Europeanization or Globalization? Transnational Wage Bargaining and the Distribution of Activity in European Labor Markets

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Abstract

This paper investigates the impact of increasing globalization on labor markets, in terms of wage inflation and the *distribution* of activity across regions. Specifically, we study the effects of aggregation in the labor markets on the distribution of employment, and on inflation pressures, when there are differences in market structures and in transmission mechanisms underpinned by relatively immobile labor. To demonstrate these ideas, we take the European experience as a "laboratory" to show what can be expected from globalization in the labor markets in practice. Using models of wage leadership vs. locational competition, we examine the extent and strength of aggregation effects on labor costs using a sample of data covering the 1980s to 2007 – i.e. over the creation of the Euro. We find that the aggregation effect has decreased significantly since the start of EMU, thereby improving the trade-off between inflation and unemployment. At the same time, while Germany played an important role in the run-up to EMU in terms of wage leader, its role has now decreased and been replaced by the forces of globalization. This has led to increased locational competition in terms of wage formation. We demonstrate this effect with the emerging role of the US as the comparator for setting wages in Europe.

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1 Introduction

In the run-up to adopting the single currency in Europe, the overriding concern of policy makers was the question of convergence. The Maastricht treaty had of course defined a clear set of nominal convergence criteria which each country had to fulfill in order to take part in the monetary union. However, very little was required explicitly in terms of real convergence; and the main worry at the time was that one may actually only be possible at the expense of the other. And since nominal convergence was part of the formal entry criteria, the real cost of the single currency was expected to appear on the real side – specifically in higher, more diverse, or more variable unemployment rates at any given level of inflation (Demertzis and Hughes Hallett 2000).

Ten years later, as we celebrate EMU's first decade in existence, this paper returns to examine two related issues: whether this conflict between nominal and real convergence has indeed materialized; and, second, how the form of nominal convergence, still very much a requirement for accession, may have changed in a world that is considerably more globalized than previously.

The first issue, of nominal versus real convergence, is of course captured in the Phillips curve trade-off; and it is important to examine how the implied sacrifice ratio may have changed as a result of a single currency in Europe. This analysis will not contribute to identifying the causality between the two, but does nevertheless describe how the trade-off has functioned in the new era of a unique monetary authority. Beyond this, we will also re-examine the argument put forward by Lipsey (1960) of how a single Phillips curve is displaced as a result of aggregating individual markets trade-offs. In the 1990s, when the discussion of convergence was still in its pre-accession phase, there was a worry that the aggregate trade-off between inflation and unemployment would be compromised, if not damaged, as a result of having labor markets that were fundament-ally different in structure and operation. This effect became known as the aggregation hypothesis. Europe was facing deteriorating labor markets, and the fear was that the increase in the first moment of the unemployment distribution would be followed by an increase in the second moment which would then impose an extra burden on that trade-off. In fact, we can see that the two moments were indeed very much correlated at the time (figure 1), so that deteriorating labor markets (on average) had been accompanied by diverging labor markets across countries. In Demertzis and Hughes Hallett (1998) we made a formal analysis and an empirical assessment of that process. We now return to take a closer look to what has happened to those factors and to that argument since.

The second issue we examine is that of wage leadership vs. locational competition. The argument behind wage leadership is that a region in a country (or a country in a Union) adopts de facto a leadership role and the rest follow closely. In the context of Europe, this had been identified with the German leadership hypothesis (Artis and Nachane, 1991) where the issue at hand was to what extent German inflation determined wage and price setting elsewhere. At the other end of the spectrum, the argument of locational competition was that, rather than follow the de facto leader, countries would try and compete with each other – so that, to the extent that wages were linked with each other, the correlations would be in opposite direction (Burda and Mertens, 1995). This was considered to be the more relevant case in Europe because labor mobility is limited, and therefore the possibility of other clearing mechanisms is more limited. But

one could take this argument further by examining whether Europe as a whole is competing with other regions, primarily the US or those countries linked to the dollar more generally[1]. We will therefore compare and contrast the role of Germany and the US in terms of wage setting and labor costs across Europe, and how this may have now changed as a result of the greater globalization in trade and capital mobility.

The paper is organized as follows: Sections 2 and 3 outline the argument and theoretical modeling behind the two issues. Section 4 then presents the way that we attempt to proxy those models econometrically. Section 5 discusses the results and section 6 concludes.

2 Wage Transfers vs. Locational Competition

2.1 The Wage Transfer Mechanism

In the regional economics literature, an important factor in trade union bargaining for higher wages is the existence of wage increases for comparable employees in different labor markets. Originally this was said to be the result of comparisons with wage settle-ments in a leading sector or leading industry within the economy. The result would be an upward drift in the average level of wages towards those in the leading sector even when the cost or productivity levels in the less prosperous sectors do not justify such wage increases (Thomas and Stoney, 1971). Indeed, according to Bhaskar (1990), " ...Workers care for fairness, and resent being paid less than identical workers in other sectors". This implies some equalizing forces in wage bargaining, with wages being determined in part by conditions prevailing in a leading sector which exerts upward pressure on national wage levels. Of course in the absence of perfect labor mobility this could just as easily happen between regions as sectors, or between countries within a currency union or fixed exchange rate zone, or countries in competing currency zones, with wages in a leading region, or country setting the pace instead.[2] Indeed Thirlwall (1969-1970) justifies such a proposition on at least three distinct grounds:
" ...1) if an excessive earnings drift takes place in a given industry in one region, this may add to pressure elsewhere on the union to negotiate an upward revision of the basic rate for all workers, irrespective of the pressure of demand for labor in the industry in other regions.
2) That in turn may produce upward pressures on wage bargaining in the country as a whole.
3) Within a region experiencing an increased pressure of demand for labor, the customary earning differentials may get out of line, and if the region is an important employer of workers in certain "key" industries this may provoke unions elsewhere to start national bargaining for a higher basic wage ...".

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[1] Freeman (1995) investigated the role of China in the international wage setting, arguing that wages in the developed world were now substantially limited by competition from outside, an argument that can only have become more relevant since then.
[2] The convergence problems caused by wage leadership between West and East Germany are a prime example of this; Hughes Hallett, Ma and Melitz (1996).

