Wages, productivity and employment:
A review of theory and international data

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1 Introduction and overview

The relationship between wages and productivity (or more specifically, the relationship between wage growth and productivity growth) has become one of particular policy relevance in recent years, in light of the recent economic crisis and emerging imbalances between Eurozone countries. As the ILO has observed:

> *"With the Euro, balanced trade requires that wages in all member states grow in line with national productivity plus targeted inflation rate of the ECB. Otherwise counties with relative higher growth in unit labour costs will systematically lose market share and build up trade deficits. The case for a coordinated wage policy to avoid imbalances, beggar thy neighbour policies and a waste of potential growth is overwhelming: it is alarming that it has been ignored for so long. Those who let unit labour costs rise too fast are equally repsonible for the explosion of imbalances after the abolition of the exchange rate mechanism as those who gained market shares through wage restraint".(Hoffer and Spiecker 2011, p. 2)*

That there is an important relationship between the growth of productivity and the growth of wages at national level is in little doubt. Figure 1.1 clearly shows this relationship, using data for 25 countries for the years 1995-2009[1].

The stylised fact of an empirical association between wages and productivity is consistent with traditional microeconomic theory, and in particular the idea that wages – at a microeconomic level – are closely related to marginal productivities. Microeconomic theory also implies that labour demand would increase if productivity per unit of labour input increased (at given wages), because a further extension of production would increase firms' profits.

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[1] In section 3 below we explore this relationship in more detail

Figure 1.1: Growth of productivity and wages
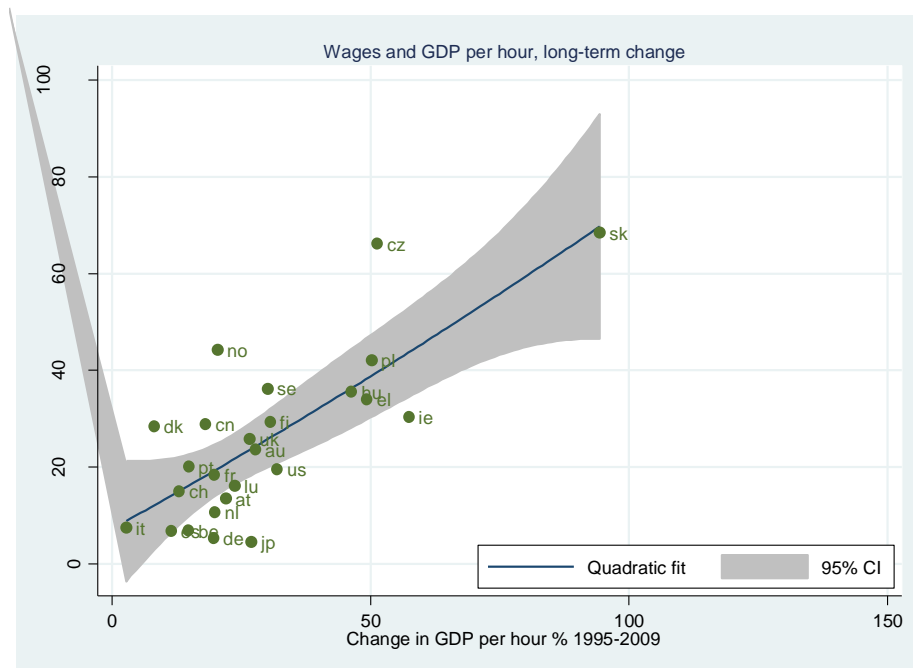
Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

This microeconomic mechanism is commonly put forward as the underlying justification for a wage–setting rule, to the effect that restraining wage increases below the rate of productivity growth will increase employment levels. Such arguments are particularly important in current policy debate, in the light of high unemployment rates in many EU member states following the recent recession. In the medium and long-run, the combination of productivity growth and moderate wage increases may help contribute to:

- the resumption of output growth and the achievement of higher employment levels and/or

- a closing of the competitiveness gap between those economies particularly hit by the recession and those which have been less affected and have emerged from the downturn more quickly.

Further, it is argued that public policy both at national and at EU level could help achieve such 'wage moderation', thereby improving the competitive position of the peripheral countries of the EU, through institutional reforms facilitating wages to grow less than productivity over the next few years.

If we accept these arguments at face value, Germany would seem to be a model for such employment-increasing wage policies: on average, German wage increases remained below productivity growth since the mid-1990s. The relatively more dynamic growth of the German economy after the recent recession suggests that wage restraint may have helped to increase Germany's relative

competitiveness (e.g. compared with the southern EU member states) and that public policy facilitated this through far-reaching institutional reforms, e.g. of non-working benefits and increased employment flexibility. Improving the relative competitiveness of the deficit countries through wage adjustments may, therefore, when seen from this perspective, result in higher growth in these countries and less requirement for fiscal transfers from the surplus countries.

However, while this argumentation is plausible in the short-run, given the links between wage moderation and employment growth when productivity is growing at the microeconomic level, the medium and long run effectiveness of such policies is much less clear, in the light both of economic theory and of empirical data. This is well illustrated by a comparison of the US and Germany since the mid 1990s: while the growth rates of wages and total labour compensation per employee were much closer to the growth rate of productivity in the US than in Germany (i.e. there was less wage moderation in the US), productivity and output grew faster in the US than in Germany, as did aggregate employment.

In addition, any policy of wage moderation would also have to take account of other important variables affecting productivity growth, such as changes in the composition of the workforce, and because of this a simple targeting of wage increases below observed labour productivity growth would be potentially misleading. Additionally, much better empirical data are needed in order to be able to assess the impact of wage-setting at sub-national levels, in order to take account of, for example, the competitiveness of particular sectors, which are more exposed to international competition and in which international competition more clearly affects output and employment levels.

With this background, this paper explores the relationship between productivity growth and wage growth and its importance for employment outcomes, drawing on two main sources:

■ First we briefly review the economic literature which sets out, from a theoretical perspective (and we also refer to empirical evidence in the literature where it is available), the short-, medium- and long-run associations between wages and productivity, and implicitly the importance of productivity-oriented wage setting for employment outcomes. The medium- and long-run relationship is particularly affected by the system of industrial relations and wage–setting, and the extent to which it allows for sufficient flexibility to align wages and productivity (including downward adjustment of wages if productivity decreases) in order to achieve high employment levels and internationally-competitive industries and services. Since there is great institutional variety across EU member states (and the other countries included in this review), our account is necessarily selective.

■ Next we present an analysis of international data illustrating this relationship in the short-run (before and after the 2009-2010 recession), as well as in the medium- and long-run. OECD data for 2010 suggest that wages grew much less than productivity in countries with severe output contractions during the recession (e.g. Ireland and Estonia). This is evidence of wage flexibility at the aggregate level in these EU member states, which might contribute to the eventual restoration international competitiveness. However it is necessary to stress at the outset that our analysis faces significant limitations. In particular, data for 2010 are available only at the level of aggregate economies or EU member states and for a limited number of countries. In addition, we cannot control for many other important variables influencing productivity. A fuller analysis at the level of sectors (in particular those exposed to international competition) would be an important supplement to understand the potential effectiveness of wage moderation strategies.

2 Reviewing the relationship of wages, productivity and employment

In this chapter we discuss (in sections 2.1 to 2.3) what is known about the relationship between wage and productivity growth, and its impact on employment outcomes, drawing on the economic literature (both theoretical and empirical). In doing so, we distinguish between the short-, medium- and long-run as, while the distinctions between these three are somewhat arbitrary, it is nevertheless the case that the predictions of economic theory and their policy implications differ according to the time perspective being considered.

We then (in section 2.4) briefly focus on some of the empirical evidence on these relationships (much of which relates to the US), and highlight some of the methodological difficulties making empirical analysis in this area difficult (this, in turn, sets the scene for our own exploration of cross-country data in chapter 3).

Finally in section 2.5 we raise the question of whether and how the observations of economic theory can be translated into practical policy rules linking wage-setting to productivity growth, illustrating this with a couple of country examples.

2.1 Short run

2.1.1 Basic microeconomic theory

Standard microeconomic theory[2] suggests a clear relationship between productivity, wages and labour demand, in which wages correspond to the marginal productivity of labour and can be derived from the profit-maximising

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[2]   A standard textbook representation of the microeconomics of labour demand can be found, for example, in Borjas (2010, Chapter 3), Hammermesh (1993, Chapter 1) or Franz (2009, Chapter 3).

behaviour of firms. Before describing this link in more detail, it is worth emphasising that the fundamental theoretical assumption of a firm being a profit-maximising entity applies only to private sector enterprises. Other market structures and the increasing relevance of public sector employment for labour market performance in many countries are not accommodated by this kind of microeconomic theory. Nonetheless, there are important policy implications which can be derived from the theory.

In its simplest form, the theory posits that a firm maximises profits. These profits are equal to the sales from its goods (sold at prices exogenously given under perfect competition) minus the costs of its factors of production (capital and labour). The relationship between these production factors and their output is specified in neoclassical theory by a production function. Typically it is assumed that the firm's capital stock is constant in the short run, such that profit-maximising behaviour determines the optimal level of production, at which a marginal worker's contribution to profit is equal to that worker's wage. The marginal productivity condition sets the point at which an individual firm's output expansion should stop: if growth continues such that marginal revenues no longer exceed the costs of marginal labour input, profitability would fall.

Although the model is very simplistic, it generates some plausible conclusions about the relationship between productivity and wages:

■ If productivity per unit of labour input (or per worker) increases, while wages remain constant, this will increase labour demand, because a further extension of production will increase profits.

■ Given a fixed labour supply, the increased labour demand would result in higher pay, until a new profit-maximising equilibrium is reached at which wages again equal marginal productivity.

In the medium- and long-run (which we consider further in sections 2.2 and 2.3 below), standard microeconomic theory assumes firms can alter not only their employment levels, but also their capital stock. As a result changes in the price of labour (wages) and/or the price of capital (interest rates) can lead firms to substitute labour for capital or vice versa. Thus, whereas in the short-run wage increases have only a scale effect, in the medium- and long-run they result in both scale and substitution effects.

However, even in the medium-run, the adjustment of both capital and labour would result in an allocation of factors of production corresponding to their marginal products under perfect competition. Once again, increases in wages would follow from increases in labour productivity. Since the neoclassical model assumes an exogenously-given price level on goods markets under perfect

competition, both the scale and the substitution effects of an increase in wages on labour demand are unambiguously negative (see Franz 1999: 125).

The clear implication from the standard microeconomic theory is that wages follow the development of productivity. This link has also been used as a rule for assessing the employment implications of particular wage levels set in collective bargaining, i.e. whether they are set in a way to achieve full employment. This, it is argued, can be ensured through decentralised or flexible wage-bargaining processes[3]. The link between flexible wage bargaining and a higher level of employment has also been one of the central findings in Calmfors and Driffill (1988)[4] explaining why highly decentralised (but also highly-centralised) wage setting may result in higher employment levels than is the case under industry-level wage bargaining.

However, the underlying limitation of short-run microeconomic analyses of this kind is that they do not allow for any influence of wage-setting on productivity. The assumption in these simple models that productivity increases are exogenous has been challenged by models of 'efficiency wages' as well as by theories about the long-run impact of particular wage levels being set in the economy.

> **Key points**
>
> Standard micro-economic theory posits a clear relationship between wages growth and productivity growth in the short run, with wages adjusting to changes in productivity. In practice, even though the assumptions of economic theory are not always satisfied, this model has been used to justify wage-setting rules, aiming to ensure that wage growth does not exceed productivity growth, in order to generate full-employment. A key assumption of such simple models is that productivity developments are exogenous, and wages adjust to productivity.

2.1.2 Efficiency wages

An important development of the simple neoclassical model (albeit one that still relies on highly stylised assumptions about individual and firm behaviour) introduces the concept of 'efficiency wages' (Shapiro and Stiglitz, 1984). Under most efficiency wage models, the link between wages and productivity is no longer straightforward even in the in short-run.

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[3] An important advocate of this approach is the German Council of Economic Experts (e.g. in their annual report 1996, paragraph 326)

[4] See the discussion in section 2.2.2 below.

Efficiency wage models reject the premise that wages are aligned to the marginal productivity of workers under perfect competition. In contrast, these models argue that paying higher-than-market wages can be a rational choice for firms, e.g. in order to increase the work effort of employees. This applies particularly if there are sources of alternative income (e.g. benefits) for the unemployed, and the models assume that individual workers maximise their utility taking account of wages, alternative incomes and efforts, all of which contribute to determining their marginal product.

In the world set out in simple efficiency wage models, the possibility is allowed for that, at any level of wages, more than one type of worker exists. In particular, they hypothesise:

■ 'productive workers' whose utility is based (positively) on wages, but is also linked (negatively) to their work effort and to the likelihood of losing their job (and becoming reliant on benefits);

■ 'shirking workers' who earn the same wage with less work effort, but who face a higher risk of job loss if their employer discovers the 'shirking', and therefore a higher risk of reliance on unemployment benefits, with lower utility.

This kind of model leads to an equilibrium under which wages are set at the level at which workers decide not to 'shirk'. This implies that wages will be higher: a) the higher the effort the firms try to extract from workers; b) the higher the alternative utility from e.g. unemployment benefits; and c) the smaller the probability that firms discover the shirking (see Franz 1999: 312).

In this sense, efficiency wage models imply a kind of 'reverse causality': rather than wages being set according to productivity, they have to be set at a particular level in order to achieve a specific productivity in a world with labour market institutions (e.g. unemployment benefits), which reduce the *penalty associated with being fired* (Shapiro and Stiglitz 1984: 434).

The policy lesson from efficiency wage theory is that institutional reforms, e.g. an increase in labour market flexibility or a reduction of unemployment benefits can reduce levels of efficiency wages and – in line with standard microeconomic thinking – increase employment levels.

Such models can also help to explain:

> *"why wages adjust only slowly in the face of aggregate shocks. A decrease in the demand for labour will ultimately cause a lower wage and a higher level of unemployment. In the transition, however, the wage decrease will match the growth in the unemployment pool, which may be a sluggish process"* (Shapiro and Stiglitz 1984: 434).

When it comes to the relation between wages and productivity, it is important to note that efficiency wages are particularly relevant for *"firms, which find shirking particularly costly"* (ibid.).

> **Key points**
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> More sophisticated models (e.g so-called 'efficiency-wage' models) allow for the possibility that, even in the short-run, it may be efficient for firms to set wages at levels different from that implied by the simple microeconomic theory, and they also take account of the potential influence of institutional arrangements (e.g. the existence and level of unemployment benefits) on the relationship between wages, productivity and employment.

2.1.3 Employment-neutral wage policies

In conventional wage bargaining models, there is broad consensus that the development of productivity is the primary variable influencing the wage-setting behaviour of unions. At the same time, the kinds of microeconomic theory discussed above suggest a policy choice of setting a particular wage in order to achieve a higher level of employment, in particular if wage increases remain below the rate of productivity growth.

This relation can be expressed in the following form (Lehment 2000):

$$\hat{B} = a\left(\pi^* - \left(\hat{W} - \hat{P}\right)\right)$$

with

$\hat{B}$ increase in employment

π^* employment neutral increase of labour productivity

$\hat{W}$ wage increase

$\hat{P}$ inflation rate

Rearranging the equation, leads to a simple assessment rule for wage setting, implying increased employment if wage increases remains below the sum of employment-neutral productivity growth and the inflation rate (ibid.):

$$\hat{B} = a\left(\left(\pi^* + \hat{P}\right) - \hat{W}\right)$$

But how can such a wage moderating policy be implemented practically, e.g. how can changes in marginal productivities be identified and wage increases set accordingly? It is argued in Lehment (2000) as well as in the annual expert recommendations of the German Council of Economic Experts (CEE) that the increase in *average* productivity does not always equate to the increase in *marginal* productivity (which is relevant to the assessment rule), for two important reasons:

- **compositional changes in the employed labour force**: if, for example, restructuring results in a reduction in low-productivity employees, the observed average productivity of remaining workers will increase. Wages increasing less than productivity in such circumstances would not result in employment increases, as there has been no substantial change in the underlying productivity of employees.

- **changes in capital costs**: if average productivity increases for a given level of employment, wage increases cannot simply be aligned to this change if there are simultaneously changes in relative capital costs. Thus, if productivity increases e.g. due to further investments in physical capital, the additional capital costs have to be accounted for when deriving the appropriate 'employment-neutral' levels of wage increases for policy purposes.

For policy decision-making, it is therefore important to distinguish increases in labour productivity from those originating from changes in technology and the composition of the workforce. In Lehment (2000), the employment-neutral rate of wage increase was the found to be about a third below the observed growth rate in productivity per hour. In addition, the effectiveness of a productivity-orientated wage policy depends crucially on the timely alignment of productivity increases and wage changes: since the negotiations are about future wages, the alignment has to allow for the fact that productivity increases in the future are uncertain.

Key points

The key policy question (if the predictions of economic theory are accepted) is what level of wage growth is consistent with maintaining (or increasing) employment levels? While various simple models exist for assessing the effect of a given relationship between wage increases and productivity increases on employment, their practical implementation is hindered by the difficulty of taking account of factors such as: the changing composition of the workforce (which may mean that observed average productivity differs significantly from marginal productivity, which is relevant to decision-making); changes in technology, and the changing cost of capital.

2.2 Medium run

2.2.1 Wage rigidities

The medium run alignment of wages and productivity depends relatively more on the interplay of bargained wages and changes in other factor prices (in particular physical capital), than in the short run. Blanchard (2006) introduces the concept of the "bargained wage" as opposed to the "warranted wage". Even under standard microeconomic assumptions like perfect competition, bargained wages are aligned to *anticipated* future output and could differ from the warranted wage, e.g. if prices

for other factors of production increase. In such a case, bargained wages may grow faster than the warranted wage, and employment would decline in order to maintain zero net profits for firms under perfect competition.

Blanchard (2006) proposes this as the key process causing increased unemployment in the 1970s and 1980s, when changes in oil prices and the reduction of the growth of total factor productivity resulted in labour productivity increases much below the level of the 1960s[5]. In these circumstances, bargaining outcomes exceeded the warranted wages and unemployment increased accordingly. Of course, the 1970s increase in unemployment varied between countries due to differing institutional circumstances, which allowed warranted and bargained wages to realign more or less speedily, and due to the nature of wage rigidities, which can be real or nominal:

> *"'Real wage rigidities' captured the speed at which (…) workers would for example accept a slowdown in actual wages in response to a productivity slowdown. The slower the adjustment, the higher and the longer lasting the effects of adverse shocks on unemployment.*
>
> *'Nominal wage rigidities' captured the speed at which nominal wages adjusted to changes in prices. The slower the adjustment, the larger the decrease in the real wage in response to an unanticipated increase in prices (…) and (…) the more the monetary authorities could use inflation to reduce real wages and (…) unemployment in response to an adverse supply shock." (Blanchard 2006)*

Blanchard (2006) argues that accommodating monetary policy was aimed at mitigating the consequences of the 1970s supply shock and delayed the unemployment increase for some time. Subsequently, however, the contractionary monetary policy of the early 1980s, aimed at reduction of inflation, increased real interest rates and – as a result of falling capital accumulation – increased unemployment even further. A neutral monetary policy, it is argued, would have increased unemployment more significantly in the short run, but the surge in unemployment would have been of shorter duration.

