fiscal consolidation) to periods of non-consolidation. (42)

Graph II.2.1: **Change in the share of general government compensations to total spending**

(2008-2012, in p.p.)



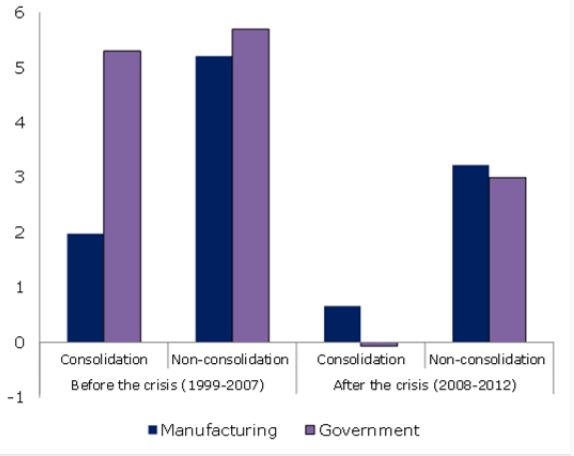
Source: DG ECFIN calculations based on AMECO.

Conversely, starting with the 2008-2009 crisis, compensations per employee in the government sector grew more slowly compared with those in the manufacturing sector, and more clearly so during fiscal consolidation (Graph II.2.2).

It is possible that, under conditions of fiscal stress, the relationship between government and export sector wages differs from that of normal periods. This aspect has been neglected in previous analyses. To shed some light on it, Table II.2.1 shows the correlation between government wage growth and manufacturing wage growth under alternative fiscal conditions (consolidation and non-consolidation), differentiating between countries with large and small public sectors. The evidence shows that the two wages are closely related in periods of fiscal stress only if the government employs a large share of the labour forces. This suggests that the possibility of expenditure-based fiscal consolidation having the type of supply-side effects described in Alesina and Perotti (1997), Alesina et al (2002) and Ardagna (2004) may be a consequence of the size of the public sector, among other things.

Graph II.2.2: **Government and manufacturing compensations under alternative fiscal conditions, EU countries**

(1999-2007 and 2008-2012, avg. annual % change)



Source: DG ECFIN calculations based on OECD.

Table II.2.1: **Correlation between government and manufacturing compensations' growth under alternative fiscal conditions, EU (1)**

Consolidation	0.3993*
Non-consolidation	0.8205*
Consolidation	
Large public employer	0.8100*
Small public employer	0.1986
Non-consolidation	
Large public employer	0.7950*
Small public employer	0.8291*

(1) 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).
Source: DG ECFIN calculations based on OECD.

Concluding remarks

Spillovers which are the result of high wages in the general government sector have been mentioned as one of the drivers of competitiveness losses in

(42) By convention, episodes of fiscal consolidation are defined as those during which the structural primary balance improves by at least 1.5 per cent of GDP in one year or at least 3 per cent in three years, with a minimum improvement of 0.5 per cent in each year. Such a definition makes it possible to distinguish between cases of "cold-shower" consolidation episodes and more gradual consolidation episodes.

some countries in the euro area before the crisis. ([43])

The results presented here speak to this debate and may be summarised as follows. Government wage levels have a long-term impact on wages in the manufacturing sector, even more so in countries in which the government sector employs a relatively large share of the labour force. That said, their short-term impact remains unaffected by the size of the public sector. Looking at it the other way round, manufacturing wages usually have a greater impact on government wages, regardless of size. This is arguably because private sector wage leadership is more common than public sector wage leadership.

The way government wages are set also plays a role. In collective bargaining systems, not only are government and manufacturing wages related in both the long- and the short-term (as they are also when the government sets wages by unilateral decision). Also, most importantly, wages in the tradable sector are better aligned with labour productivity. The evidence provided here indicates that, if the government wage bill is inflated, for example due to unjustified wage premia, limiting public wage growth would spill over into the private export sector reducing labour costs and helping boost competitiveness and employment in the sector. Whilst structural reforms including skill upgrading in manufacturing are an important and necessary ingredient for achieving non-reversible gains in competitiveness, the adjustment of competitiveness through fiscal policy remains a complementary tool to deliver sustained external rebalancing.

([43]) Blanchard, O., (2007), "Adjustment within the euro. The difficult case of Portugal", in: *Portuguese Economic Journal*, 6/1, 1-21