Thus the role of the "leader" whose wage negotiations are closely observed by others could be played by an industry, or a sector, or a region within a wider union. In the European economy, however, it is unlikely that any one region or industry within one country will manage to influence the negotiations in another region or industry in another country - or that it would matter much if it did. But if a country (or even a set of countries) did so, there would be a considerable scope for influencing the level of wages demanded in other countries beyond that which is justified by their own labor market conditions. Moreover the key feature of Europe's monetary union is the commitment to price stability.[3] Under such a regime, if a country wants to avoid running unsustainable trade deficits, or fiscal deficits, or a growth rate permanently lower than her partners, then that country will be obliged to set wages to follow those in the centre just to keep costs and competitiveness in line – there being no opportunity to manipulate the nominal exchange rate to restore competitiveness. Thus membership of the system is achieved and maintained through control of the real exchange rate. In that case, who better to provide the necessary anti-inflationary discipline and leadership than a country that has the reputation of having achieved it domestically, and the greatest incentive to safeguard those achievements? But the same of course applies when countries in the Euro-zone have to compete against others in the same zone, or countries in other blocs beyond their own currency area, especially where currency and price stability are prized.

2.2 German Leadership during the Run Up to EMU

Thus, in the run up to monetary union, the concentration on strong inflation discipline inevitably introduced an asymmetry in the form of *German Leadership* (Artis and Nachane, 1991).

In the past, the possibility of German leadership has been tested in different ways. Some tests were simple causality tests (De Grauwe, 1989), but yielded only weak evidence outside the currency and financial markets. There may also have been a break in this leadership during the re-unification period, but Gardner and Perraudin (1993) suggest German financial dominance strengthened after that episode. More stringent tests are based on the extent to which German inflation leads price setting elsewhere - and the results are largely positive (Artis and Ormerod 1991; Artis and Nachane 1991). Sometimes these arrangements are even codified into law; Belgian wage settlements for example are required to follow German wages, in an attempt to "tie Belgian hands".

2.3 The Story since then: Locational Competition?

Both the German Leadership hypothesis, and the wage transfer mechanism cited above, suggest a positive association between the leading country's wage inflation and the rates of wage inflation elsewhere. That means it's a sellers' market.

But the distinguishing feature of the European labor markets has been low labor mobility, wage inflexibility and high capital mobility. Hence it is the employers, not

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[3] If wages respond to changes in prices, then one should expect some of these anti-inflationary tendencies should feed through into wages.

the employees, who will arbitrage wages. That gives rise to an alternative mechanism based on the idea of "*locational competition*". We formalize this idea in section 3 below, in order to test directly for this competition effect in the data.

Burda and Mertens (1995) define locational competition as "...the efficient economic response of locales to the immobility of labor and the regional variation of economic outcomes". In the absence of sufficient labor mobility, wages have to move continuously in order to attract and retain the mobile factors of production (both physical and human capital). Hence countries that are unable to compete either in terms of attracting capital or in terms of productivity levels, find themselves competing with the dominant economy (Germany, the US, and more recently the new industrial economies in Asia) in terms of labor costs in order to retain factors of production. Burda and Mertens point out that locational competition, in the face of capital mobility and labor immobility, will inevitably result in incomes becoming more variable. To prevent excessive welfare losses arising from locational competition, agents will surely seek insurance. However, protecting incomes can only be welfare improving if non-systematic risk predominates since, if there are systematic shocks or systemic policy biases, locational competition will re-appear and real wages will move in order to retain the mobile factors of production.[4] But, as Burda and Mertens argue, in other cases, including some European countries where bargaining and labor mobility are not flexible enough to respond to changes in excess demand, insurance against very low real wages will be welfare-improving.[5] That is the purpose of the social security net and labor market regulation. But if those programs are rolled back, then something else (locational competition) will inevitably emerge to limit wage fluctuations.

2.4 Wage Leadership vs. Locational Competition:

Suppose a productivity shock hits a member country and causes an increase in the level of real wages. If that country is Germany, then the combination of the two hypotheses presented above will induce all other countries to seek greater wage increases to match. This will push the average level of European wages up. However, in the absence of any capital controls, the industries in all the other countries now have to face greater wage costs - but without the extra productivity gains. After a time they will be tempted to move to the areas where labor costs match productivity levels (including outside the euro). This has an adverse effect on the level of aggregate demand and will cause greater volatility of short-term interest rates. In anticipation, therefore, of capital moving from the less "efficient" areas to more productive ones, not only will the trade unions in the less efficient areas avoid demanding higher wages; they will actually try to maintain competitive wages in order to counteract the increase in the leader's efficiency.

The same reasoning can be used to justify why "follower" countries will not initiate wage increases while German trade unions remain inactive.

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[4] The reduction in welfare in the Burda-Mertens model arises entirely from the risk involved, and not from the lower wages necessary to stimulate locational competition. But it obviously applies to the latter case too.
[5] This may account for the greater demand for social insurance in Europe; and also for the fact that, where deregulation has been introduced, cuts in the welfare net have been accepted.

Of course, Germany is just being used as the obvious wage leader in the context of the formation and transition into EMU (Artis and Nachane 1991). However anecdotal evidence suggests that several counties (Belgium, the UK) followed German wage settlements in order to preserve their competitive position/real exchange rates vis-à-vis the lowest inflation country in the EU zone. But Germany is now locked into EMU, and with the slowdown in the core EMU economies plus the rise in price/cost competition from Asia, Eastern Europe, and to some extent from the US or NAFTA zone, the focus may well have shifted to the (cost) competition posed by this block of dollar linked economies. In that case, the US may be taken as the representative, or benchmark, for that group as far as their cost behavior is concerned. Everyone marks their costs against the US in order to remain competitive, even if (in our sample period) the competitive pressures have largely come from the Asian economies in that group

Recent theoretical work demonstrates more formally how this locational competition effect can arise. Puga (1999), for example, has a model of how integration affects differences in structures and income levels. If the cost of doing business across regional borders is high, industry will spread over the regions to meet demand. But if those costs fall (trade barriers fall, transport becomes easier, we introduce a single currency, or a single market or a free trade agreement), increasing returns, comparative advantage and new patterns of specialization will create centers of agglomeration. When workers and/or capital migrate to the regions with higher returns, the agglomeration process is intensified and wages will follow the leading region. But if workers do not (or cannot) migrate, then the falling barriers and transactions/transport costs will make firms more sensitive to wage differentials and they will spread out again. In essence, that is exactly the kind of competitive process we are describing here.