Key points

The economic literature commonly attributes medium-run divergences of wage growth from that warranted by productivity growth to wage 'rigidities' associated with institutional features of the bargaining system. Such an account is often cited

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[5]   Blanchard (2006) reports the rate of technological progress falling from 5% in the 1950s and 1960s to 2% in the 1970s and 1980s.

to explain persistent unemployment following the oil shocks of the 1970s in many countries, exacerbated in some cases by monetary policy responses.

2.2.2 Bargaining flexibility

As we have seen, the theoretical literature suggests that the interplay of real wage-setting and labour demand is the relevant mechanism for aligning wages and productivity and of achieving a high level of employment. Therefore, most modern microeconomic research focuses on the role of the bargaining system in allowing real wages to respond to shocks and adjusting flexibly to changes in productivity, rather than on the role of mitigating fiscal and monetary policies.

Initially, this research began with the empirical observation that corporatist countries (characterised by a high degree of centralisation of wage negotiations) generally achieved lower unemployment rates. If wages increased faster than productivity in such a highly centralised system, it was argued, there would be an immediate effect on prices, which would offset any increase in real wages.

Calmfors and Driffill (1988) extended this view, in a well-known contribution to the literature, highlighting the famous non-linear relationship between the degree of centralisation of the bargaining system and employment levels. Under this model both highly centralised systems and highly decentralised systems are able to align wages and productivity ensuring a high level of employment, while systems with intermediate levels of centralisation (e.g. with industry-level wage bargaining) tend to result in wages set above a level that would ensure high employment. The main reason is that a highly decentralised system of negotiations, e.g. at firm level, leads to wage increases at or below the increase of marginal productivity because individual firms would not be able to increase prices on the goods markets. Rather, they would simply lose market share to competitors offering close substitutes for their products.

This model has been put forward to explain why competitive systems like that of the US achieved well-aligned wage and productivity increases, while coordinated economies with industry-level wage bargaining (Germany in particular, has been cited in this context), tended to experience wage increases above increases in productivity, resulting in a poor employment performance. If negotiations take place at sector level, the competition between firms offering close substitutes does not apply, and there is no mechanism restraining union wage-setting to increases below or close to productivity growth.

While the essence of the Calmfors and Driffill model dominates mainstream economic thinking in this area, more recent extensions to this literature (e.g. Fitzenberger and Franz, 2003, who consider the insider-outsider problem of wage negotiations) cast doubt on the proposition that a fully decentralised system

necessarily leads to superior employment outcomes than an intermediate system operating at sector level. However, at the other end of the spectrum, there remains little doubt that a highly centralised system of coordination is superior with regard to ensuring that wage increases reflect productivity growth.

> **Key point**
>
> More recent developments in the economic literature highlight the nature of the bargaining regime as a key influence on medium-run outcomes. In particular bargaining systems that are either highly centralised at national level or highly decentralised can secure a closer link between wage growth and productivity, than intermediate models (based for example on sector-level bargaining). While there have been some challenges to this analysis, it has been widely used to explain inter-country differences in this area.

2.2.3 International competition

This emphasis on the level of collective bargaining appropriate to achieve wage adjustments linked to productivity still guides much of the research on wage flexibility, although it only holds for the case of a closed economy. Thus while the predictions of Calmfors and Driffill might be expected to apply to the aggregate EU economy, this may not be the case for individual EU member states, because the common market introduced competition across countries and thus there is a potential for substitution even for countries with industry-level wage bargaining.

The view in the economic literature seems to be that the introduction of the Euro as well as increased global competition have made the particular system of wage formation less relevant for the alignment of wages and productivity: indeed some research (e.g. Danthine and Hunt, 1994) suggests that when consideration of the wage bargaining process is extended to open economies, both key results from the earlier literature (the relative superiority of coordinated wage negotiations, and the notion that industry-level wage bargaining results in poor labour market outcomes) may not apply when sectors are exposed to international competition.

> *"If the force of international competition is sufficiently strong (…) the margin for manoeuvre left to the unions decreases considerably"* (Danthine and Hunt 1994: 537).

Thus global competition can result in a clearer orientation of wage setting to reflect productivity changes, even when operating at sector level. As argued by Martin (1999), a possible effect of introducing the Euro would be to stimulate international convergence of bargaining, thereby bringing wage outcomes closer to those of decentralised negotiations (as in the US) unless, of course, there is a shift towards sectoral or fully-coordinated negotiations at the aggregate EU level.

> **Key point**

The impact of global competition, as well as the coming together of countries in trading blocs or monetary union may weaken the validity of predictions based on different national bargaining structures. In particular, the alleged inferiority of sector-level bargaining as a mechanism for co-ordinating wage and productivity developments becomes less relevant (at least in sectors exposed to international competition).

2.3 Long run

2.3.1 The impact of wages growth on long-term productivity growth

Standard microeconomic models assume that technological change is exogenous in the short- and medium-run. More recently, however, endogenous growth theory rejects this assumption, on the basis that changes in factor use resulting from factor price changes impact on technological progress. Unlike traditional theory, endogenous growth models do not assume that marginal productivities decrease at the aggregate level as they do at the microeconomic level of firms. In this sense, productivity growth at the level of an economy results from investment in capital stock at firm level, but diffusion and learning effects create non-private returns and technological progress beyond the microeconomic entity (see Romer 1990). Unlike Solow-type growth models (Solow 1956), these models do not predict that growth in productivity results in a steady state after some time, or that productivity growth requires external changes in technological progress.

Assuming that the nature of technological change is endogenous in this way, resulting from capital investments (depending on wages as well as capital costs) helps explain why moderate bargaining outcomes (even wage increases below productivity increases) may not be an effective mechanism to increase employment. This could be the reason why even some countries with histories of very moderate wage increases have not experienced the expected levels of employment, e.g. Japan or Germany.

This is the starting point of a model developed by Hellwig and Irmen (2001), who assume that firms' choices of innovation investments depend on both (real) interest rates and (real) future wages. The set-up of the model is inter-temporal and assumes rational expectations (i.e. anticipations of wage increases materialise as actual wage increases). Under the usual profit-maximising framework, firms anticipating a high level of future wages have incentives to invest in productivity-enhancing innovations or be driven from the market. Therefore, a high growth rate of wages leads to investments in productivity-enhancing capital. As in standard theory, wages and productivity will be aligned in the long run, because firms with productivity increases below the level of wage increases will eventually be unable to pay their wage bills and go out of business.

The verdict about aggressive wage policies derived from this kind of model is as negative (for employment levels) as in the standard microeconomic theory, but the underlying mechanism is different. Aggressive wage setting would result in productivity-enhancing investments and productivity growth far above the growth of aggregate demand, and:

> *"The shortfall of demand growth from productivity growth causes a shrinkage in employment, even if wages and productivity grow at the same rate, and the condition for employment neutrality (…) is satisfied". (Hellwig and Irmen 2001: 5)*

It is worth noting that in these models employment outcomes result from changes in aggregate demand (rather than supply) in a world deciding about real prices and not (as in traditional Keynesian thinking) money wages as the key relevant variables for employment contracts. The model is also consistent with microeconomic theory in the sense that employment levels result from wages and marginal productivity being aligned. And yet, the important finding is that (although wages and productivity may be observed growing at the same rate in practice), a simple microeconomic rule of thumb, based on targeting wage increases below or at productivity increases may still fail to increase or sustain employment once the inter-temporal effects of wage setting on capital investments, productivity and output levels in subsequent periods are accounted for. In consequence, consumption is

> *"not autonomous in the Keynesian sense [but] results from intertemporal optimisation of households and firms and their coordination by interest rates"* *(ibid.: 6).*

This finding provides an alternative explanation of the poor employment performance of Europe in the 1980s, despite relatively moderate wage increases. Thus Hellwig and Irmen (2001) suggest that the expansive wage policies of the 1970s increased productivity so much that an output gap was opened, which could not be subsequently closed. The declining labour share thereafter may:

> *"reflect the effects of the previous wage push on the development of labour productivity (…), i.e. dynamic substitution effect" (ibid.)*

Bester and Petrakis (2003) take a similar view. Here, too, the direction of causality is questioned: while empirical observations might suggest that the ratio of wages to labour productivity partly reflects an upskilling of the labour force and improvements in labour productivity (e.g. through the adoption of new technologies), the alternative view is always that higher wages can result in long-run substitution away from labour through new technologies. There are some empirical studies (see Chennels and van Reenen, 1997) in favour of this view. While Bester and Petrakis (2003) assume some kind of dynamic innovation process, there remains ultimately a cost-push effect of wages growth. Hence, long

run productivity growth at the level of individual industries is driven by the growth rate of wages.

Through this relationship, the argument suggests that the growth rate of wages determines the number of active firms, their labour costs per unit of output, the size of the firms and the output of the industry in the long run. The level of wages is less relevant to aggregate employment in the long run, although it is still important in determining the level of labour productivity and employment within an industry.

> **Key points**
>
> Much recent theoretical analysis, including the so-called 'endogenous growth' literature challenges the assumption of traditional microeconomic analysis that technological change is exogenous (particularly in the long-run). In these models 'excessive' wage growth may be one of the factors stimulating capital investment in new technology. While, in some variants of these models, wages growth greater than productivity still leads to lower employment in the long-run (because of substitution effects towards capital and away from labour at the firm or industry level), in other variants the endogenous technological change generates externalities beyond the investing firm which benefit employment. An important conclusion is that the introduction of endogenous technological change in such models breaks the simple link between wages growth and employment growth (via productivity) and allows for the possibility that wage moderation below productivity growth at national level may fail to have the anticipated employment benefits.

2.3.2   Empirical evidence on the reverse causality

Millea (2002) reports empirical evidence[6] about the bi-directional relationship between wages and productivity, in particular considering the nature of the wage setting process in different countries. The empirical evidence of this paper – as well as that of a more in-depth study for Germany (Fuess and Millea 2006) – can be interpreted in the light of efficiency wages, i.e. explaining productivity as resulting from particular wage levels, for given characteristics of the labour market (e.g. the total level of unemployment). It shows that the effects of productivity on wages differ substantially between the six countries of the analysis, but there is evidence for conventional wage bargaining following productivity in most countries with the exception of the US. The authors interpret this in the light of union coverage, with the US having the smallest share of workers covered by collective bargaining. At the same time, the study shows the

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[6]   Based on an analysis of time-series data to estimate long-run linear associations between productivity and wage growth, separating the effects from productivity on wages from the effect in the reverse direction and contemporaneous effects.

evidence for efficiency wages being strongest in the US, Canada and Italy, the countries with the shortest duration of unemployment benefits. Since longer durations and more generous levels of unemployment benefits are likely to reduce the 'efficacy of efficiency wage payments', these findings are broadly consistent with theory. More generous levels of unemployment benefits such as in Sweden or France also correlate with a weak efficiency wage mechanism.

Overall, the evidence shows that the greater the union coverage the clearer is the link between productivity and wages, i.e. it reflects a mechanism associated with a conventional bargaining system, according to which unions take their share of increases in productivity. The highly decentralised system of wage bargaining in the US is consistent with an opposite direction of causality, however (in line with efficiency wage setting).

Key point

While the research described above provides some evidence for the bi-directional wage-productivity relationship there is, it seems, no empirical research confirming a long-run relationship whereby wage growth increases productivity via inter-temporal substitution towards capital, which would link the generation of technological change to wage setting as suggested by endogenous growth theory.

2.4 Available empirical evidence and methodological problems

Turning now, in more detail, to empirical evidence in the research literature on the relationship between wages and productivity growth, much of this relates to the US. Most studies find increasing evidence that wages have grown below productivity in the last 30 years and discuss this finding in the light of increasing income inequality and not (as is typically found in the European debate: see Gros 2010) with regard to relative changes in a country's competitive position.

Mishel and Shierholz (2011) describe a widening gap between growth rates of productivity and wages (and labour compensation, including bonus payments). Labour compensation growth was particularly low in the private sector, while the growth of average wages was particularly weak for college educated public sector workers.

Harrison (2009) reports a similar divergence between the growth of real earnings and productivity in the US and Canada, but this results largely from rising earnings inequality (i.e. increases in the top one per cent of the income distribution alongside stagnant or falling income shares elsewhere). There are also, however, important measurement issues affecting the observed decline in labour earnings, e.g. when taking account of the depreciation of fixed assets, which has increased

as a result of adoption of new technologies, and which has tended to push the labour share downwards.

Fleck, Glaser and Sprague (2011) provide further evidence on a widening wage-productivity gap, which began in the mid 1970s. However, they note that this may also result, in part, from the measures of labour productivity not having been adjusted for compositional changes in the workforce, and from the choice of different price indices to adjust for inflation[7].

Lopez-Villavicencio and Silva (2010) analyse a macroeconomic panel of OECD countries between 1985 and 2007 finding that wage increases have exceeded productivity growth for permanent workers, while the opposite is true for temporary workers, in line with their the lower bargaining power. Given the great inter-country variation of the share of temporary workers, this may be an important reason explaining why the existence and size of the wage-productivity gap varies between countries.

Key points

In our view, the evidence of the widening gap between wages and productivity is not robust with regard to the specific indicators chosen in many of the papers. In line with Feldstein (2008), we would highlight two major problems of the available descriptive evidence:

- There are differences in the observed changes in price levels, affecting the growth rates presented in these essays. Using the Consumer Price Index (CPI) in order to obtain real wages and not output price indices results in lower growth rates, because the CPI rose more than output prices (in the US, see Feldstein 2008: 593). It would be more appropriate in the light of the theoretical link between productivity and wages to express both in real terms using output price levels.

- Secondly, wages have grown on average less than total labour compensation because of changes in labour costs at the same time. Feldstein (2008) notes that

  "Because of the rapid growth of health insurance benefits and other fringe benefits, wage and salary payments declined from 89.4% of total compensation in 1970 to just 80.9% in 2006. As a result, the annual rate of increase in wage and salary payments was 0.3% less than the rate of increase in total compensation".

When both these factors are taken into account, the growth of labour compensation is actually quite similar to the growth of productivity. In addition, as was noted earlier, the observed growth of labour productivity is likely to overstate the change in marginal productivity, as it does not control for changes in the composition of the workforce or increases in capital costs. Given that most of the empirical descriptions

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[7]   The compensation data have been adjusted based on the CPI, while a price deflator was used to obtain real growth in output; an approach which has also been criticised in Feldstein (2008).

in the literature do not fully address these weaknesses, the reported productivity trends are likely to be somewhat misleading indicators of true changes in labour productivity.

2.5 Policy rules for wage-setting in the light of economic theory

In this section we briefly consider the extent to which the policy rules for wage-setting in relation to productivity, emerging from the theoretical discussions and empirical evidence discussed above can be seen to influence policy debate in the real world. To this end we highlight some relevant examples of such debate.

2.5.1 Facilitating wage moderation as an employment policy through institutional reforms: The German case

In most of its annual reports, the German Council of Economic Experts (CEE) has emphasised the importance of wage moderation, i.e. that wages should grow below productivity increases in order to increase employment levels. In implementing this concept for policy purposes, as noted above, changes in price levels as well as changes in productivity have to be modelled appropriately. This is difficult in practice, because of two important problems:

- First, some changes in price levels cannot be compensated for, either because they are driven by taxation (and therefore not neutral in distributional terms), or because exporting firms cannot achieve higher price levels on international markets. In addition, wage-setting decisions in the real world are made under uncertainty because they have to respond to anticipated rather than observed price changes.

- Second, observed changes in marginal productivity have to be interpreted in the light of compositional changes to the workforce: lower productivity jobs disappear, higher productivity jobs remain, but the effective productivity at the workplace remains unchanged.

Since marginal productivity cannot be observed, it must be estimated. In practice, the CEE assumes a particular production function[8], implying, holding capital

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[8] A linear homogeneous function.

constant, that the output change due to a change in labour input reflects the marginal productivity of the factor[9].

The CEE advocated wage moderation as a policy in order to increase employment from the mid-1990s, and, although basic wages increased only very moderately since then, there were nevertheless higher than employment-neutral increases in labour costs per employee, caused by increases in social insurance contributions. Thus, the German case also shows that the adoption of wage moderation as a basis for an employment policy requires a clearer analysis of the total labour compensation rather than the wage. As Feldstein (2008) notes, the percentage of wages as a component of total compensation has gone down in many countries, and measured wage growth may no longer be a good representation of the total growth rate of labour compensation.

A comparatively weak Euro in the early 2000s, coupled with changes to unemployment benefits systems and continued institutional reforms reducing union bargaining power through further deregulation (e.g. in order to facilitate fixed-term employment), contributed to a situation of relatively weak increases in German labour costs in the 2000s. With the exception of Japan, no other country has achieved such low increases in labour costs per employee, but nonetheless, the employment gains in Germany were fairly modest until very recently.

2.5.2   Setting minimum wages to achieve poverty reduction without losing low-productivity jobs

Standard microeconomic theory also plays an important role in setting minimum wages, which exist in the majority of the EU member states. Eurofund (2009) provides a thorough description of the existing minimum wage regimes, which consist either of systems of indexation (in most countries by aligning minimum wage increases to price changes and some increment related to estimated increases in workers' productivity), or of collective bargaining agreements declared as the wage floor for specific sectors (e.g. in Austria, Denmark, Finland, Germany, Italy and Sweden). The coverage of minimum wages varies widely, with more workers

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[9]   Empirically, this marginal productivity corresponds to the wage share. The change rate of marginal productivity is therefore estimated as the sum of the change rate of the wage share and the growth rate of average productivity. This growth rate of productivity is corrected for the change of employment as the observed growth rate of productivity plus the change rate of employment multiplied by one minus the wage share. Finally, adding the average change rate of the wage share to the growth rate of productivity, correcting for employment change, results in an estimate of the change rate of the marginal productivity of labour accounting for employment changes, which is the relevant measure for wage bargaining, according to the CEE.

covered in the Eastern European member states (but also in France) and relatively fewer in most other European countries (often less than 5 per cent of the workforce).