2.5 Globalization Pressures on Costs and Prices

The implication of this discussion is that locational competition will have made wage levels in the follower countries more similar and possibly lower than they would otherwise be in the run up to EMU; but that wage leadership by Germany or others would make wages higher than otherwise. Now however, the possibility of wage leadership or locational competition from the dollar based economies may have transferred that role to the US as a representative of that group. We have to test for that possibility in the data.

3 A Formal Model of Transnational Wage Bargains

There are a number of possible formulations of the way the wage transfer mechanism works. The general characteristics are the following [see Thomas and Stoney (1971)]:[6]

a)   A normal Phillips-type trade-off determines the leading sector's relationship between wage changes and unemployment:

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[6] The model presented here is based on the Layard, Nickell and Jackman (1992) wage bargain, extended to allow for the leadership term. The detailed micro-foundations of the wage and price setting decisions which underlie this model were presented and formally analysed in Demertzis and Hughes Hallett (2000).

$$\dot{w}_L = f(u_L) \qquad f' < 0, \ f'' \geq 0 \tag{1}$$

where L denotes the leading sector or country (Germany during the formation of EMU, and possibly the US thereafter);

b) For all non-leading sectors/countries however, we have:

$$\dot{w}_i = f(u_i) + h[\dot{w}_L - f(u_i)] \qquad\qquad i = 1 \ldots m \tag{2}$$

Changes in the non-leading sector wages may thus be separated into those resulting from local labor market conditions, plus an additional term which is proportional (by a factor of h) to the difference between the "leading" rate of wage change ($\dot{w}_L$) and the wage changes which would have occurred in the absence of transfers. Rewriting (2), we get

$$\dot{w}_i = (1-h)f(u_i) + h\dot{w}_L \tag{3}$$

where, in the most general version of our model, the parameter h may be allowed to vary for each economy considered (h_i, $i=1 \ldots n$).[7]

From (3) we see that wage leadership, $h>0$, will downgrade the influence of market forces on wage settlements. But locational competition, implying $h<0$, will upgrade the impact of those (outside) market forces. That is the distinction between the wage leadership hypothesis and the locational competition hypothesis.

Let each market's inflation-unemployment trade-off have the following form: [8]

$$\dot{w}_i = a + k\dot{P} + \beta f(u_i) \tag{4}$$

where the sign of β will guarantee an inverse relationship. Allowing for a leadership effect, wage inflation in each country is formed as:

$$\begin{aligned}
\dot{w}_i &= a + k\dot{P} + \beta f(u_i) && \textit{for } i = L \\
\dot{w}_i &= a + k\dot{P} + \beta f(u_i) + h[\dot{w}_L - a - k\dot{P} - \beta f(u_i)] && \textit{for } i \neq L
\end{aligned} \tag{5}$$

In specifying (5) we have made two assumptions: first, that all countries within a group are influenced by the aggregate group price inflation rate through a common

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[7] The $\dot{w}_L$ term can be wage inflation in a single country, or it could represent the average for a group of countries $(\dot{w}_L = \Sigma \dot{w}_j / m$, for j = 1 ...m, if "m" is the number of countries in that leading group). In addition the identity of the leader or leading group of countries could vary over time. For the purposes of this paper, however, we will assume that the leading sector comprises of a single country (Germany say), whose identity does not change in the run up to EMU, and the US (say) thereafter. But a nice extension to the paper would be to take the core countries (France, Germany, Benelux) as a single block in the earlier period.

[8] Alogoskoufis et al (1995) justify the use of Phillips curves for the short to medium term analysis of labor market performance in Europe, and we follow their example.

coefficient k and a single market in goods;[9] and second, that the wage transfer mechanism itself operates with equal strength (h) in all non-leading markets.

The first assumption is entirely reasonable. If we are concerned with different regions in one country, or different countries within a union or a de facto fixed exchange rate bloc, we would not expect each region's trade-off between inflation and unemployment to be affected by different rates of price inflation. In any case, that assumption could easily be relaxed (footnote 9). But the amount of difference it would make with the low inflation rates in the OECD countries over our sample period, shows that it is not worth-while to do so. But the second assumption is almost certainly unreasonable; and a number of factors would suggest a differentiated impact across countries. However, we are interested in discovering whether German labor market conditions, or if US labor market conditions, are of any significance in forming wages in other parts of Europe. So a common value of h is a reasonable simplification to make for that simpler question.

We can now define aggregate wage inflation as:

$$\dot{W} = \sum_{i=1}^{n} \alpha_i \dot{w}_i \tag{6}$$

where α_i represents country i's labor force share in the group's total labor force. Given (5) and (6), we can derive an expression for the aggregate wage inflation of each of the two groups as follows:[10]

$$\dot{W} = \sum_{i=1}^{n} \alpha_i \dot{w}_i$$
$$= a + k\dot{P} + \beta \sum_{i=1}^{n} \alpha_i f(u_i) + \beta h \sum_{i=1}^{n} \alpha_i [f(u_L) - f(u_i)] \tag{7}$$

However,

$$\beta h \sum_{i=1}^{n} \alpha_i [f(u_L) - f(u_i)] = \beta h \left[f(u_L) - \sum_{i=1}^{n} \alpha_i f(u_i) \right] \tag{8}$$

since $\Sigma \alpha_i = 1$. Thus,

$$\dot{W} = a + k\dot{P} + \beta \sum_{i=1}^{n} \alpha_i f(u_i) + \beta h \left[f(u_L) - \sum_{i=1}^{n} \alpha_i f(u_i) \right] \tag{9}$$

Equation (9) represents a Phillips type trade-off in which aggregate wage inflation is a function of aggregate price inflation, generalized excess demand as captured by the

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[9] For a country specific parameter k_i, the proportion of price inflation reflected in wage inflation varies from country to country. In this case, anticipated price changes in each country cannot be represented by changes in the aggregate price level and $k\dot{P}$ must be substituted by $\Sigma k_i \gamma_i \dot{p}_i$ where γ_i is the GDP share of country i.

[10] Downward sloping aggregate Phillips curves generally exist in this form whenever there is heterogeneity between wage bargains, but immobility between regional or sectoral labor supplies: Hughes Hallett (2000).

aggregate of domestic unemployment rates,[11] and a German leadership effect in the last term. We write that term as $A=[f(u_L)-\Sigma\alpha_i f(u_i)]$. In addition, $\Sigma\alpha_i f(u_i)$ can be expanded in a Taylor series approximation around $U=\Sigma\alpha_i u_i$ to yield:

$$
\begin{aligned}
\Sigma\alpha_i f(u_i) &= f(U) + \sum_{j=2}^{\infty}\sum_{i=1}^{n} \frac{\alpha_i(u_i-U)^j}{j!}\frac{d^j f(U)}{dU^j} \\
&= f(U) + \frac{1}{2}s^2\frac{d^2 f(U)}{dU^2} + \frac{1}{6}\mu_3\frac{d^3 f(u)}{dU^3} + \frac{1}{24}\mu_4\frac{d^4 f(U)}{dU^4} + ...
\end{aligned}
\tag{10}
$$

where μ_j is the jth sample moment of the inter-regional unemployment distribution about its mean, and $\mu_2=s^2$.

Assuming as a specific functional form $f(U) = \log(U)$, (10) then becomes:

$$
\Sigma\alpha_i f(u_i) = \beta\,lnU - \frac{\beta\sigma^2}{2U^2} + \frac{\beta\sigma^3}{3U^3} - \frac{\beta\sigma^4}{4U^4} + ... \qquad \beta < 0
\tag{11}
$$
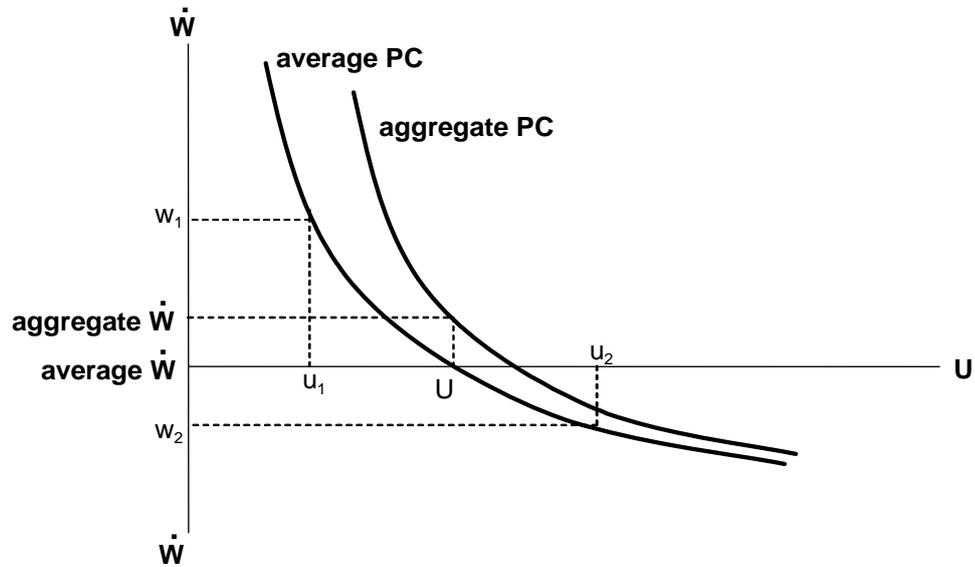
Figure 1: The aggregation hypothesis

Figure 1 shows equation (10) graphically – the higher moments are a measure of the displacement implied by accounting for the discrepancies between regions/countries.

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[11] See Demertzis and Hughes Hallett (1995, 1998) for more detail on this distinction between average and aggregate unemployment rates.

Substituting (10) into (9) shows that both the overall level of wage inflation (i.e. $\dot{W}$ on the left of (9)), as well as the degree of wage leadership or locational competition (the last term in (9)), will depend on *both* the distribution of unemployment rate (i.e. the sum of all the moments in (10)) *and* on the markets' sensitivity to excess demand β. In fact, the greater the inequalities in unemployment (s^2), the higher is average wage inflation, the lower are the wage leadership effects and the stronger is the locational competition effect (where $h>0$, $h<0$ respectively).

But there is a downside to the apparently favorable reverse interpretation implied: that fewer inequalities in unemployment rates across the union would lead to lower inflation at each value of average unemployment. Putting the log specification (11) into (10), we see that the slope of the aggregate curve is

$$\frac{\partial \dot{W}}{\partial U} = \beta(1-h)\left\{\frac{1}{U}+\frac{3\sigma^2}{2U^3}+\ldots\ldots\ldots\right\} \qquad \text{where } \beta < 0 \qquad (12)$$

whereas the slope of the corresponding average curve (similar to that of an individual country's Phillips curve, for that matter) is just

$$\frac{\partial \dot{W}}{\partial U} = \beta(1-h)\frac{1}{U}$$

This shows the aggregate curve is steeper, and the inflation-unemployment trade-off more unfavorable than that faced in the average curve or the national curves. Moreover that discrepancy gets larger, the smaller is U. That means the cost, to individual regions or to individual countries, of reducing wage or price inflation becomes larger as average unemployment falls *and* as the dispersion of the unemployment rates falls. So whether a flatter Phillips curve is an improvement or not is moot: it implies lower inflation at any unemployment level, but larger unemployment fluctuations if the economy adjusts. It is better for inflation control therefore, but makes the economy more unstable in the short term. On the other hand, we do have an explanation of why the Phillips curve has become flatter in recent years: this time due to the discipline imposed by transnational wage bargaining and the desire to reduce unemployment differentials ($h<0$, or small), rather than to migration, more effective central bank policies, or greater trade intensity and foreign investment flows per se, as is usually argued.