In recent years, there has been a lot of debate about the introduction of statutory minimum wages and the levels at which they should be set, and there are two prominent examples that show the trade-off between reducing poverty and putting employment opportunities at risk:

- In **Germany**, there is currently a lively academic and policy debate about introducing a statutory minimum wage at the level of the whole economy rather than the sector level (where minimum wages can already be created by the Federal Government by declaring collective bargained agreements as generally-binding wage floors). While some simulations indicate that introducing a level of €7.50 per hour throughout the economy would not result in significant changes in the average hourly pay in the economy, it would increase labour costs very substantially at the lower end of the wage distribution, in particular in East Germany and, due to the nature of the gender pay distribution, would affect the female workforce more than men (Müller and Steiner 2008). Since wages would increase, some economists have argued that many of these employment opportunities would be at risk (Franz 2007: 435), a finding reinforced by some sector studies of binding collective agreements (e.g. Möller and König 2008, but only for East Germany). In contrast, Möller (2008) argues that the introduction of a minimum wage below a certain level would be either neutral or even increase employment, while negative effects would dominate only for a too high level of minimum wage.

- The employment neutrality of the introduction of a minimum wage at an appropriate level is consistent with the findings in the **United Kingdom**, where a national minimum wage was been introduced in 1999, with some differentiation by age bands, but of a generally binding nature for all sectors of the economy. While it substantially increased the relative pay level of the lowest pay workers and reduced the gender pay gap, no significant effects on employment have been found by a range of studies, and the most pessimistic predictions of employer organisations and others who opposed its introduction have certainly not been realised. According to Metcalf (2008), the lack of employment effect did not result from being set at a level which was generally "too-low-to-matter": it now affects about 10% of the employed workforce and has risen substantially over time. There is also only weak evidence that the lack of employment impact resulted from non-compliance and the mitigation of negative effects by the Tax Credit system which was introduced over the same period. The more likely explanation of the employment neutrality of the UK National Minimum Wage is that it may have increased productivity through

capital investments and improvements in work organisation (in line with efficiency wage theory as outlined above). At the same time, there is also evidence that the price changes resulting from the introduction of the minimum wage were to some extent passed on to the goods markets, especially in labour-intensive sectors.

2.6 Summary

As has suggested by Figure 1.1 in the introduction, the strong empirical link between wages and productivity is consistent with economic theory. Other than through the operation of labour laws and social insurance (which indirectly influence bargaining power) or by setting minimum wages, it would seem that the influence of public policy in the formation of this relationship is fairly limited in the short as well as in the medium and long run.

In the **short run**, the idea that wages are related to marginal products is plausible and, under assumptions of perfect competition, wage moderation would indeed translate into output expansion. However, the increase in production would also increase labour demand, which is likely to offset this effect, at least in part, because it would entail further upward pressure on wages. Whether or not downward wage adjustments (or wage increases below productivity growth, as in the US following the recent recession) are feasible in practice depends very much on the flexibility of labour market institutions. These would need to facilitate flexibility and/or involve social partners endorsing high levels of employment as a target in wage-setting. Again the influence of public policy here is rather limited, e.g. to setting minimum wages or to the decision of whether to introduce them at all.

In the **medium run**, wage negotiations (in particular under international competition) link wages and productivity irrespective of the level and structure of bargaining processes. If wage growth exceeds productivity growth due to exogenous increases in aggregate demand, as observed before the 2008-2010 recession in some European countries (e.g. due to cheap credit in Greece for consumption or in Spain/Ireland for construction spending[10]), the likely implication is that wage moderation in the following period will re-establish this close relation. Neither long-term employment-increasing wage-moderation as in Germany (where wages in the most recent period increased faster than productivity[11]), nor wage increases above productivity growth are likely outcomes in the medium run, because international competition tends to force alignment between wages and productivity. Such an adjustment appears to be currently under way in Ireland[12], where labour costs and wages are decreasing while productivity increases substantially, realigning wages and productivity once more.

[10] See Figure 3.9 below, and compare with Gros 2010: 2

[11] See Figure 3.13 and Figure 3.14 below

[12] See Figure 3.14 below

In line with the predictions of endogenous growth models, **long run** productivity increases depend on capital investment, which itself is partly an outcome of wage growth of the past. Even a moderate/employment-neutral or employment-increasing wage policy with wage increases below productivity growth would fail to increase employment if wages set in the past had caused productivity increases exceeding increases in aggregate demand. Under such circumstances, even wage moderation would no longer be a useful policy instrument to increase employment.

3 Analysis of international data

In this chapter, building on the review of the literature reported in the previous chapter we look at the development of potential indicators for regular monitoring of wage and productivity data for policy purposes.

We then go on to report some simple descriptive analyses of recent trends in and patterns of wages and productivity growth, across a range of advanced economies (both EU member states and a selection of other OECD members), and interpret these trends and patterns in the light of the theoretical and empirical literature.

3.1 Indicators

3.1.1 Productivity

In the following analysis, productivity is measured by observed Gross Domestic Product per hour of work in the economy (GDP/h) using data obtained from the Conference Board – a business-financed research organisation – covering the period up to the end of 2010. These data are internationally adjusted using Purchasing Power Parities (EKS), resulting in 'international' dollars and were adjusted to 2010 real prices[13]. The resulting time series as shown in Figure 3.1, which was included in the thematic paper by Meager and Higgins (2010), shows that labour productivity in the EU remained below the US level for the available time series.

As described in Meager and Higgins (2010), the remarkable recent decline of hourly productivity and productivity per person employed of the EU-15 member

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[13] The data were downloaded from "The Conference Board Total Economy Database" (http://www.conference-board.org/data/economydatabase/) in March 2011.

states compared to the US levels is likely to have resulted primarily from labour hoarding in the recent recession, often facilitated by public programmes such as short-time working.

**Figure 3.1: EU-15 GDP per capita and productivity in comparison to the US.**
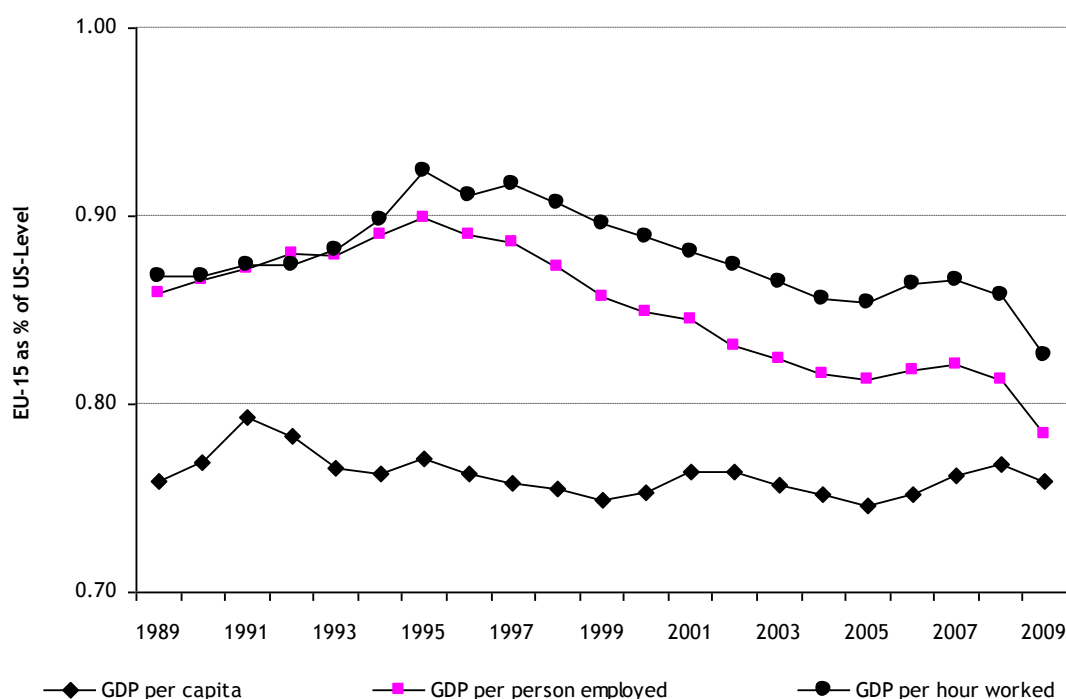
Source: Conference Board Total Economy Database, own calculations

While the comparison of aggregate indicators of labour productivity of the EU-15 and the US shows that a convergence to US levels (as proposed by the Lisbon strategy) could not be achieved at the aggregate level, individual EU member states show a wide variation of labour productivity compared with US levels. GDP per person employed remains below the US level in all EU member states, but per-hour labour productivity is much closer to US levels for many EU member states, as this indicator takes account of differences in working times which are much higher in the US. Figure 3.2 shows how individual countries compare to the US with regard to GDP per person employed and GDP per hour of work.[14]

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[14] Note that GDP per capita shows extreme values for Luxembourg due to its very unusual labour market exceeding the size of the resident population: Employment levels in Luxembourg are around 108% of the working-age population and the expression of GDP/P cannot account for this. GDP/H is not affected by the difference between residence population and employment as it is based on employment and hours worked in the economy (ie including the contribution of

In 2010, GDP per person employed was close to US levels in the Netherlands
(100%), Belgium (99%), France (92%), Germany and Ireland (91%). With levels
running at around two thirds of the US level, GDP per hour worked is lower in the
southern EU member states, and it is lowest in those EU member states which had
been communist states in the past, with productivity levels ranging from 25% of
the US level in Romania to around 60% in the EU member states with successful
early transformation to the market economy (e.g. the Czech Republic and
Slovenia).

Figure 3.2: Indicators for labour productivity, 2010
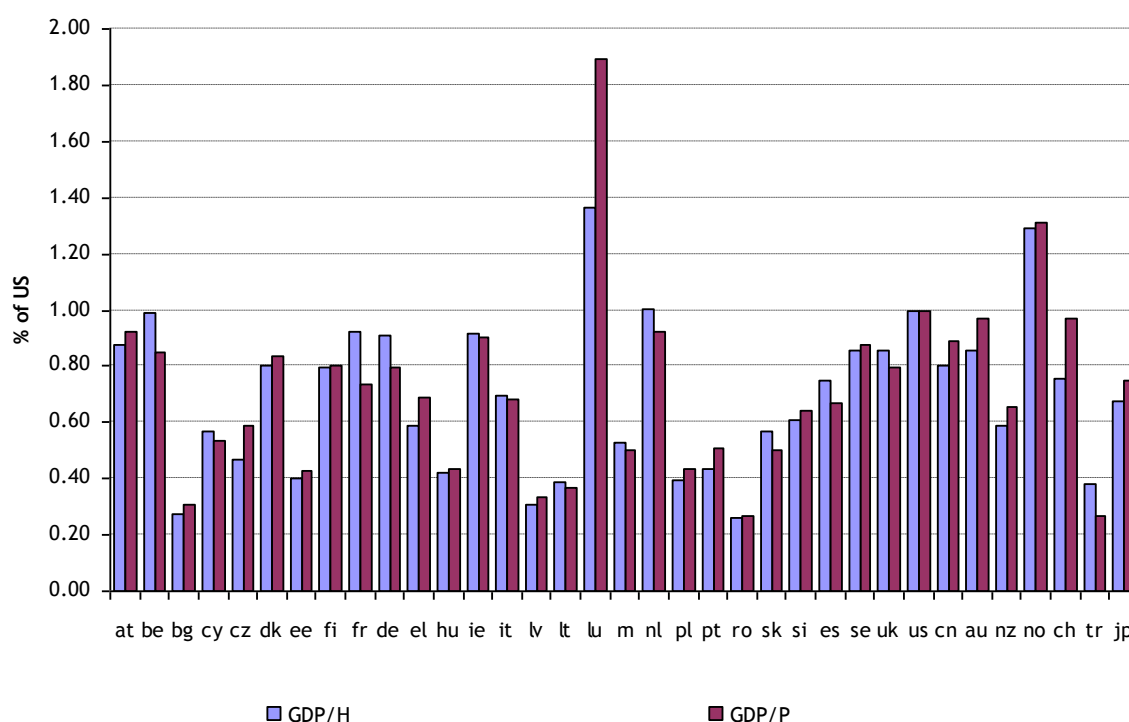
Source: Conference Board Total Economy Database, own calculations

Across the EU member states and other similar western economies, there is great
variation in the development of productivity between 1995 and 2009, using the
indicator of GDP per hour.

Figure 3.3 shows that the total increase in labour productivity over the period
1995-2009 ranged between 3% in Italy and 128% in Estonia. There are some clear
associations between important institutional characteristics of the different

non-residents) and represents a more realistic measure of the productivity. It still shows – due
to the very specific nature of the economy – the highest value internationally.

countries (in particular with regard to the type of welfare state), and achieved increases in productivity growth. In particular:

■ Comparatively low growth rates of labour productivity have been found in the established continental welfare states (Germany, Belgium, Netherlands and Luxemburg) and the southern EU member states (Spain, Portugal, France). In Greece productivity grew faster than in other southern EU member states.

■ Countries of the liberal type of welfare state achieved slightly higher productivity growth than most other EU member states (Cyprus, the UK, Malta, but also Australia and the US). There was a much more dynamic growth of labour productivity in Ireland. Productivity in Canada grew only moderately over the last 15 years.

■ Sweden and Finland, as examples of coordinated Nordic-type economies, achieved productivity growth comparable to the US, while Denmark and Norway did not. Productivity in Japan also grew more dynamically than in most EU member states.

■ Apart from Ireland, the highest increases in labour productivity were achieved in the former communist EU member states, clearly reflecting a catching-up process during economic transition to a market economy.

Figure 3.3: Growth of labour productivity 1995-2009
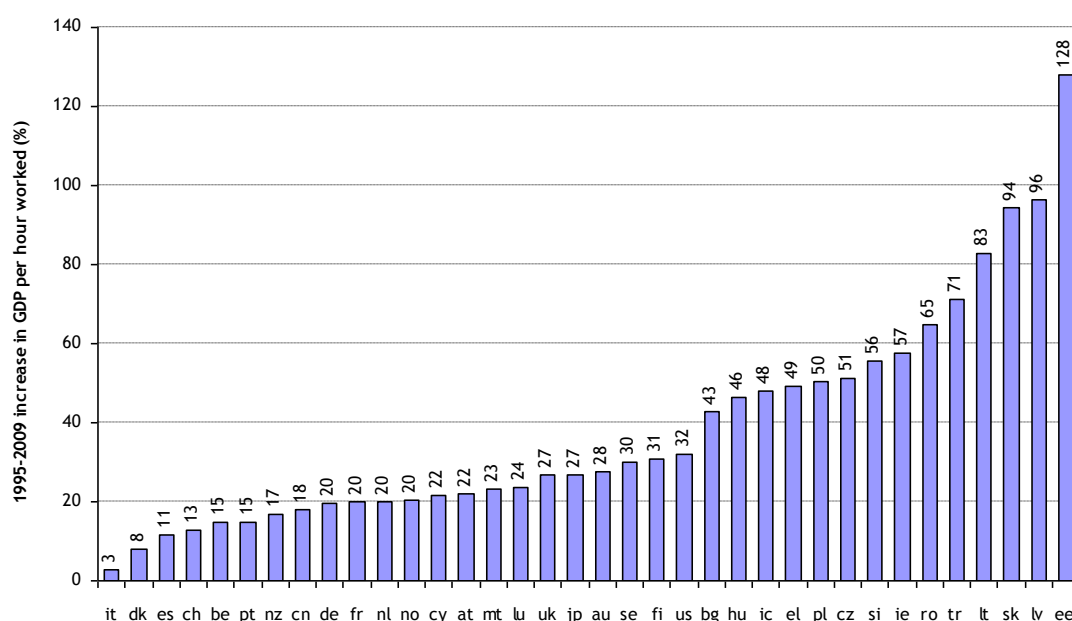
Source: Conference Board Total Economy Database, own calculations

3.1.2 Wages and labour costs

We reviewed previous empirical studies in section 2.4 which showed that (notably in the US) wages have not increased as much as productivity for many years. It is likely that simultaneous changes on the aggregate labour market may have contributed to these developments, including wage growth being dampened as a result of labour supply expansion (through increased female participation or immigration). Nevertheless, it seems that at least some of the observed wage-productivity gap (and associated fall in the labour share) is a statistical artefact due to qualitative changes in compensation packages. Focusing on wages may not tell the full story about developments in labour costs for two important reasons:

■ First, there is a growing importance of **variable compensation elements** in many countries. While wages represent regular payments (e.g. basic wages, cost-of-living allowances and other guaranteed and regularly paid allowances), total earnings additionally incorporate overtime payments, bonuses and gratuities regularly and irregularly paid, remuneration for time not worked and payments in kind (OECD 2011).[15] Not fully accounting for these additional elements biases wages data downwards, especially in countries with an established history of performance elements to pay like the US and some other Anglo-Saxon economies. In such cases, the choice of wages as an indicator would understate the true factor costs.

■ Second, even total earnings understate the true factor costs, insofar as they do not include **employer contributions** to statutory social security schemes, private insurance, unfunded employee social benefits paid by employers for children/spouses/family, education or other allowances in respect of dependants, payments made to workers because of illness, accidental injury, maternity leave, etc. This, for example, would bias the labour cost measure downwards in countries with substantial employer contributions to mandatory social insurance, particularly relevant in continental Europe.

For these reasons it is also important to look at measures of **total compensation** which are included in some data sets such as those of OECD. Even this measure may not represent total labour costs, which would additionally include the cost of vocational training, other welfare costs (e.g. cost of canteens), costs of transport of workers, cost of work clothes, cost of recruitment and some specific taxes. However, it is likely to be very difficult to compare these other elements of total labour costs internationally, because of institutional differences between countries

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[15] http://stats.oecd.org/mei/default.asp?lang=e&subject=11

(e.g. with regards to vocational training), and because consistent measures are not readily available in comparative datasets.

For the empirical analysis presented here, therefore, we rely on OECD data on both the growth of average wages for a full-time equivalent in the economy and total labour compensation per employee. We look at developments in these data for EU member states and a selection of other major economies, namely the US, Canada, Japan, Australia and New Zealand and non-EU European countries.

Growth rates of wages and labour compensation per employee were derived from variables shown in 2008 USD PPPs and 2008 constant prices. Labour compensation per employee was used instead of hourly labour compensation because the latter is available for fewer countries[16].