Finally it is important to note that both Thirlwall (1970) and Metcalf (1971) discovered that the impact of a leader's wage on the followers typically takes some time to materialize. This suggests that the wage transfer term should not be included contemporaneously, but should allow time for the effects to feed through. In addition, Bhaskar (1990) maintains that this term should be in expectations format because "a trade union will match, within limits, the money wage it *expects* other unions to set". In the case of Europe, we argue that the case for the expectations form will be even stronger because the information on the outcomes of wage negotiations in other countries will take some time to appear and be transmitted, and may be less well understood on the outside. Hence bargaining will normally be conditioned on what is *expected* to emerge from the bargaining round currently underway in Germany (or the US). We might replace A by its rational expectation, or some other form of expectation, therefore.

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4 Econometric Modeling

We adapt (10) to give a standard short-run Phillips curve specification of the Friedman-Phelps type. Also, given the simultaneous determination of prices and wages, we apply the estimation to a VAR system in wages and prices, but report only the results for the relevant wage equation:

$$\begin{pmatrix} \dot{W}_t \\ \dot{P}_t \end{pmatrix} = \begin{pmatrix} \beta_{0,1} \\ \beta_{0,2} \end{pmatrix} + \begin{pmatrix} a(L) & b(L) \\ c(L) & d(L) \end{pmatrix} \begin{pmatrix} \dot{W}_{t-4} \\ \dot{P}_{t-4} \end{pmatrix} + \begin{pmatrix} \beta_{1,1} & \beta_{1,1}h \\ \beta_{1,2} & \beta_{1,2}h \end{pmatrix} \begin{pmatrix} \Sigma\alpha_i f(u_{i,t}) \\ A_{t-4} \end{pmatrix} + \begin{pmatrix} e_{t,1} \\ e_{t,2} \end{pmatrix} \quad (13)$$

The term $A_{t-4}=f(u_L)-\Sigma\alpha_i f(u_i)$ captures the wage transfer or locational competition mechanism. Note that modern attempts to estimate Phillips curves with forward looking expectations for prices, wages and the A term, as the pure theory would predict, have proved to be poor predictors of inflation dynamics (Rudd and Whealan, 2006). The lag terms in (13) are therefore included as a proxy for an adaptive expectations process. We have experimented with forward looking (rational) expectations terms here, but the resulting estimated model was very unstable. That confirmed the Rudd-Whealan result; and suggests a good deal more persistence than forward looking behavior on the part of wage bargainers when trying to maintain the position of their wages/wage costs relative to the leading wage setter or relative to the main competitor in terms of unit labor costs.

To complete this model we must now specify $f(u_{it})$ explicitly. For maximum flexibility, we adopt a Box-Cox transformation and allow the data to pick the best fitting specification:

$f(u_{it}) = a + \beta \log u_{it}$ with $\beta<0$, if $\lambda=0$; or, $\qquad\qquad\qquad$ (14)
$f(u_{it}) = a + \beta u_{it}^{-\lambda}$ with $\beta>0$, if $\lambda>0$ and $\beta<0$, if $\lambda<0$. $\qquad\qquad$ (15)

The signs of β in (14) and (15) are specified to ensure weak convexity. However, we shall allow the data to determine if (weak) convexity has actually held in practice.

We also allow the data to determine the best values for λ. After a numerical search, we concluded that the two most suitable specifications for $f(u_i)$ on our data set were the logarithmic and reciprocal formats. The logarithmic form gave results which are uniformly most robust in terms of fit, equation diagnostics, correct parameter signs; and in terms of the significance, plausibility and stability of the parameter estimates. The same cannot be said of the reciprocal specification. Hence we retain the logarithmic specification; but report the results for the reciprocal specification, as a comparison, in Table 2 of Appendix A.

The data we use covers the first 12 members of the Euro-zone (less Luxemburg), and the US. It is of quarterly frequency and spans from 1983 to 2007. A full description of that data is given, with variable definitions, in Appendix B.

Finally we present the estimation results for our preferred logarithmic specification over the whole sample period, and then for two sub-samples that are designed to

capture the differences in behavior in the pre and post EMU periods. We in fact experimented with the break-point being set at different dates between 1995-9 because the effects of EMU could have well been anticipated. The best results show that the break point should appear a little earlier that the actual starting date of EMU, so anticipation of the coming regime change does appear to have changed wage behavior. But when exactly the break point should appear depends on the variables to be included in the regression. Table 1 reports the results for the best fitting equation. By way of contrast, we also include some pre-1984 results: that is results on the run up to EMU in Table 3 (Appendix A), to show the German wage leadership regime when those effects were still operating.

5 Empirical Results

5.1 General Features

Table 1 summarizes the estimated parameters of (13), our final wage equation.

We focus here on the following three differences in behavior:

- wage leadership vs. locational competition, both inside the Euro-zone and from any influences outside;
- sensitivity to changes in supply and demand ("market sensitivity") and prices, i.e. the slope of the Phillips curve;
- the degree of cross-country convergence in wages and unemployment levels, i.e. the contribution of the higher moments.

We present the results for the wage equation, and then those for parameters that are of relevance to the question posed. We estimate the equation from 1984 to 2007 but also split it to pre and post EMU. The exact break point is identified econometrically, and appears to be slightly earlier than the actual start of the use of the single currency. Since the start of EMU had been a long process of convergence, it is not surprising that agents had internalized its effects by the time the actual union started.

Next we test the wage leadership/locational competition proposition with both Germany and the US as leaders. This has been done to identify if a conflict between nominal convergence in wages, and real convergence in activity or unemployment levels, has emerged. If there were such a conflict, convergence in wage levels or wage inflation will lead to greater unemployment differentials, and hence to a worse trade-off between wage inflation and unemployment. That would make it more difficult to raise activity levels in the depressed areas, or to improve competitiveness, to lower labor costs, or to allow wages and employment to benefit from productivity growth. As a consequence, any convergence in wages will tend to produce divergence on the real side.