3.1.3 Basic description of potential indicators and further issues

In the following, we describe the growth of productivity, average wages and labour compensation per employee for our sample of countries in order to understand whether the relationships in the data reflect those hypothesised in the economic literature.
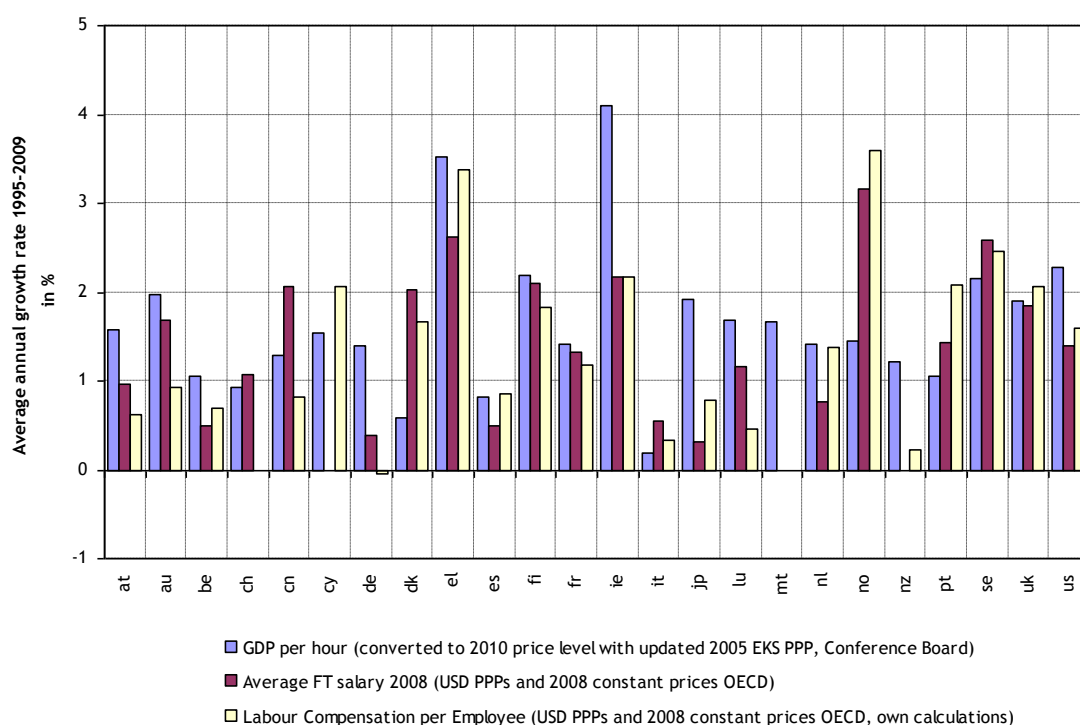
Figure 3.4 shows that GDP per hour has grown around 1.64% per year on average in the different countries over the period 1995-2009. The growth of full-time wages and labour compensation per employee remained slightly below this level, with average annual rates of 1.41% and 1.46% per year. However, there are some interesting further observations:

1. In Sweden, Canada, Denmark, Norway, Italy and Switzerland, real wages grew faster than GDP per hour, which may partly reflect country-specific differences in the economic cycle considered further below (e.g. for Sweden which experienced a particularly severe economic crisis in the early 1990s, following which wage growth is likely to have lagged productivity growth by several years).

2. In most cases, the growth of labour compensation per employee was less than wages growth, with important exceptions like the UK, US, Japan where variable compensation/performance pay is more relevant. However, compensation also grew faster than wages in Greece, Norway and the Netherlands.

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[16] In practice, given that there were no substantial falls in working time over the period of observation, this is likely to be an acceptable indicator for current purposes, although a per-hourly indicator would clearly be preferable.

3. In Germany, labour compensation per employee as reported in OECD data was
   declining. However, this was potentially caused in part by reporting problems,
   which we consider further below.

Figure 3.4: Growth of productivity, wages and labour compensation 1995-2009

☐ GDP per hour (converted to 2010 price level with updated 2005 EKS PPP, Conference Board)

☐ Average FT salary 2008 (USD PPPs and 2008 constant prices OECD)

☐ Labour Compensation per Employee (USD PPPs and 2008 constant prices OECD, own calculations)

Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Base year effects

It seems surprising to observe that labour compensation growth exceeded the
growth of labour productivity over a long time period (1995 to 2009) in the
Scandinavian countries, Canada, but also in Portugal, Italy and Switzerland.
However, such observations may result from country-specific differences in the
timing of the economic cycle, relative to the beginning of the period of observation
in 1995[17]. Thus in the early years after the recession of the early 1990s, productivity
is likely to have increased faster than labour compensation (a common pattern as
post-recession unemployment tends to moderate wage-setting behaviour).
Subsequently as employment grows with a lag, labour compensation growth may
'catch up' and exceed the growth of productivity for a period.

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[17] Our choice of time window reflects data availability (it would have been preferable to use the
end of the previous recession in 1992/93 as the base year).

A similar effect of using 1995 as the base year is likely to apply to the observed growth rates of labour productivity, wages and labour compensation in the former communist countries. Due to economic restructuring following transformation to market economies, these countries show exceptionally high growth rates and equally, labour compensation growth may follow productivity growth.

Equity-based labour compensation

Some elements of labour compensation, in particular those based on stock options or the productive capital of firms, may not be fully accounted for in standard statistical definitions. Many large, publicly-listed firms implement compensation plans based on capital stock, which link performance outcomes (e.g. increases in the firm's market values) to labour compensation either by allowing employees to become shareholders or through remuneration based on stock option plans. Such payments often cannot be clearly separated into labour or capital income, because of institutional factors (e.g. specific taxation arrangements) or because they establish long-term incentives, requiring employees to hold shares for some time under which pay-offs attributable to labour inputs may materialise only after a significant time lag (e.g. when options are vested). Equity-based compensation may be categorised in technical terms as part of the firm's capital stock, and is in any case, unlikely to be reported consistently across countries. This issue is, in particular, likely to bias downwards the data from the US, where long-term incentives can be extensive. More generally, there are reported problems with the consistency of OECD indicators, because they exclude some compensation elements in some countries[18] or for a part of the time-series.

> **Key point**
>
> In our view, structural under-reporting of different elements of labour compensation, which varies between countries and over time, substantially limits the conclusions which can be drawn from international comparisons of indicators like wages or total labour compensation per employee.

3.1.4 Alternative indicators

Given the strengths and weaknesses of the core indicators for wages and productivity discussed above, it is also worth briefly considering some of the

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[18] The OECD lists a number of exceptions from international reporting standards (http://stats.oecd.org/mei/default.asp?lang=e&subject=11), but the most important are potentially that bonuses regularly paid are excluded for Belgium, France, Germany (and those irregularly paid for Estonia, Greece, Portugal).

alternative measures which might throw further light on the underlying relationships.

Wage share as a percentage of GDP

Another potentially relevant indicator in the light of wage growth is the development of the wage share (or labour share) as a percentage of GDP.

If achieved increases in productivity result in a corresponding increase in real wages, the labour share of GDP should remain unchanged. Short-term wage increases above the level of productivity are likely to increase the labour share of GDP, an observation found for many of the EU member states between the mid-1960s and the mid-1970s (European Commission 2007: 241-243)[19]. In the longer-run, however, changes in production technology will have an effect, and a short-run increase in the wage share (due, for example, to aggressive wage policies) may ultimately be offset if employment declines because of this. It is interesting to note that following the earlier growth in the labour share, such employment reductions seem to have cancelled this gain in the labour share entirely, and labour shares in the 1990s are similar to those of the 1960s and have been falling slightly since in most countries.

The wage share has been extensively discussed in the Employment in Europe (EiE) report 2007 (European Commission 2007: 237) as a measure of the distribution of national incomes to capital and labour and in light of the increasing concerns that workers *are not getting their fair share of the gains from technological progress and globalisation*" (ibid.). Therefore, the labour share was – and still is – widely regarded as important for social cohesion.

In principle, a declining labour share would indicate that labour obtains less of the production output as factor remuneration. Kaldor's (1963) famous observation that the wage share was more or less constant over time has not been confirmed in practice, and there were substantial increases in the labour shares in the late 1960s and early 1970s, which have been described in detail in the EiE report. Glyn (n.y.) reviews some international developments which help to explain the reduction in the wage share, in particular the loss of wage bargaining power in the context of more global competition, but he attributes little weight to other possible explanations such as higher levels of labour taxation and unemployment benefits.

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[19]   Indeed, if we do not assume perfect competition (e.g. if price increases can be achieved on the goods market), medium run increases in the labour share of this kind are consistent with theory.

Figure 3.5 shows that wage shares (*indicated by markers related to the right axis*) of countries used in this analysis are spread around 65% of GDP in most cases, with some exceptions: The UK records a comparatively high wage share of 71% (as does Switzerland with 76%) in 2008. Most of the eastern EU member states report relatively low labour shares of 60% and below.

The flexibility of the wage bargaining system cannot on its own explain inter-country variations in wages share of the GDP, e.g. Germany and the US show exactly the same share of 63%, although traditionally German unions and sectoral bargaining systems were believed to have generated comparatively strong bargaining power.

As a second relevant measure, Figure 3.5 also shows the change in the wage share between 1990 and 2008, which was on average a reduction of around 4 percentage points. The major EU economies, the UK, France and Germany, have experienced a reduction of 4 percentage points and Italy of 7 percentage points. Compared with this, the US and Japan have observed reductions of 2 percentage points, while no clear pattern is observable for the smaller EU member states, including the former communist EU member states in Eastern Europe. Although some of the latter show very substantial reductions in the labour share (e.g. Poland, Hungary and Slovenia), others show only very moderate decreases (e.g. Slovakia: 3 percentage points) or even increases (the Czech Republic, Lithuania, Latvia).

Figure 3.5 Wage shares 2008 and percentage-point changes 1990-2008
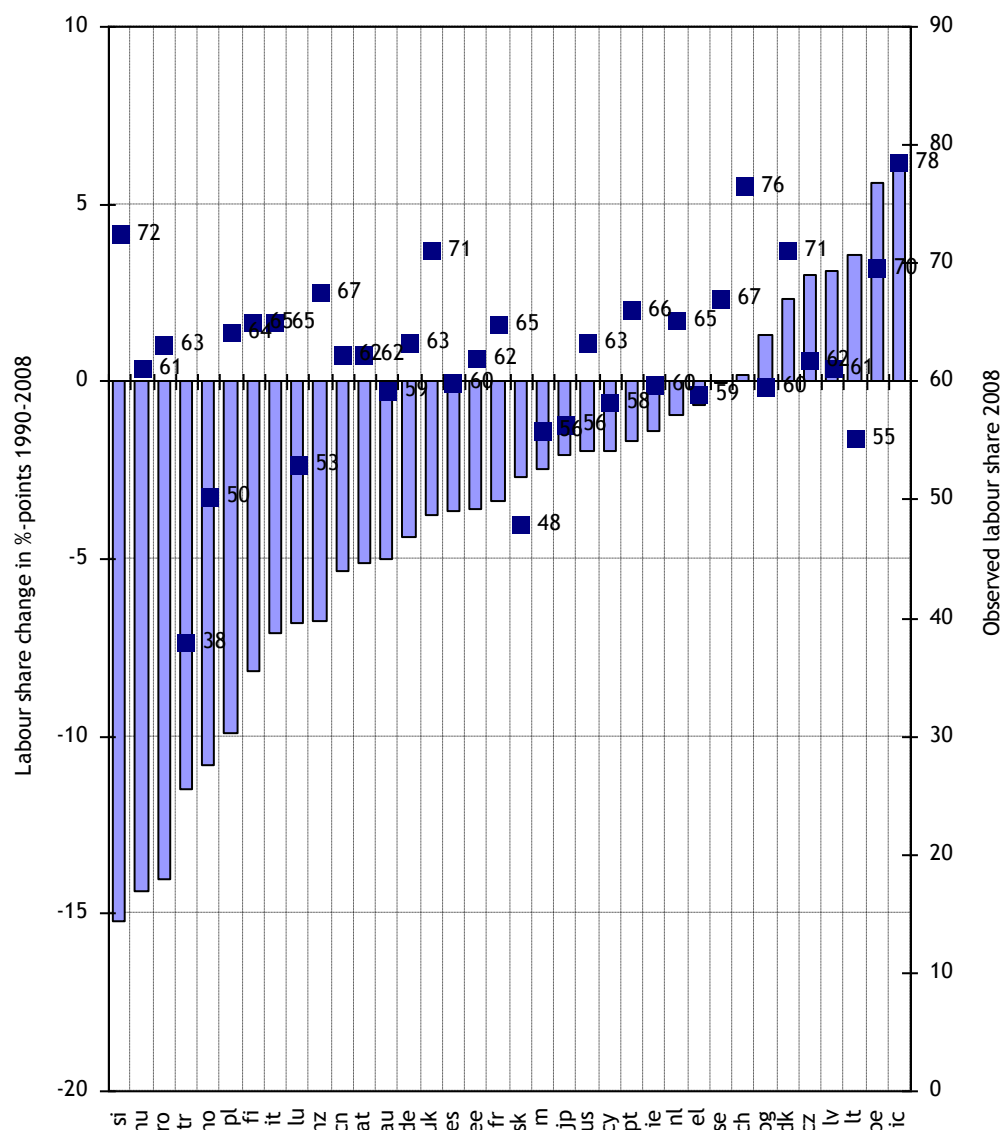
Source: Conference Board Total Economy Database, own calculations

Overall, a picture emerges that changes in the labour share may not accurately represent the development of labour compensation in relation to productivity. This is partly in line with expectation, given (as already discussed) the theoretical endogeneity of labour income resulting from production technology (at least in the short and medium run). Indeed if this indicator is to be used at all, it would seem most relevant in the context of a discussion of the long-term impact of levels and changes of the wage share on capital formation and the development of productivity, also taking account of changes in the labour and capital ratio caused by changes in interest rates.

In addition, there are some (more severe) problems associated with the labour share as a potential indicator for monitoring purposes, which arise from the statistical construction of the indicator:

■ First, changes in employment structure, e.g. reductions in working time and the extent of part-time work, cannot be controlled for in this indicator (although they can be in constructing some of the other indicators such as hourly wages or average labour compensation at the level of national aggregates). While it is possible to hold the structure of employment constant and to report a wage share unaffected by employment growth, in this case the choice of the base year affects the development of the wage share.

■ Second, in order to measure labour income in the first place, it is necessary to construct a 'wage' for self-employed or family members working in self-employed business without a clearly observed income (usually assumed to be equivalent to some kind of average wage). Given the significant role of self-employment in some economies and the big inter-country differences in the self-employment rate, this further detracts from the use of this indicator for monitoring purposes.

■ Third, this indicator also shares some of the other weaknesses of wages data discussed above, for example, the fact that reported labour incomes in different countries may not include (or may include to differential extents) some of the non-wage elements, and this is an issue of greater relevance in a world in which equity-based compensation and other non-wage elements of remuneration packages become more important in many countries.

Key point

In sum – and in addition to the theoretical problems with the indicator – the wage share and trends in it are just too inaccurate measures to contribute to a useful understanding of changes in labour costs and remuneration relevant to quantities of production or levels of employment. This is particularly true if non-standard elements of remuneration are taken into account.

Unit labour costs

Unit labour costs offer an alternative view into the growth of labour compensation, which expresses the ratio of wages/labour costs to total GDP. This indicators, too, has to account for labour compensation of self-employed and usually corrects for the level of self-employment in the economy either by adding "hypothetical" wages for the self-employed or by re-weighting the observed unit labours costs to account for the self employed.

Unit labour costs can be expressed as nominal or real unit labour costs by either relating wage costs to the real or nominal GDP:

■ Nominal wage costs represent the ratio based on the real GDP;

■ Real wage costs express the ratio based on nominal values as the contribution of labour to total output, which can be observed by the total wages observed in the economy.

Internationally, there are different methods in use in order to adjust the real unit labour costs for the problem that wages cannot be observed for the self employed, either by assuming some kind of average wage that can be applied to the self employed or by correcting the measure obtained from relating nominal wage costs to GDP or Gross Value Added. Eurostat and the ECB use an indicator of unit labour costs as re-weighting the real wage costs are expressed in the above by multiplying them with a correction factor that shows total employment including self-employment as a percentage of the employees. While Eurostat data are available for all EU member states, other European countries and Japan[20], there are no such data available for the US, Canada, Australia and New Zealand. We therefore decided to rely on information for unit labour costs from OECD Statistics.[21]

The potential difficulties with this indicator are very similar to those discussed above in the context of the wages share (e.g. relating to the role of self-employment, and to non-standard elements of remuneration). For these reasons we discuss only briefly in section 3.3.3 below OECD data on the ratio of labour costs and real output (based on an index with 2005 as the base year of real output).

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[20]http://epp.eurostat.ec.europa.eu/tgm/download.do;jsessionid=9ea7971b30dc5f7331a6582841a1b4d 58ac5cc34f3f6.e34RaNaLaN0Mc40LcheTaxiLbN8Se0?tab=table&plugin=1&language=en&pcode =tsieb070

[21] Note that the OECD Data also include a correction for labour costs of self-employed, by assuming "that labour compensation per hour or per person is equivalent for the self employed and employees of businesses. This assumption may be more or less valid across different countries and economic activities thus affecting the comparability of unit labour cost level data." (http://stats.oecd.org/OECDStat_Metadata/ShowMetadata.ashx?Dataset=ULC_ANN&Coords=[SUBJECT].[ULABUL99]&Lang=en&)

Real exchange rates

An analysis of real effective exchange rates could potentially complement the analysis of the relation of wages and productivity with regards to their impact on a particular country's competitiveness. Real effective exchange rates capture both

■ the development of a domestic currency relative to the currencies of other countries and

■ changes in the domestic price level.

In order to derive the real effective exchange rate, the domestic currency is compared to a basket of other currencies and then deflated by nominal unit labour costs: Eurostat compares a domestic currency with the other EU member states and Australia, Canada, United States, Japan, Norway, New Zealand, Mexico, Switzerland, and Turkey, ie provides a weighted multilateral exchange rate of any EU member state relative to this basket. The weighting of the different exchange rates the countries' different shares of either exports or imports or both. As an example, one would consider an export-based weighting for one particular country in order to understand a change in national competitiveness on international markets for domestic products[22]. Such a weighted multilateral exchange rate would correspond to a nominal effective exchange rate.

If price levels in the domestic economy and in the other areas of the currency basket are developing at the same rate, the nominal and the real effective exchange rates are identical. However, if labour costs (and correspondingly prices) were increasing at a higher rate in some countries than in others, the real effective exchange rates would differ. This is immediately apparent for the countries of the Euro area: Since the nominal exchange rates are fixed, a higher increase in the domestic price level of one of the member states than in the others would result in imported products to become relatively more attractive to consumers and hence, this domestic economy would lose in competitiveness. Within the aggregate area obviously, a gain in competitiveness of one country the results in a loss of competitiveness in another. Eurostat reports REERs for the EU member states and other important economies as Index values (1999 corresponding to 100%), which are shown in Table 3.1 below for selective years.

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[22] See for a concise definition of the REER provided by Eurostat: http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/dataset?p_product_code=TSDEC330

The table shows that increases in competitiveness (indicated by smaller index values) over the last 10 years until 2009 have only been achieved in very few countries (Germany, Austria, Poland and the UK), but these changes are also very sensitive with regards to the choice of the base year, particularly for countries with own currencies.