The results with Germany as leader show that there is a significant trade-off between wage inflation and unemployment in the EU across the whole period: table 1. However this trade-off was substantially greater in the first sub-sample, and indeed the curve has become a lot flatter after the start of the single currency. At the same time the role of Germany was indeed of leadership ($h>0$) across the whole sample period. But it has become smaller as well as insignificant post-EMU. This implies that, following con-

vergence in wages, the role of Germany is now less central to the way in which prices and wages are set across the Union.

With respect to this last point, it is interesting to see how the role of the US compares. The US for the whole period is dominated by its strong position in the most recent data, where h>0. This implies that that the US has been adopted as a wage leader in wage transfers, a sure sign of globalization. In the earlier sample we see that the US had a weak locational competition role, albeit statistically insignificant. In the second period, the US takes on a more important (disciplining) role in the way wages are formed in Europe, as the coefficient on the wage transfer term changes sign, increases ten-fold in size, and becomes significant.

Table 1: Results for the log wage specification ($\lambda = 0$); Euro-zone economies

Dependent variable:	$\dot{W_t}$			$\dot{W_t}$			
a) Germany Dominates	$\beta_{1,1}$	$\beta_{1,1} h$	h	$\beta_{1,1} h$	h	lag	R^2
1984q1-2007q4	**-2.52** (-4.39)	**-1.59** (-4.26)	0.63			5	0.93
1984q1-1996q4	**-3.25** (-2.77)	**-4.31** (-1.98)	1.22			5	0.91
1997q1-2007q4	**-1.43** (-2.03)	-0.66 (-1.32)	0.46			5	0.42
b) The US Dominates							
1984q1-2007q4	**-3.86** (-3.20)			-3.30 (-1.74)	0.85	5	0.93
1984q1- 1997q4	**-3.70** (-3.01)			6.56 (0.66)	-1.77	7	0.94
1998q1-2007q4	-2.04 (-1.71)			**-20.90** (-2.27)	10.22	8	0.63

Note: **Bold** indicates significance at the 5% level, (t-ratios in parentheses)[12]

The interpretation has to be that the US had come to be seen as the benchmark for wage increases, both as a standard of comparison for wage discipline and to show what can be allowed if competitiveness against the main trading partners or alternative production sites is to be maintained.

The slope of the Phillips curve is very similar irrespective of whether we look at Germany or the US (albeit slightly less significant for the latter). We can therefore use the estimated $\beta_{1,1}$ in the German wage leadership case to calculate the contribution of the higher moments to wage inflation based on (11). We present the results in Table 2:

Table 2: The higher moment contributions

	σ_2	μ_3	μ_4		σ_2	μ_3	μ_4
1980q1	0.44	0.00	0.11	**1994q1**	0.22	-0.07	0.06
1981q1	0.40	-0.06	0.12	**1995q1**	0.24	-0.08	0.07
1982q1	0.26	-0.06	0.07	**1996q1**	0.19	-0.06	0.04

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[12] The VAR regressions are estimated with the reported lag-lengths chosen based on using the standard SIC information criteria. When those tests led to a conflicting lag choice, we have repeated the estimation for alternative lag lengths to ensure consistency in results. Detailed results are available from the authors.

1983q1	0.18	-0.05	0.04	**1997q1**	0.06	-0.01	0.01
1984q1	0.19	-0.06	0.05	**1998q1**	0.05	0.00	0.01
1985q1	0.23	-0.09	0.08	**1999q1**	0.06	0.00	0.01
1986q1	0.24	-0.09	0.08	**2000q1**	0.06	0.00	0.01
1987q1	0.25	-0.08	0.08	**2001q1**	0.06	0.01	0.01
1988q1	0.20	-0.04	0.04	**2002q1**	0.05	0.01	0.01
1989q1	0.19	-0.02	0.03	**2003q1**	0.03	0.00	0.00
1990q1	0.20	-0.03	0.03	**2004q1**	0.02	0.00	0.00
1991q1	0.22	-0.04	0.04	**2005q1**	0.02	0.00	0.00
1992q1	0.21	-0.04	0.04	**2006q1**	0.02	0.00	0.00
1993q1	0.22	-0.07	0.06	**2007q1**	0.03	0.00	0.00

From this table, the first observation to make is that the third and fourth moments cancel each other out most of the time. It is therefore the variance term that is responsible for most of the displacement (shift and twist) of the Phillips curve in Figure 1. In 1980 the second moment contributed about half of a percentage point (44 basis points) to a level of wage inflation of about 10 per cent. This has been steadily reducing across the whole period, halving in the first sub-period, and effectively disappearing after the start of EMU (it fell to 6 basis points in 1999, and 3 basis points in 2007). This implies that the original fear of nominal convergence at the expense of real convergence was misplaced. That problem has not materialized.

5.2 A Summary of the Results

In summary, we distinguish three cases here in order to demonstrate how the real vs. nominal convergence conflict appears in our results:

i) Where h rises and β_1 becomes more negative. This is the case where wages become more sensitive to conditions in the domestic economy, instead of those elsewhere in the EU. In the run up to EMU, this was true of Greece, Sweden and Denmark (and perhaps the UK) who appear to have converged on this "model" of wage behavior – see Table 3. But it is not true of the Euro-zone as a whole; either in the run up to EMU (table 2) or in EMU itself (table 1). It says very little about real or nominal convergence among the insiders.

ii) Where h rises or becomes insignificant, and β_1 falls towards zero. This is the case where wages become less well integrated with domestic or Euro-zone markets; and potentially more sensitive to changes in external conditions, or to locational competition from outside the bloc. In fact, the Germany dominates or is the benchmark case has a falling h parameter and a falling β_1 parameter ($\beta_1 \rightarrow 0$). That suggests that Euro-zone wage setting has become progressively less sensitive to EMU-wide conditions, or to German labor market conditions, although the statistical significance of this effect now appears to be fading. The implication of this result is therefore that the EMU economies seem to be becoming more sensitive to non-EMU conditions, a fact which is then confirmed by the estimates reported in panel b) of Table 1.

iii) The third case is the one in which h is rising (becoming more positive) and β_1 is falling (becoming more negative), but both remain significant. This is the US leadership or pure globalization case, where the influence of domestic and EMU market conditions have been weakening across the board, and which we have found to

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be the case in the second sub-sample of Table 1. It is this result which suggests that structural reforms are needed.