Table 3.1 Real effective exchange rates

	1999	2000	2005	2009
EU-27	100	89.38	113.99	120.65
Bulgaria	100	95.97	109.28	155.39
Czech Republic	100	101.58	137.56	161.51
Denmark	100	94.03	106.9	122.43
Germany	100	93.67	94.4	94.41
Estonia	100	97.18	112.93	153.14
Ireland	100	95.32	117.05	125.02
Greece	100	93.28	104.32	110.69
Spain	100	97.38	109.39	116.08
France	100	94.75	103.75	107.85
Italy	100	94.04	110.28	118.82
Cyprus	100	97.16	114.67	117.74
Latvia	100	102.61	99.81	148.26
Lithuania	100	101.35	114.57	134.18
Hungary	100	108.65	144.32	135.96
Malta	100	95.34	109.91	116.19
Netherlands	100	98.08	108.44	114.86
Austria	100	95.16	95.14	97.99
Poland	100	105.87	99.16	94.64
Portugal	100	99.65	110.93	115.21
Romania	100	128.99	148.41	179.85
Slovenia	100	97.05	100.79	111.76
Slovakia	100	109.19	135.28	179.94
Finland	100	93.92	102.12	111.03
Sweden	100	102.82	99.22	91.09
United Kingdom	100	103.76	106.08	86.8
Norway	100	97.25	111.52	129.37
Switzerland	100	96.76	105.22	112.57
Turkey	100	96.54	87.66	85.21

Source: Eurostat

While REERs have gained importance in the current policy debate – in particular with regards to international competitiveness – the available data are relatively dated and also only useful for sectors that are exposed to international competition. If newer data were available, they would potentially already show some adjustment in international competitiveness eg by a downward adjustment of wages or productivity growth exceeding wage growth, but with data ending in 2009, these indicators are still much affected by the recession (and shifts in values of currencies, eg of the Pound Sterling or the Zloty).

Sector level data

For a number of countries, sector specific data on productivity and labour compensation has been prepared by the *Growth and Productivity Accounts* published by the EU KLEMS consortium[23]. In November 2009, the most recent data set was made available, covering 32 sectors with data from 1970-2007, following an initial release in March 2008 for 72 industries for the period to 2005.

Our discussion of the aggregate indicators in the preceding sections highlighted the difficulties in ensuring consistency across countries on particular elements of remuneration. It is even more obvious that data at a meaningful level of sectors can only be made comparable based on extensive research into the different national methods used and how data can be harmonised. In principle, the EU KLEMS data allow a regular reporting of real wages and real productivity and should, therefore, allow the derivation consistent measures of the growth of such key variables in order to understand the alignment of wages and productivity. Timely and frequent reporting of such data (e.g. quarterly), would also allow close monitoring of their growth rates, as an input into any assessment of the implications of wages growth on the competitiveness of sectors.

The EU KLEMS project has shown that such a database would improve the available information substantially compared to existing statistics, e.g. AMECO[24], which do not allow the derivation of informative productivity measures below the aggregate level of GDP per person employed:

■ As has been discussed above, per-hour productivity is particularly important in accounting for the differences in working time between countries, but also with regards to the economic cycle. As extensively discussed in Meager and Higgins (2010), many EU member states – in particular those with short-time work

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[23] http://www.euklems.net/

[24] http://ec.europa.eu/economy_finance/db_indicators/ameco/index_en.htm

programmes – reduced working hours substantially and a standard 'per employee' reporting would not be informative with regards to the true development of labour productivity under such circumstances.

■ While the EU KLEMS project generated high quality statistics using the methodologies of national accounts and input-output analysis, which also allowed for energy inputs and other intermediates, AMECO data are only available for very broad sectors and are not adjusted to PPPs.

It would have been possible to run the entire analysis undertaken below (where we use national level OECD data) at the level of industries, using EU KLEMS data for most of the countries covered, with the exception of the newest EU member states, Romania and Bulgaria. However, since EU KLEMS data run only until 2007, these data would not be informative in order to understand the adjustments of wages as the European economies emerge from a severe recession. Since the short and long-term links between wages and productivity may differ (not only due to the system of industrial relations, but also due to public policies increasing wage flexibility), EU KLEMS data would not have enabled us to observe wage adjustments after the recession, which may have already have affected the competitiveness of some countries.

3.2 Short run: Before and after the recession

Having discussed the pros and cons of some of the alternative indicators for monitoring wage and productivity developments, we now turn to look at the comparative patterns and trends emerging from some of these indicators, for our selection of major economies. First we look at short-run data covering recent periods of interest, in the run-up to the recent recession, during the recession itself, and in the immediate post-recession period.

3.2.1 Situation until the recession (2009/10)

In the three years preceding the most recent recession (which began in the second or third quarter of 2008 in most countries), average annual wage growth was running between -0.1% (Belgium) and 10.2% (Norway). Figure 3.6 shows the empirical association between productivity growth and wage growth over this period and a linear regression line (and its related 95% confidence interval). While the data are consistent with a positive linear relationship –which becomes more apparent when removing the two outliers of Norway and the Slovak Republic – some specific country clusters can be observed:

1. There is strong productivity growth in the eastern EU member states, with wages and productivity growing very similarly between 2005 and 2008.

2. In the Nordic countries, wages were generally growing faster than labour productivity (especially in Norway and Sweden).

3. Wages were growing less fast than productivity in most other countries, including the US. and Japan. This gap was particularly wide in Germany, where productivity increased by 3.8%, while wages increased only by 0.2%.

Figure 3.6: Wages and productivity, 2005-2008

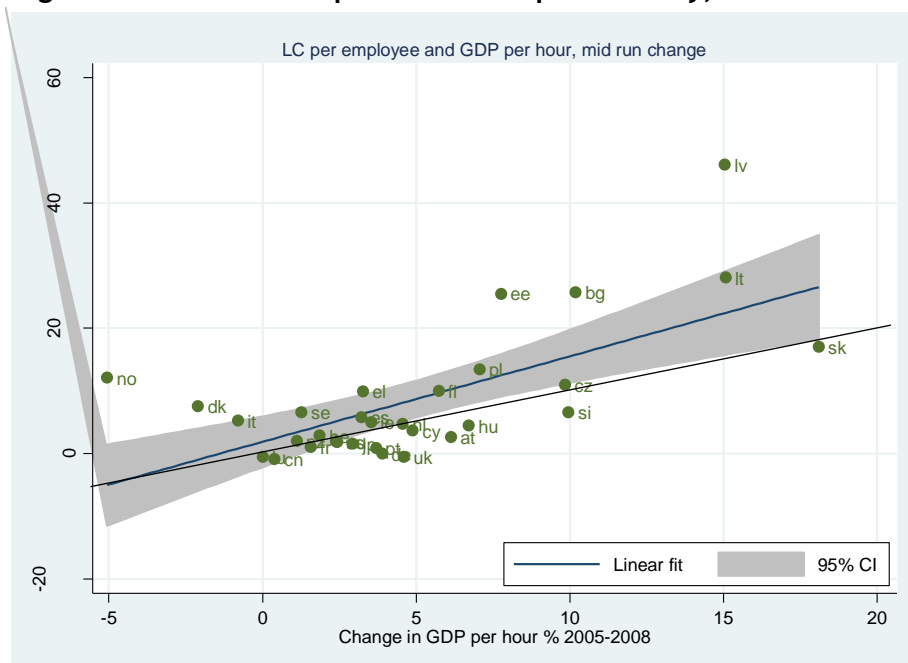*Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations*

If we exclude the new (post-2004) EU member states (whose performance reflects a catch-up process reflecting the transformation from communism to the market economy in the 1990s), the overall relationship of productivity and wages becomes flatter (Figure 3.7). During this period wages grew much faster than productivity in Denmark, Sweden, Italy and Luxembourg, but also slightly faster in France and Spain. Wages were growing slightly less than productivity in Greece and Ireland, while productivity grew substantially above wages in most other countries: in Germany with 3.5 percentage points difference; Austria and Portugal showing around 3 percentage point differences; and Belgium a difference of 2 percentage points. Growth of productivity exceeded that of wages by around 1 percentage point in the UK, the Netherlands and Finland.

Figure 3.7: Wages and productivity, 2005-2008, EU-15 only
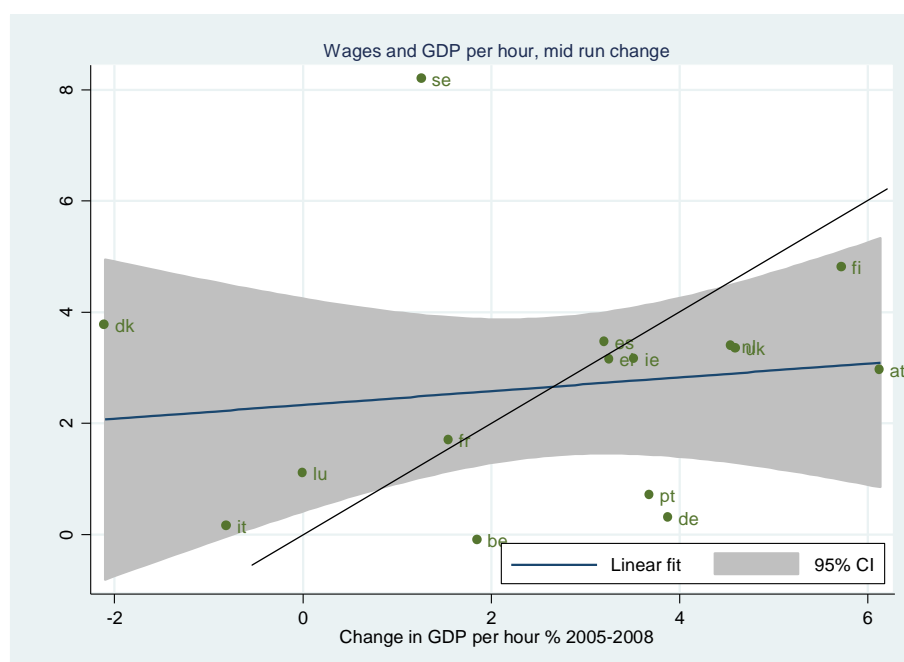
N.B. OECD Wage Data not available for some EU member states joining the EU in or after 2004, NZ, IC and TR, Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

As discussed earlier, labour compensation offers an alternative (and, in some ways, potentially superior) indicator for labour costs. The association of growth of labour productivity and labour compensation is shown in Figure 3.8 for the sample of 36 developed economies. The figure shows a similarly close association of wages and productivity growth, with the Eastern EU member states experiencing the highest growth rates between 2005 and 2008.

This indicator shows fewer empirical regularities than is the case for the wage growth/productivity growth relationship. Labour compensation was growing faster than productivity in many EU member states, including eastern European. Labour compensation was growing more slowly than productivity in the UK (by -5.1 percentage points), Germany (-3.9), Austria (-3.9 points), Slovenia (-3.1), but also slightly lower in many other EU member states, Japan and the US.

Figure 3.8: Labour compensation and productivity, 2005-2008

N.B. Labour compensation not available for MT, RO, CH, TR and IC; Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Restricting the country to the EU-15 States (Figure 3.9), a more detailed picture emerges, with Greece in particular recording a very high growth of labour compensation (10% between 2005 and 2008), while productivity increased only by 3.3% over the three year period. There was a similar development of labour compensation compared to productivity in Italy, but also in Denmark and Sweden. Labour compensation also increased substantially more than productivity in Spain and slightly more than productivity in Ireland, Finland and the Netherlands.

In light of the earlier discussions we would expect countries with labour compensation increasing significantly faster than productivity growth to suffer reduced national economic competitiveness relative to other EU member states (especially Germany) if corresponding price increases cannot be achieved. Clearly countries such as Denmark and Sweden which remained outside the Eurozone will be differently affected, given exchange rate flexibility (in this context it is interesting to note that, in the recession, the foreign value of the Swedish Krona decreased substantially in 2009/2010, but there were no such changes observed for Denmark). However, within the Eurozone, any impact on competitiveness is immediate, but will also vary sectorally according to the degree of international competition in individual sectors.

Figure 3.9: Labour compensation and productivity, 2005-2008, EU-15 only
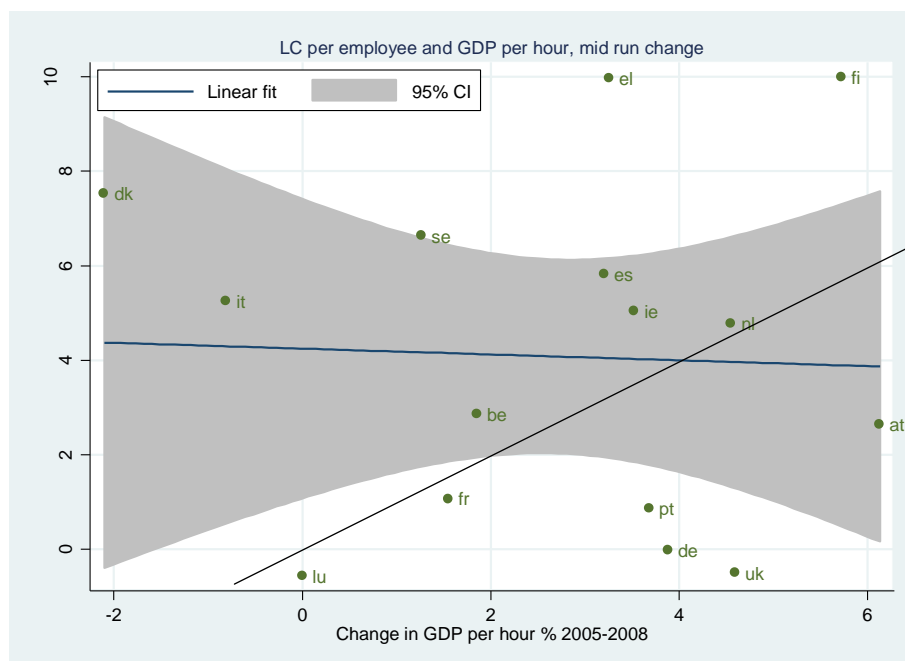
3.2.2   Recession 2008-2010

Turning to the period which included the recent recession in most countries, Figure 3.10 shows the development of employment and labour productivity in the years 2008-2010. As extensively discussed in Meager and Higgins (2010), this figure shows the empirical association of a likely employment/productivity trade-off in the short run. Employment levels fell proportionately less in countries experiencing short-run reductions in labour productivity, in particular in Germany where employment increased by 0.4%, while GDP per hour decreased by 1.2%. Employment losses were greatest in countries with substantial increases in productivity at the same time. Such changes occurred in most of the eastern EU member states, but also in Ireland and Spain (and the US), where unemployment increased substantially because public policies like short-time work compensation did not mitigate the employment impact of the recession. The adjustments in Ireland and Spain both included massive employment losses despite the differences between a liberal and a southern European type of welfare state, reflecting different adjustment process, particularly in Spain, where flexibility was achieved primarily through the reduction of fixed-term employment: unemployment increased to more than 20% of the total labour force in Spain and to 15% in Ireland, while it fell to 6.3% in Germany.

Figure 3.10: Employment and productivity, 2008-2010
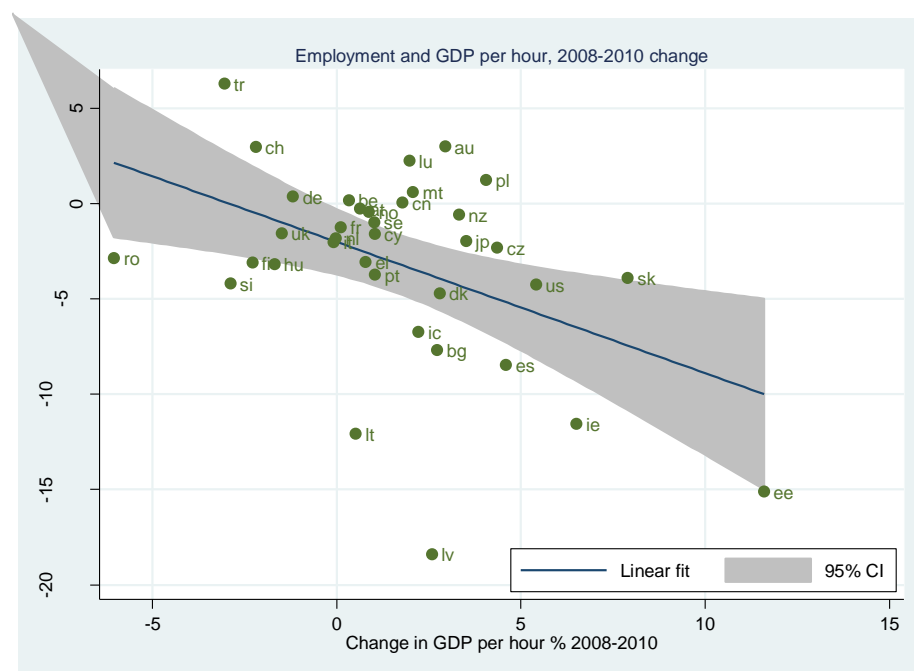
Source: Conference Board Total Economy Database, own calculations

As would be expected, given the growth in unemployment, there was only very moderate wage and labour compensation growth in most countries over this period. Figure 3.11 shows percentage changes in real labour compensation per employee and GDP per hour between 2008 and 2010 for countries for which comparable data from are available from OECD. While the expected positive association between both variables remains, the figure shows the wide variation across EU member states.

Labour compensation has fallen during the recession in Estonia, Greece and Hungary and has grown less than productivity in most EU member states with available data. There are, however, with some important exceptions: in particular, in Germany, Italy, Slovenia and Finland, labour compensation increased, while productivity decreased, which would suggest a negative impact on relative international competitiveness in those countries.

At the other end of the spectrum, labour productivity increased 12 percentage points more than labour compensation (which declined by 1.3%) in Estonia; similarly productivity grew significantly faster than labour compensation in Ireland. Labour compensation also decreased substantially in Greece (-4.9%), while GDP per hour remained relatively constant (+0.8%).

Figure 3.11: Labour compensation per employee and productivity, 2008-2010
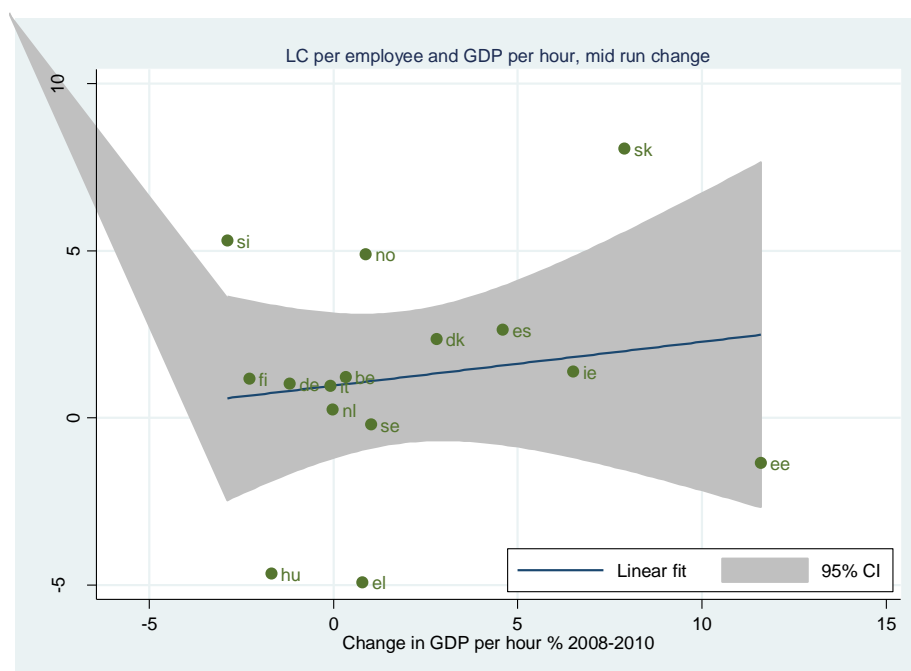
N.B. Countries without OECD data for 2010 have been excluded from the analysis
Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations
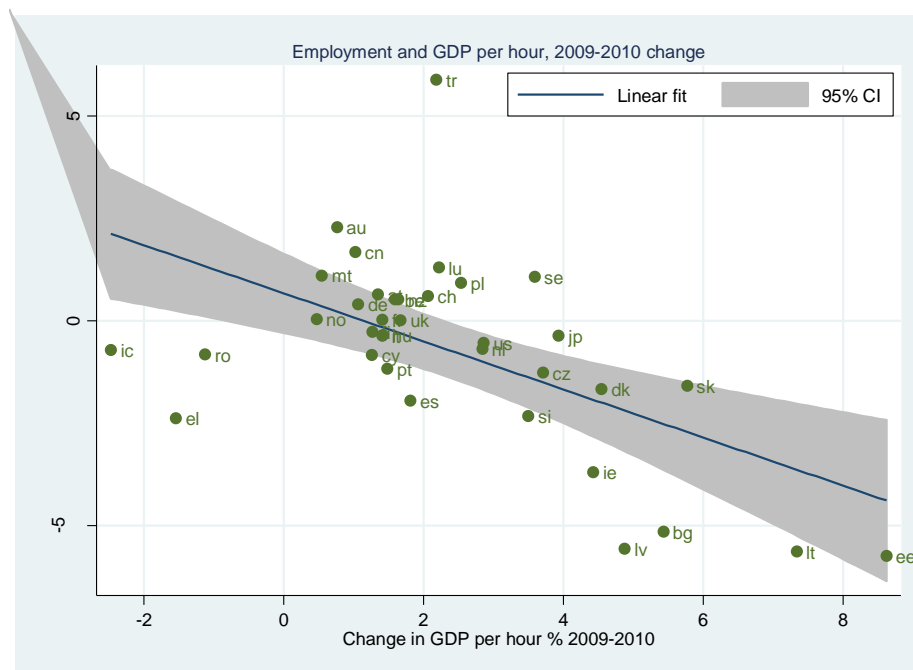
3.2.3 Emerging from the recession

By the end of the recession in most countries in 2010, the differential labour market effect of the decline in economic activity can be seen even more clearly (Figure 3.12). In contrast to the period at the beginning of the recession, productivity increased in 2009-10 in all countries with the exception of Iceland, Romania and Greece, but there is also persistent evidence of the employment-productivity trade-off, with countries tending to record either large increases in productivity and employment declines (e.g. eastern European EU member states, Ireland) or smaller increases in productivity and stable or increasing employment (Germany, France and the UK).

The only major EU economy achieving both substantial increases in productivity as well as employment during 2009-2010 is Poland, but it is also worth noting that there was also a very substantial – and fast – reduction of the foreign value of the Polish currency over this period, resulting in substitution for domestic goods and, following the recession, strong export growth.

Figure 3.13 shows, for the same period, annual growth rates of labour productivity and labour compensation per employee. There is a positive association between the two variables, but this is solely due to the extreme outlier of Greece. Once Greece is removed from the analysis (Figure 3.14), a different picture emerges.

Figure 3.12: Employment and productivity growth: emerging from the recession 2009-2010

Source: Conference Board Total Economy Database, own calculations

Figure 3.13: Labour compensation and productivity changes: emerging from the recession (2009-2010)
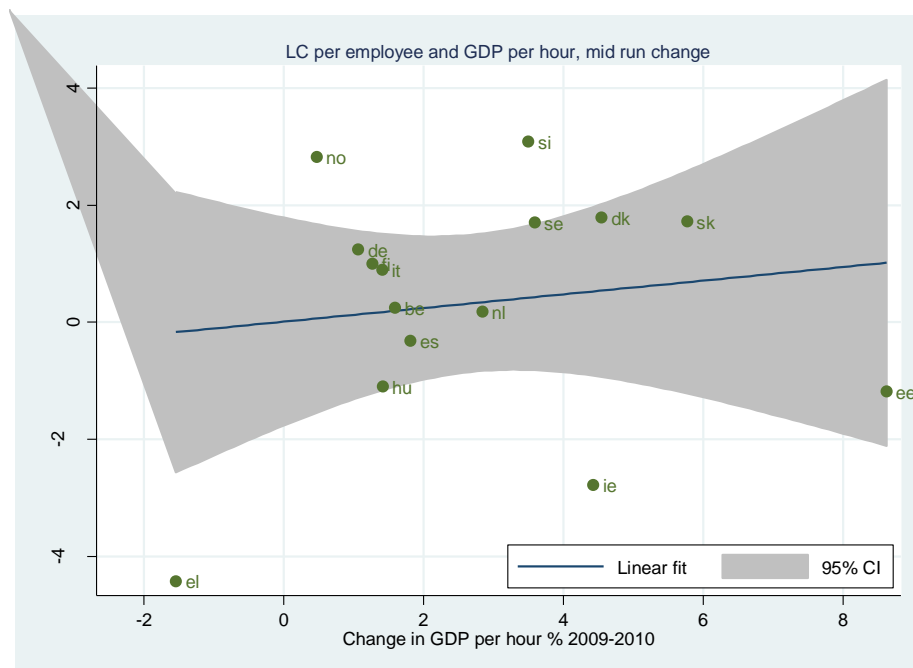
N.B. Countries without OECD data for 2010 have been excluded from the analysis
Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Figure 3.14 shows remarkable differences between EU economies as they emerge from the recession. There are countries experiencing relatively low productivity increases, such as Germany, Finland and Italy, where there are either moderate increases in unemployment (Finland, Italy) or moderate decreases (Germany). In Italy and Finland, productivity growth exceeded labour compensation growth slightly by 0.3 and 0.5 percentage points, but in Germany, with particularly low levels of unemployment after the end of the recession and a booming economy, growth in labour compensation exceeded productivity growth.

Figure 3.14: Labour compensation and productivity changes: emerging from the recession (2009-2010, excluding Greece)
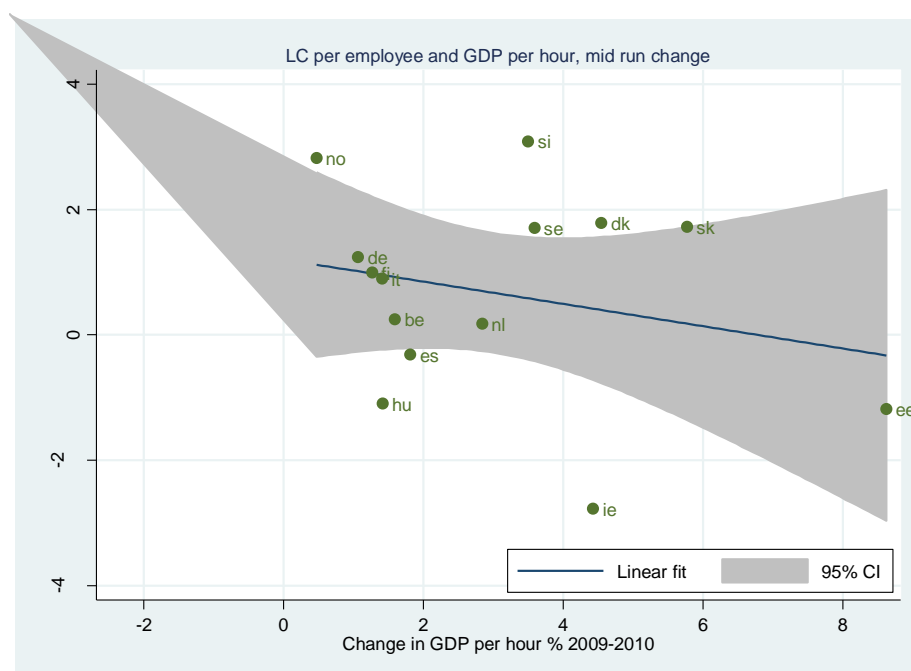
N.B. Countries without OECD data for 2010 have been excluded from the analysis
Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Productivity growth higher than the growth of labour compensation was found in all other countries, e.g. in the Scandinavian countries outside the Euro zone. Across the EU member states, substantial differences can be observed. Thus labour compensation grew at a rate 7.2 percentage points the rate of productivity growth in Ireland and 9.8% below the productivity growth rate in Estonia. The divergence of productivity growth and labour compensation growth was also substantial in Slovakia (a difference of 4 percentage points), the Netherlands (2.7 percentage points), Spain, Hungary and Greece (slightly lower).

Key points

In summary, the 2010 figures suggest that countries with large increases in unemployment during the recession are currently experiencing wage moderation and productivity growing faster than wages. This is likely to result in competitive

advantages in sectors exposed to international competition, in particular within the Euro zone (Estonia, Ireland), and can create new employment opportunities by output expansion if wages growth remains low for some time. There are early signs of such output expansion, e.g. for the industry sector in Ireland, which grew by 13.2% in 2010, although aggregate GDP still declined by 1% over the same period[25] However, it is too early for conclusive evidence as to whether wage moderation is a sufficient mechanism to generate the resumption of output growth and employment expansion in Ireland or in any of the other countries severely affected by the recent recession.

3.3 Medium and long run

Having explored some recent (pre- and post-recession) developments in wages and productivity growth in EU and OECD economies, we turn, in this section, to look at similar relationships over a slightly longer time horizon (1995-2009)

3.3.1 Wages and productivity

Wage increases and productivity growth are clearly related in the long run. Figure 3.15[26] confirms this relationship for all sampled countries with available wage data from OECD sources. Between 1995 and 2009, wages grew below productivity in most continental European economies, but the wage-productivity gap was quite dissimilar across the different EU member states: In France, the increase in productivity (+19.8%) was close to the increase in real wages (+18.4%), while productivity in Germany grew similarly by 19.7%, but wages increased only by 5.3%. In all other continental EU member states as well as the US and Canada wages grew slightly slower than the increase of productivity, but the difference was not as marked as in Germany. In Japan, the picture was even starker: wages increased by 4.5%, while productivity increased by 27%.

Wage increases were slightly higher than productivity increases in the Nordic EU member states, but these countries were only emerging from the recession of the early 1990s by the beginning of the period of observation (as already noted, with wage increases lagging behind productivity growth, this pattern may have been partially affected by the choice of the base year).

The fastest growth of both wages and productivity over this period was observed in the eastern European EU member states and in Ireland. Wages grew less fast

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[25] http://www.cso.ie/releasespublications/documents/economy/current/qna.pdf

[26] Also shown in the introduction to the paper (Figure 1.1)

than productivity in most of these countries, with the exception of the Czech Republic.

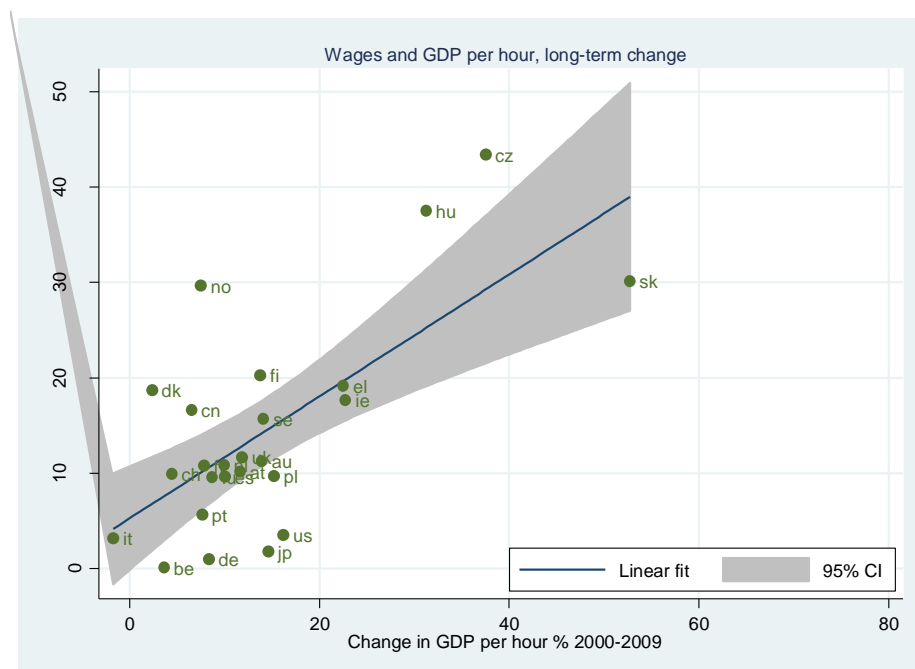**Figure 3.15: Wages and productivity, 1995-2009**

N.B. Ends 2008 for Greece, OECD Wage Data not available for some EU member states joining the EU in or after 2004, NZ, IC and TR, Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Figure 3.16 and Figure 3.17 show the same relationship between wage and productivity growth for the 1990s and the 2000s respectively, with largely similar results. The patterns observed for the two sub-periods are again consistent with wage increases lagging productivity growth, as illustrated by Ireland, where productivity increased by 28.3%, while wages increased only by 10.8% during the 1990s, while in the later period (200-2009) the two rates were 22.7% and 17.7% respectively.

The observed relationship in the 1990s is also substantially different from that of the 2000s in the US. In this country, we observe closely aligned productivity and salary growth in the 1990s. In contrast, wages grew by 3.5% between 2000 and 2009 while productivity increased much faster (by 16.2%).

Figure 3.16: Wages and productivity, 1995-2000

N.B. OECD Wage Data not available for some EU member states joining the EU in or after 2004, NZ, IC and TR, Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Figure 3.17: Wages and productivity, 2000-2009

N.B. Ends 2008 for Greece, OECD Wage Data not available for some EU member states joining the EU in or after 2004, NZ, IC and TR, Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

3.3.2 Total labour compensation and productivity

As discussed above, measured wages may have grown more slowly than productivity because of the increasing importance of alternative elements of compensation, e.g. bonus payments or other non-wage labour compensation including social insurance contributions, which have increased in most western economies since the mid 1990s. This is particularly relevant to understand the experience of US and other liberal or Anglo-Saxon economies, where performance-based pay and efficiency wages are often observed.

Figure 3.18 shows the long-run growth of labour compensation and productivity. For the EU, the empirical data indicate that labour compensation grew faster than productivity in 'early' transformation countries and substantially above productivity growth in the Baltic States. In most EU-15 countries and other western economies, productivity growth and the growth of labour compensation were very closely associated. While we observe a decline in labour compensation per employee in Germany in real terms, there was also lower growth of labour compensation per employee compared to productivity in Japan, New Zealand, Australia and the US.

**Figure 3.18: Labour compensation and productivity, 1995-2009**
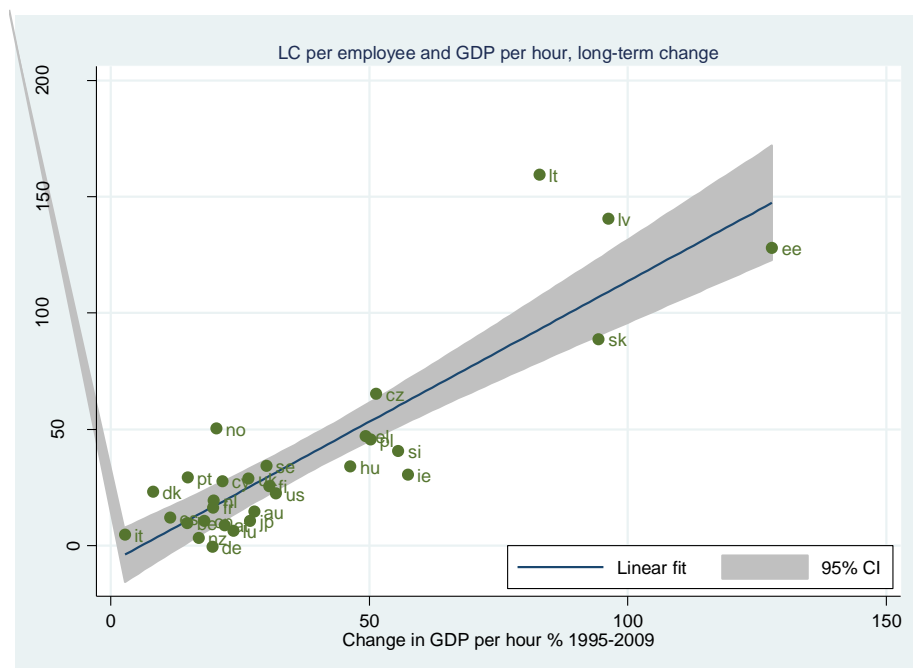
N.B. Slightly different time series (ends 2008) for CY, LV, LT, CN, AU, NZ and JP. Not available for BG, MT, RO, CH and TR; Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

A further breakdown of this relationship for the two sub-periods 1995-2000 and 2000-2009 shows that growth rates were more closely aligned in the 2000s (Figure 3.20) than in the 1990s (Figure 3.19). In the 5 years between 1995 and 2000,

productivity grew between 2% in Spain and almost 28% in Ireland, while growth of total labour compensation in these two countries was similar at around 5%. In most EU member states, productivity growth was around 10% during this period. In contrast, labour compensation per employee grew by 18% in the Czech Republic and only 1% in Germany. Productivity growth was comparatively high in Sweden, Finland, the UK and the US (around 15%), but the observed change in labour compensation ranged between 22% in Sweden and 8% in Finland. While the growth of labour compensation exceeded the growth of productivity in the UK, it was slightly lower than productivity growth in the US.

Between 1995 and 2000, labour compensation per employee decreased only in New Zealand, but it also grew substantially less than productivity in Germany, Austria and Japan. Growth of labour compensation per employee exceeded productivity growth in most eastern EU member states, with the exception of Slovenia and Estonia.