5.3 Inflation, Unemployment and Wage Convergence in EMU

As for the remaining results: Table 1 shows convexity is confirmed in both models of wage bargaining, given the expected negative and highly significant β_1 parameters. The appearance of a new set of wage and cost comparators has not affected that.

The second part of the sample shows that this domestic market sensitivity effect has become weaker and less significant in the 2000s, compared to the early 90s or 1980s when the forces of convergence under the Maastricht treaty were at their peak, whether we account for German leadership or for Dollar zone competitiveness. We hypothesize that this is due to attempts to preserve employment when price levels (if not inflation rates) are lower outside the Euro-zone. In other words, the Euro-zone economies have come to use wage settlements in their chief trading partners in the Dollar zone as a disciplining device, or yardstick, for showing what can be allowed for the purposes of preserving competitiveness and jobs. Certainly the data supports that hypothesis, and significantly so, for the period since the Euro-zone was formed and when the sanction of being denied entry was removed.

The consequences of this change in strategy can be seen in Figures 1 to 3. European unemployment remains high and with its traditional cyclical pattern, although it may now have a slight downward trend. But the dispersion of unemployment, which had revealed sharply rising inequalities in the 1990s, has been on a clear downward trend since 1996 – even if it has now settled at a persistent standard deviation value of about 2% (compared to 14% at its pre-EMU peak). Price inflation likewise has come down on average and in dispersion, with the start of EMU showing a clear change in regime. Core and periphery members both show very little price deviation outside a range of 1%-3%, post EMU, with the exception of Spain, Ireland and the Netherlands at various points. That contrasts sharply with the much higher levels and wide variations in price inflation in the EMS era, before EMU.

Likewise wage inflation shows a distinct change of regime with EMU (or perhaps a few years earlier in the core). Here most countries hold to a 2%-5% range after EMU, but with larger deviations from Spain and Germany, Italy, Ireland and Greece. Perhaps the new EMU regime hypothesis doesn't hold up quite as well among wage bargains in the periphery countries; but it clearly does for the larger economies and among the core countries. And even for the periphery counties there has been a major shift/convergence in behavior since the 1980s and early 1990s.

6 Conclusions

a)   Europe's labor markets, in the 1990s and 2000s, and in the run-up to Monetary Union, have shown a significant degree of locational competition in their wage bargaining - rather than integration and harmonization.

b)   The strength of locational competition, internally to EMU, has been weakening in the 1990s as opposed to the 1980s, and may not now be very important.

c)   Instead, the US – or perhaps more accurately the dollar zone – has replaced Germany as the pace setting economy as far as wage setting and gauging competitiveness is concerned.

d)   There appears to be some evidence, albeit rather weak and intermittent, of nominal convergence by the EMU insiders in the 1990s. There is stronger evidence, however, of convergence on a wage bargaining behavior which shows less internal competition or leadership, and more dependence on the balance of supply and demand conditions in the domestic markets and cost comparisons outside the zone. This takes the form convergence on a regime of increased market sensitivity and external measures of competitiveness.

e)   If that is true, and differences remain across countries in terms of labor market institutions or regulation, wage sensitivity, or cost/industrial structures, then unemployment differences should be expected to persist. However this has not happened. Our measures of unemployment dispersion in the Euro-zone have fallen steadily since 1996. There are several possible explanations for that. Structural differences in the labor markets and in wage bargaining may have been reducing at the same time; the single market program may have reduced the impact of cost/industrial structure differences; greater attention to domestic market conditions, or to supply and demand relative to an external measure of competitiveness; and structural reforms that have made domestic labor and product markets more flexible. Consequently the absence of a real trade-off between wage integration and unemployment convergence (nominal vs. real convergence) could be more apparent than real. Nevertheless some differences do persist, which suggests structural reforms will remain a key policy.

f)   These results are important for policy formation. Brechling (1973) showed that the natural rate of unemployment in a multi-region economy will typically remain undefined. Consequently there is a need to manage the distribution of demand to minimize the aggregate natural rate of unemployment: the shift and twist in the area-wide Phillips curve noted in Figure 1. In that case only would the long run Phillips curve become vertical; otherwise it will remain upward sloping, if steeper than the corresponding short run curve (Hughes Hallett, 2000). Hence the issue of managing the distribution of activity across European economies or regions is important not only because it reduces the burden of the inflation-unemployment trade-off, and the gap between the European trade-off (which is the level at which the policy makers are operating) and the perceived national trade-offs; **but also** because it implies that there is a role for managing the distribution of aggregate demand, even if there no role for managing the level of aggregate demand.

# FIGURES:

Figure 2: Euro-Area Unemployment and Variance
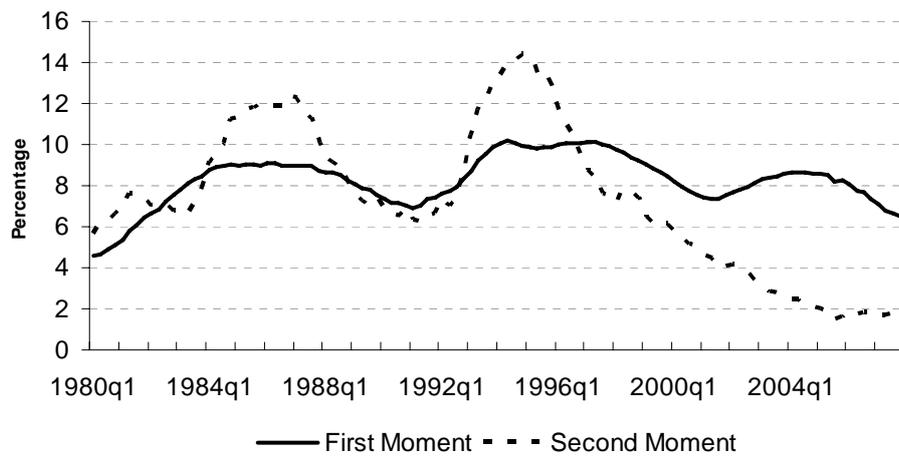
Figure 3: Euro-Area Inflation (CPI)