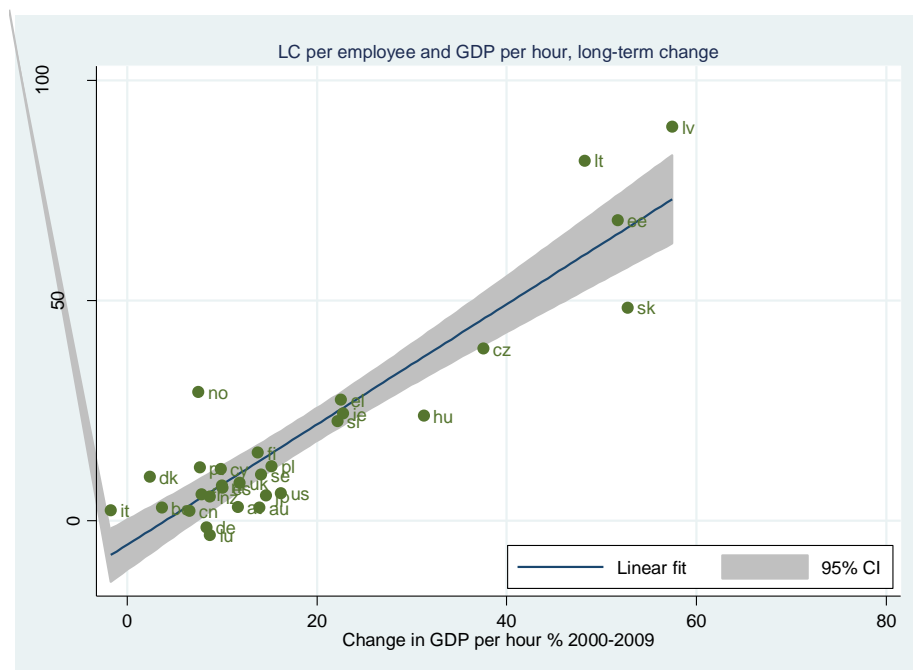**Figure 3.19: Labour compensation and productivity, 1995-2000**
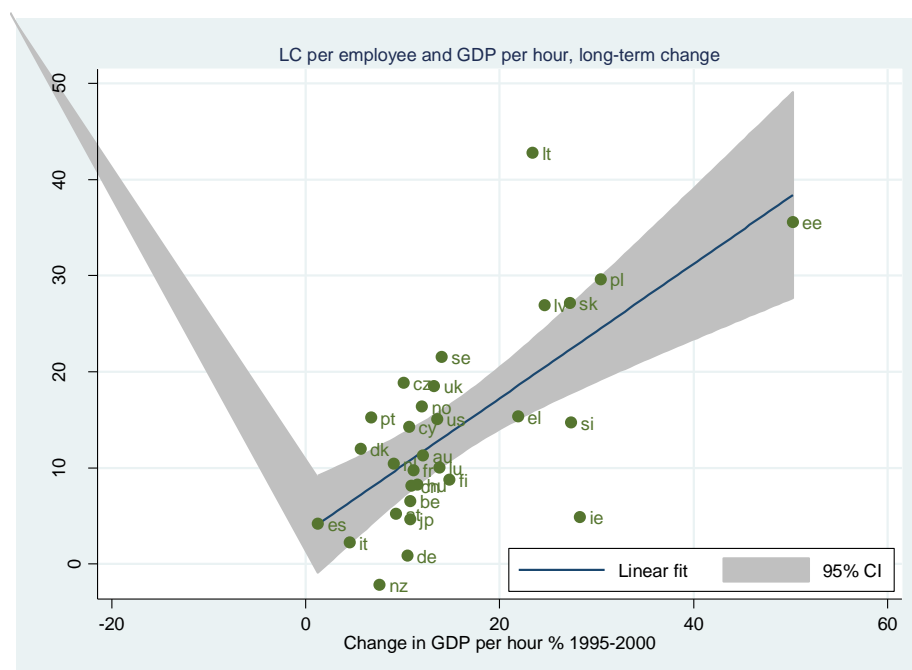
Not available for BG, MT, RO, CH and TR; Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Compared to the 1990s, the empirical association of growth of productivity and labour compensation per employee seems much closer for the years 2000-2009 (Figure 3.20) and there are some further important differences compared to the earlier period. Thus the 'earlier' transformation countries (Czech Republic, Poland, Hungary, Slovakia) show relatively similar growth of both indicators, while labour compensation growth exceeded productivity growth in the Baltic member

states. In most non-EU countries, productivity increased more than labour compensation, particularly in the US, Canada, Australia and New Zealand.

Labour compensation per employee decreased in real terms in Luxembourg and Germany, where productivity increased by around 8% over the nine years observed.

**Figure 3.20: Labour compensation and productivity, 2000-2009**

N.B. Slightly different time series (ends 2008) for CY, LV, LT, CN, AU, NZ and JP. Not available for BG, MT, RO, CH and TR; Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

A separate description for EU-15 countries, excluding the eastern EU member states (Figure 3.21), shows the wide variation of productivity and labour compensation growth in the 2000s. GDP per hour growth was highest in Greece and in Ireland (around 23%), but growth of labour compensation per employee exceeded this in both countries (Greece +27%, Ireland +25%). Productivity was also increasing more slowly than labour compensation per employee in Portugal (8% and 12 % respectively), but also in Denmark and in Italy. In Italy, productivity was falling in the aggregate economy, while labour compensation grew by more than 3%.

The developments in the 2000s are likely to have reduced the competitive position of countries where labour compensation growth exceeded the growth of productivity (Greece and Portugal in particular), relative to countries exhibiting wage moderation such as Austria, Germany and Luxembourg. However, the extent to which this feeds through to output and employment levels in these countries clearly depends on goods markets (e.g. on the extent to which price

increases can be secured when labour costs are rising above productivity) and on real exchange rates affecting international competition (particularly for those countries outside the Eurozone).

Figure 3.21: Labour compensation and productivity, 2000-2009, EU-15 only
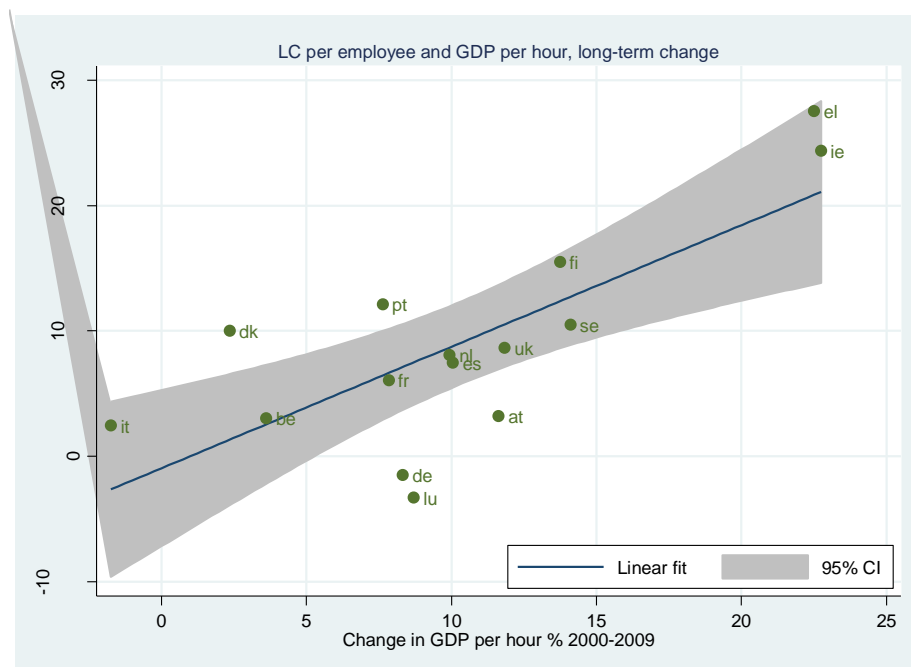
Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

3.3.3   Labour share and unit wage costs

An alternative view into the changes in labour compensation observed for aggregate economies is the change of the labour share, i.e. labour compensation as a percentage of GDP (but note also our reservations about the value of this as a comparative indicator in section 3.1.4 above). As noted previously, the labour share has fallen in many EU member states since the mid-1970s (after a previous period of growth from the mid-1960s). For the period observed here (1995-2009), the direction of change in the labour share differs widely. The labour share increased by more than 5 percentage points in Belgium, Denmark and Greece (and slightly below that in Sweden) and there were much smaller increases in Norway, Switzerland, the UK, Portugal and Luxembourg. In all other countries, the labour share declined over the last 15 years, with Australia, Spain and Ireland showing the greatest decrease of more than four percentage points.

There is a positive cross-country association between wage growth and the change in the labour share (Figure 3.22), but with several significant exceptions. The largest increases in labour shares were achieved in countries with the fastest real wage growth (Greece, Sweden, Denmark), while equally rapidly growing wages in Ireland at the same time were associated with one of the greatest declines of the

labour share across the countries covered. A decline of the labour share was more often observed for countries with slow real wage growth, e.g. Spain, Japan and Germany, but there are again exceptions such as Belgium, where the labour share increased more than in any other country while real wage growth was one of the smallest observed for all of the countries.

Figure 3.22: Changes of labour share and average wages 1995-2009

N.B. Ends 2008 for Greece, OECD Wage Data not available for some EU member states joining the EU in or after 2004, NZ, IC and TR, Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Finally in this section, Figure 3.23 reports changes in unit wage costs in relation to changes in labour productivity. Once again, broadly in line with expectations, large increases in labour productivity are associated with similar increases in unit wage costs, in particular in the former communist countries. Unit wage costs were increasing substantially more slowly than productivity in Germany, but also in Austria, the US and Ireland. For all other EU member states unit wage costs increased more than productivity, but the difference is particularly substantial in the southern EU member states and the former communist countries.

Figure 3.23: Changes of productivity and unit labour costs, 1995-2009
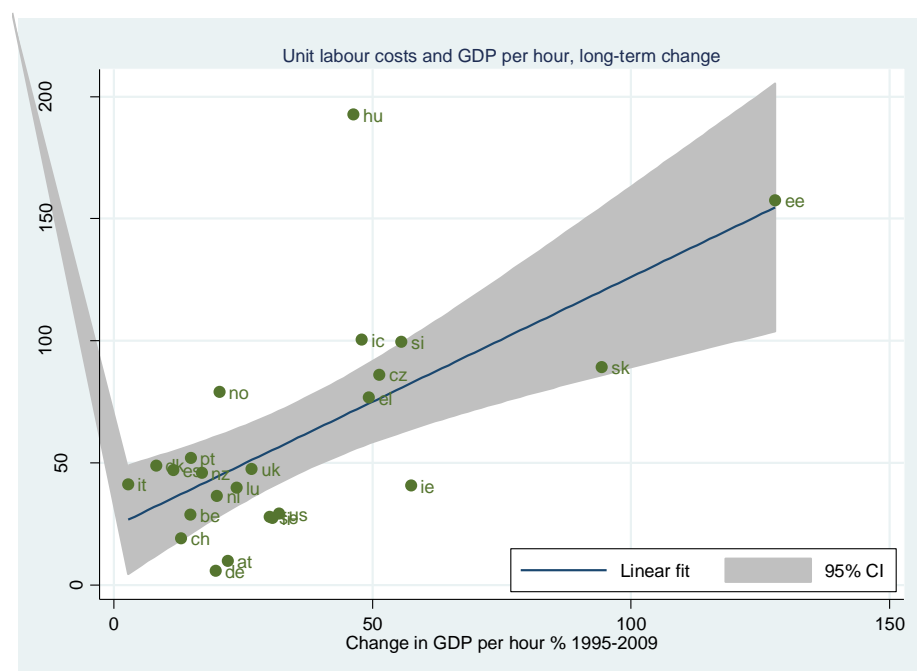
Unit labour costs and GDP per hour, long-term change

N.B. OECD Wage Data not available for some EU member states joining the EU in or after 2004, NZ, IC and TR, Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

3.4 Differential growth of wages and productivity and aggregate employment performance

Having set out some of the key relationships between productivity growth and various measures of growth wage or labour compensation, we now turn to the key question of how these relationships play out in terms of aggregate employment performance.

As we have seen, over the period 1995-2009 as whole, productivity grew faster than wages in many of the countries included in this analysis. Indeed, some countries (such as the Slovak Republic, Japan and Germany) exhibited very substantial wage moderation relative to productivity growth. Wages also grew less than productivity in Ireland, where productivity growth was exceptionally high. In most other countries, the difference between productivity growth and wage growth was less than 1 percentage point on average per year. Finally, there are countries, in particular the Nordic EU member states and the former communist EU member states, with growth of wages exceeding the growth of productivity over the period.

In Figure 3.24 to Figure 3.26, in the final empirical analysis of this paper, we relate these differences in average growth rates of wages and productivity to the growth

of employment at country level for the whole period (1995-2009) and the two sub-periods 1995-2000 and 2000-2009.

As Figure 3.24 shows, there has been employment growth in most countries except Japan and Hungary, where employment declined. The growth observed for most countries over 1995-2009 is around 15%, but there are some countries with much larger increases, in particular due to substantial net immigration (Ireland, Luxembourg, Australia) or because of a relatively low/post-recession level of employment in the mid-1990s (Spain, Finland).

Figure 3.24: Differences in growth rates of productivity and wages and employment growth, 1995-2009
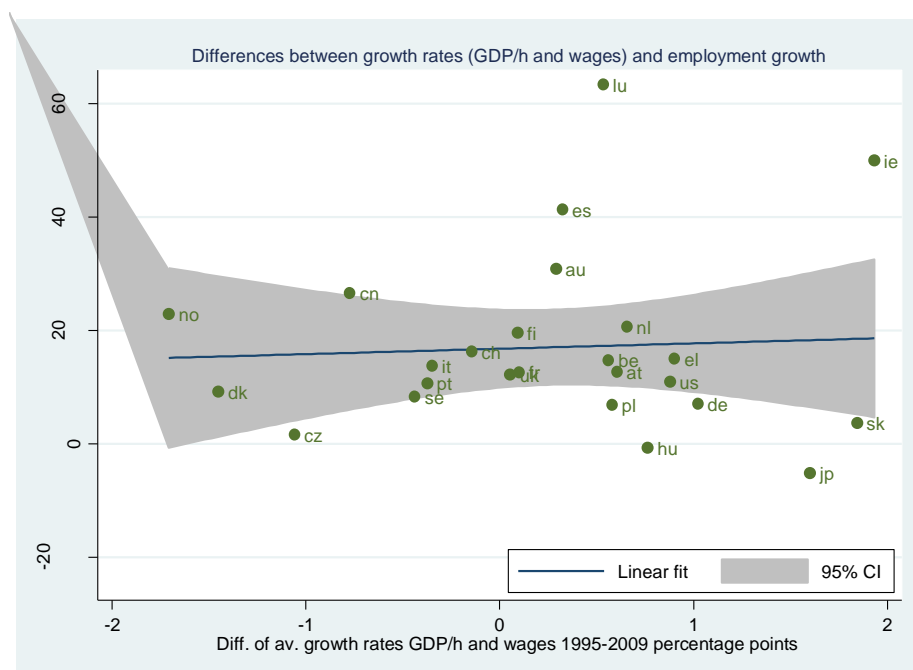
N.B. Ends 2008 for Greece, OECD Wage Data not available for some EU member states joining the EU in or after 2004, NZ, IC and TR, Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Generally, these outliers not withstanding, Figure 3.24 suggests a (slightly) positive relationship between wage moderation and employment outcomes, but this empirical association is affected by

1) Exceptional patterns of rapid growth in the transformation economies of Eastern Europe, which recorded very high productivity growth in the 1990s;

2) The choice of the base year, which results in wage increases above the productivity increases particularly for Denmark and Sweden, which already had relatively high employment rates and where there was less scope for employment growth than in countries with labour supply growth potential (e.g. due to immigration or the increase of female labour participation).

3) The composition of employment. Employment growth can consist of full-time employment as well as part-time employment and – since we cannot control for this effect – the percentage growth of employment may translate to lower growth of total number of hours worked in the economy for counties with average reduction of working hours or increasing part-time work.

Key point

These findings should be interpreted with caution. We believe that the weak observed positive relationship between wage moderation and employment growth is unlikely to be robust with regard to the time period chosen or the sample of countries (i.e. OECD member states with consistent wage information). The conclusions which can be drawn from the available data, with regards to wage moderation as a successful policy to increase employment are, therefore, limited.

A further note of caution is sounded by the fact that the positive relationship between wage moderation and employment performance becomes even less clear when the time-series is broken down into sub-periods (1995-2000 and 2000-2009).

The positive relationship is observable in the earlier of these two periods (Figure 3.25), albeit once more with several important outliers. Following the recession of the early 1990s, wage growth exceeded productivity growth in a number of countries (including the US, Denmark and Sweden and the Czech and Slovak Republics: Figure 3.25). Most other EU member states, however, saw wages increasing below productivity growth and on average employment seems to have increased more in these countries. Between 1995 and 2000, employment levels were still declining following the transformation to the market economy in Poland and the Czech and Slovak Republics. In other countries employment increased due to more part-time work (Netherlands) or from very low levels of employment following the early 1990s recession (Spain).

Figure 3.25: Differences in growth rates of productivity and wages and employment growth, 1995-2000
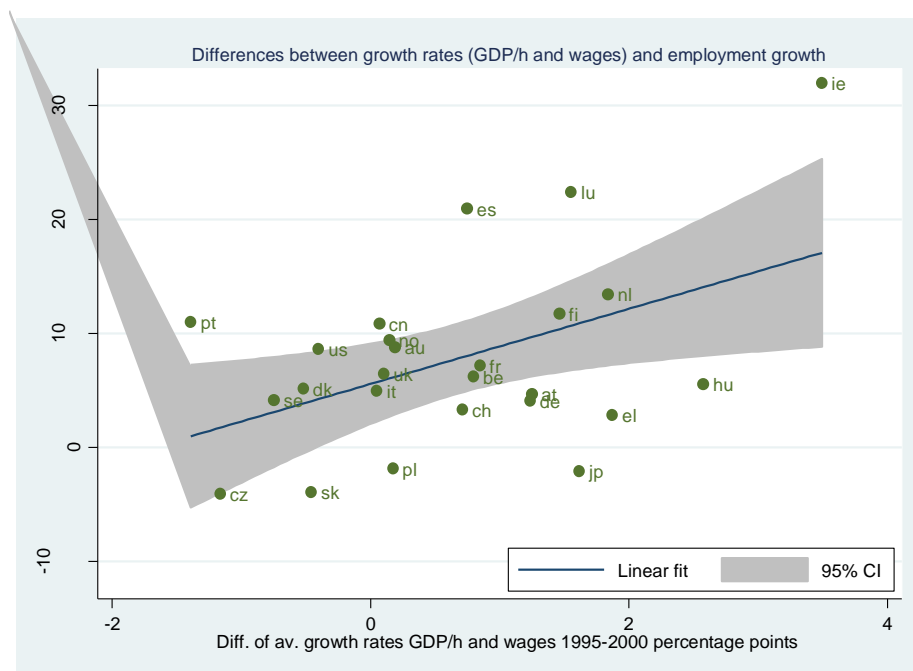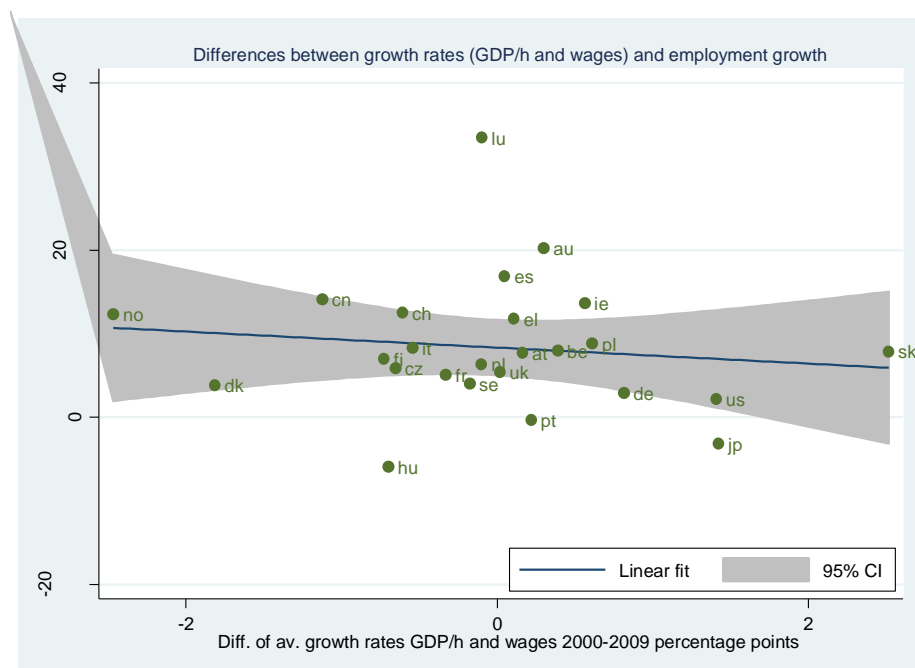

N.B. OECD Wage Data not available for some EU member states joining the EU in or after 2004, NZ, IC and TR; Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

In contrast, Figure 3.26 shows that the relationship between wage moderation and employment in the long run becomes negative for the period 2000-2009. During the 2000s employment grew in most countries, including the former communist economies. However, employment growth in Norway (where wages increased far more than productivity) is similar to employment growth in the Slovak Republic, where the growth rate of productivity was 2.5 percentage points above the growth rate of wages. In Germany, where the growth rate of productivity exceeded the growth rate of wages by roughly 1% on average per year, employment grew less than in Sweden, where growth rates of productivity and wages were almost identical.

It is, of course, possible that the relationship is obscured by the inclusion of economies at a very different stage of economic development. Indeed, restriction of the analysis to the EU-15 countries in Figure 3.27 results again in a positive association between wage moderation and employment performance for the 'mature' EU member states, but the relationship is very weak one, and an imposed regression line is almost horizontal.

Figure 3.26: Differences in growth rates of productivity and wages and employment growth, 2000-2009

Differences between growth rates (GDP/h and wages) and employment growth

N.B. OECD Wage Data not available for some EU member states joining the EU in or after 2004, NZ, IC and TR; Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Figure 3.27: Differences in growth rates of productivity and wages and employment growth, 2000-2009, EU-15 only
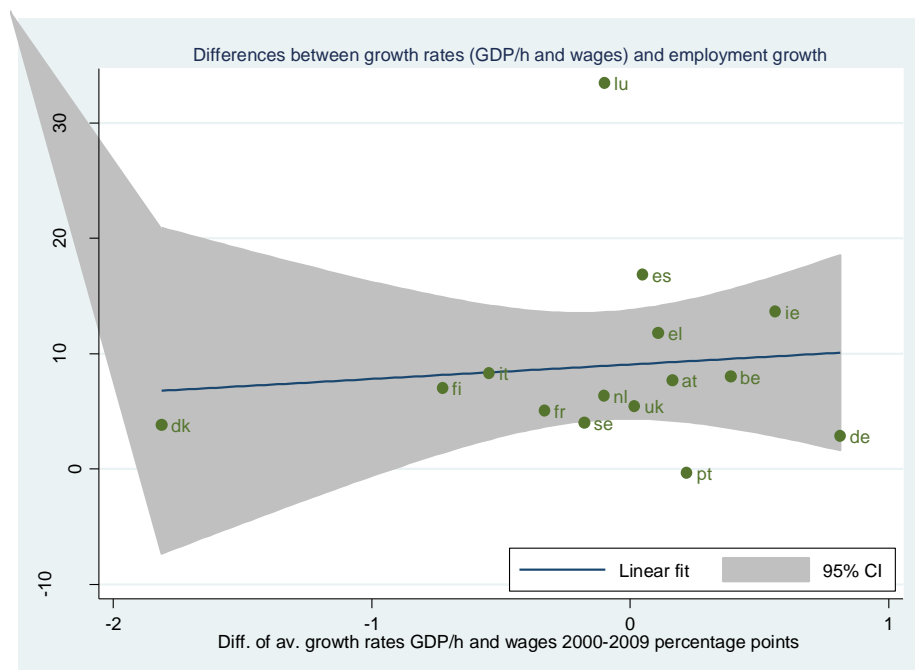
Differences between growth rates (GDP/h and wages) and employment growth

N.B. OECD Wage Data not available for some EU member states joining the EU in or after 2004,

An analysis based on labour compensation per employee instead of wages (see Appendix Figures A1-A3) confirms the weakly positive relationship between wage moderation and employment growth for the long run as well as for both sub-periods, but these data are more affected by extremes as they include the Baltic States, for which OECD wages data were not available. However, the empirical observations are broadly similar and lead to similar conclusions with regards to the long run association between wage moderation and employment outcomes at aggregate level.

Key point

Overall, the empirical data suggest that wage moderation is indeed weakly associated with long-run employment increases, but this finding is likely to be affected by data availability and the time periods covered, and caution is required in drawing policy conclusions.

In order to assess more definitively whether wage moderation is indeed an effective mechanism for increasing competitiveness, leading to production and employment growth, it would be helpful to analyse the development of wages/labour compensation, productivity and employment at less aggregated levels, e.g. for sectors (not currently possible with readily-available and up-to-date comparative data). This would allow us to understand, in particular, whether long-term wage moderation increased competitiveness internationally for sectors exposed to international competition.

4 Concluding remarks

4.1 Does wage moderation really lead to better economic and employment performance?

Standard microeconomic theory relates wages and productivity very clearly. While making many simplifying assumptions, the theoretical link between both measures is extensively used as a criterion to assess wage-setting (and minimum wage levels) with regard to their implications for employment outcomes. The main conclusion of microeconomic theory is the following: if the growth of wages (or more realistically, total labour compensation) exceeds the growth of productivity, firms would need to reduce output levels and employment in order to survive. Over time, firms affected by wages growing faster productivity growth would need to improve productivity growth (e.g. through capital investment), which would reduce employment opportunities potentially even further. An alignment of wage growth below the rate of productivity growth is therefore important in order to maintain high employment levels.

These textbook predictions of neoclassical microeconomic theory are also discussed in the current political debate at EU level (e.g. Gros 2010). It is argued that international competition in a single European market (and even more so under a single currency) would result in reduced competitiveness of firms, sectors or even entire EU member states if the growth of labour compensation exceeds the growth of productivity. This could apply in local areas or individual sectors in different EU member states as more substitutes from other firms and other countries are available. And equally competitiveness may increase elsewhere at the same time, as a result of extensive wage moderation following institutional reforms (the case of Germany is often cited).

The important policy question is: can competitiveness be restored and the economic/employment situation in some EU member states be improved, through holding wages growth below productivity increases (or even reducing wages while productivity growth continues)? Recent data indicate that such adjustments

are taking place at least to some extent, particularly in economies which enjoy 'flexible' bargaining mechanisms (Ireland, Estonia, but also in the US, for example). It is anticipated that wage moderation should improve/restore international competitiveness and result in more output and employment in these countries. However, it is also clear that the success of such a strategy crucially depends on:

■ The degree of international competition and the availability of substitutes in consumption, which are very likely to exist for industry and manufacturing, but not as much for services, public services in particular.

■ The institutions of the labour market. Flexible adjustment processes, including wage moderation, involve unions and firms bargaining over wages in modern welfare states. Union wage claims may themselves be affected by unemployment benefits and employment protection, while public policy towards labour market regulation may also affect the conditions for wage moderation.

There are some theoretical and empirical findings presented in this paper suggesting that wage moderation may increase employment in the medium and long run, although any relationship appears to be fairly weak, and there are numerous exceptions at country level, and at different periods.

At the same time, the evidence sows the seeds of doubt about the extent to which sustained wage moderation (as observed in Germany) is really a successful mechanism to increase output and employment in the long run. Indeed, empirical data show that wages were more clearly aligned to productivity in countries such as the US or the UK (i.e. there was less wage moderation through holding wage growth below productivity growth). Yet in those countries, over the longer run, in recent decades these countries report much better employment performance and higher productivity growth than Germany, where wage growth was held below productivity growth for a substantial period. It needs also to be remembered that, even in economic theory (albeit more sophisticated theory than the most simple models cited by many policy commentators), innovation itself is endogenous, and excessive wage moderation may reduce innovation activity, resulting in lower productivity growth in the long run.

4.2 How should monitoring be undertaken?

Whether or not the simple policy recommendation to moderate wage growth in support of employment growth turns out to be fully justified by the empirical evidence, there is a strong case for better data and more extensive monitoring in this area which will:

- Provide further, more robust empirical evidence on the wage growth/productivity growth/employment growth triangle;

- And, in so far as the relationship is confirmed by the evidence, provide the basis for monitoring wage and productivity developments to feed into policy discussions on appropriate wage-setting in individual EU member states.

As EU member states emerge from the recession, productivity growth currently exceeds the growth of labour compensation in most countries, especially in countries with flexible labour market institutions (Ireland, Estonia) or with high degrees of co-ordination (the Nordic countries) in the context of persistent high levels of unemployment. In Germany, by contrast, where unemployment levels are already low (and have remained low throughout the crisis) and the economy is growing strongly, labour compensation growth now exceeds productivity growth. To some extent, it may be expected that this may help to rebalance the relative competitiveness of countries and groups of countries in the medium run.

Extending the analysis of wages, productivity and employment to less aggregated levels (e.g. sectors) is, however, clearly desirable, as the whole question of relative competitiveness primarily affects sectors exposed, to a greater or lesser extent, international competition. This would require an informative data set at the level of sectors, which should consist of:

- Disaggregated industries rather than broad sectors (as included in AMECO data);

- Timely and frequent information in order to observe the impact (and its time lag) of wage moderation on output, employment and investment activity and the incentives to innovate;

- Productivity measured as GDP per hour employed (and not per employee as included in AMECO data) and further variables that allow to control for productivity changes arising from changes in the composition of the workforce and capital stock;

- Harmonised wage information, including all relevant components of remuneration;

- Consistent price level information relevant to production to obtain real growth of productivity and wages.

Producing such a set of data, perhaps building on the work of the EU KLEMS database would be an ambitious exercise. Without it, however, it is unlikely either that the empirical relationships between compensation growth, productivity growth and employment growth can be fully understood at sectoral level (which is ultimately the level which matters in a world of international competition), or

that effective instruments can be development for monitoring developments in real time, as an aid to policy and wage bargaining processes.

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6 Appendix

We also repeated the analysis of section 3.4 using a variable based on labour compensation per employee instead of wages. Figures A1-A3 show (for the 1995-2009) period, the average difference between annual growth of productivity and labour compensation on the one hand, and aggregate employment growth on the other. The analysis of the two sub-periods was undertaken in a similar way. The analysis suggests again a positive relationship similar to the one found using wages, but labour compensation shows much greater dispersion compared to wages, mainly as a result of the inclusion of the Baltic EU member states.

Figure A.1: Differences in growth rates of productivity and labour compensation per employee and employment growth, 1995-2009
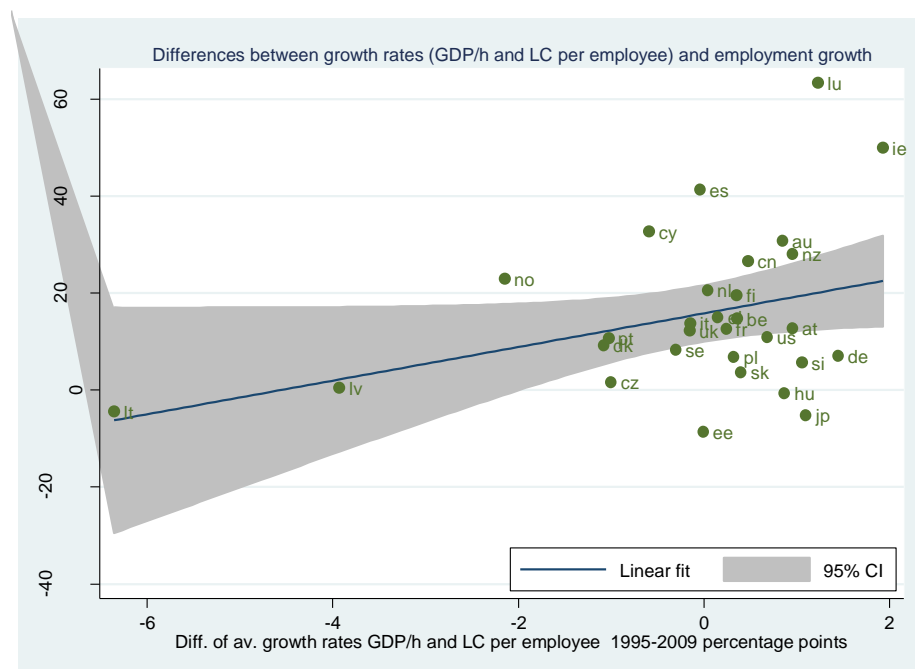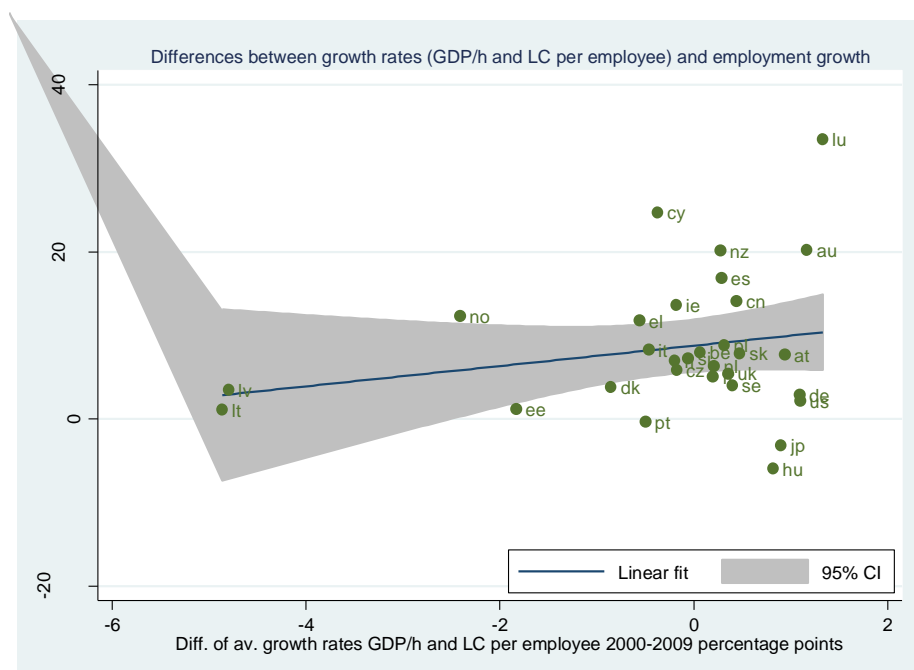

N.B. Slightly different time series (ends 2008) for CY, LV, LT, CN, AU, NZ and JP. Not available for BG, MT, RO, CH and TR; Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Figure A.2: Differences in growth rates of productivity and labour compensation per employee and employment growth, 1995-2000
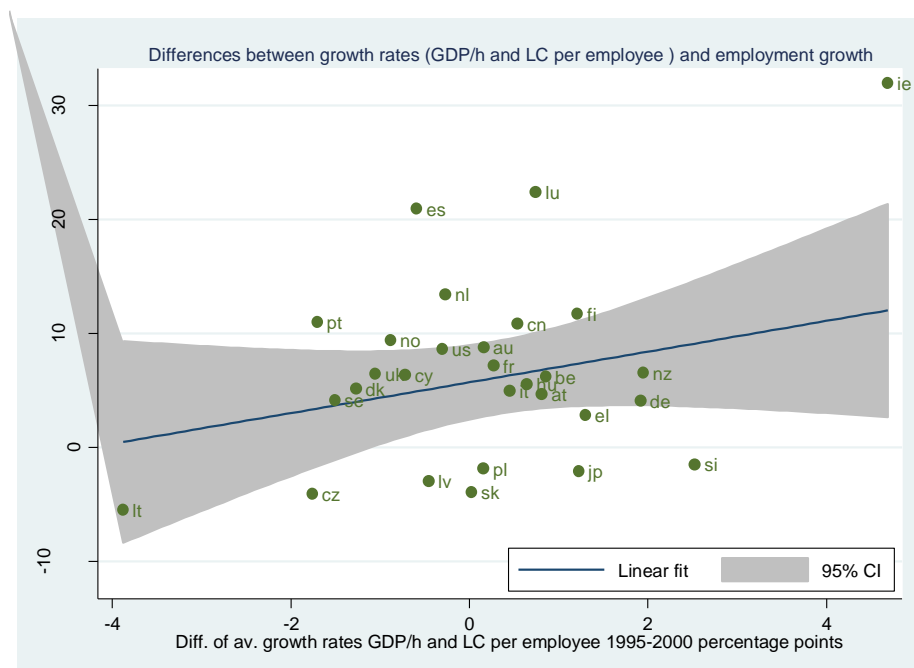
N.B. Not available for BG, MT, RO, CH and TR; Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations

Figure A.3: Differences in growth rates of productivity and labour compensation per employee and employment growth, 2000-2009

N.B. Slightly different time series (ends 2008) for CY, LV, LT, CN, AU, NZ and JP. Not available for BG, MT, RO, CH and TR; Source: Conference Board Total Economy Database, OECD Stat. Extracts, own calculations