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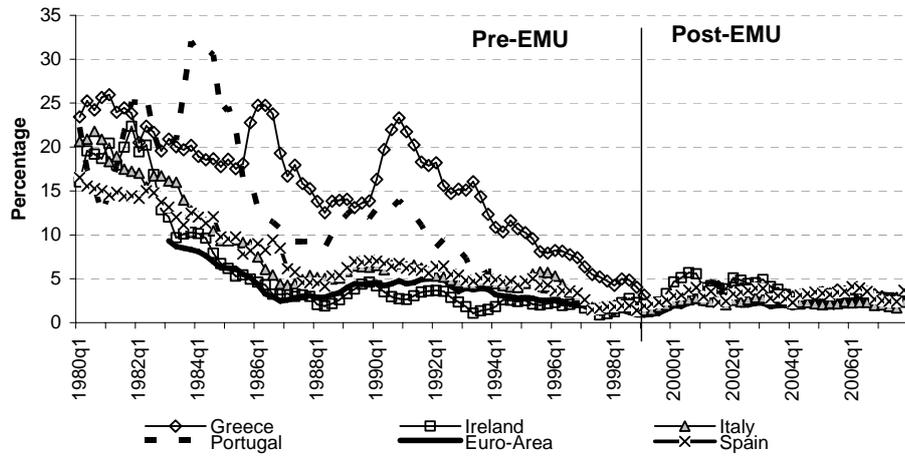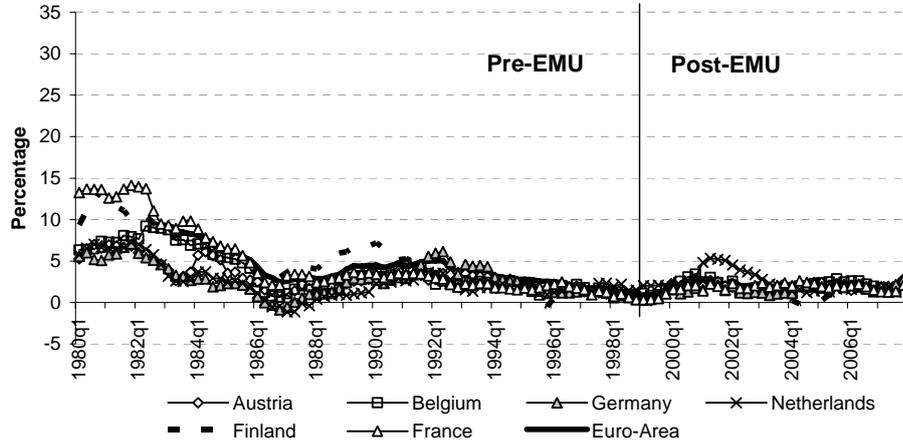
Figure 4: Euro-Area Wage Inflation
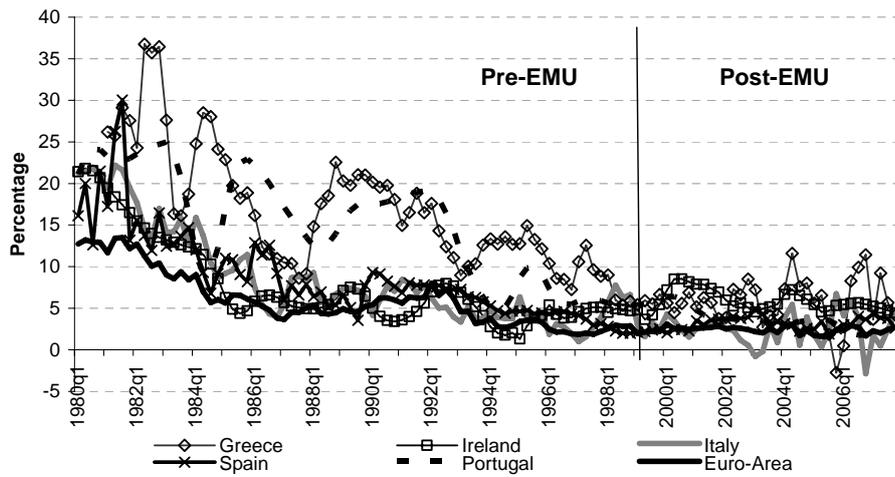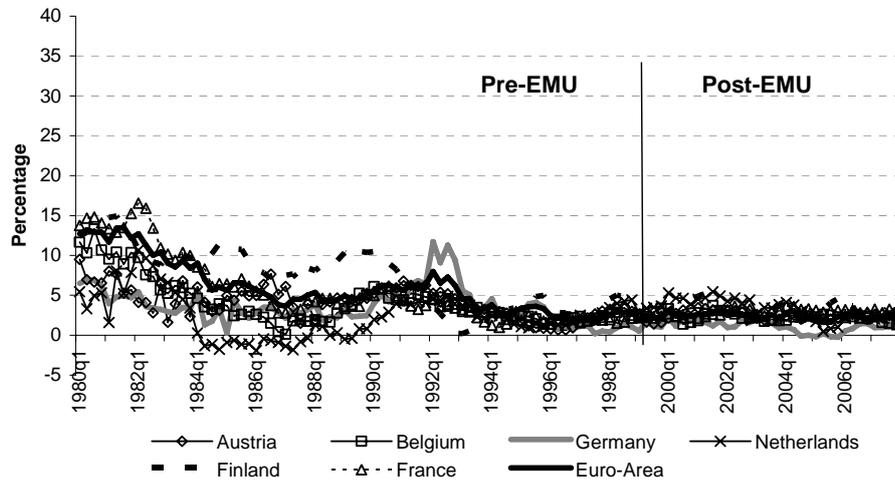
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<u>Appendices</u>

Appendix A: Robustness Results

A. 1 An alternative specification of the wage equation

Table 3 presents the results for the reciprocal model specification. The results are not very different. But on the whole the logarithmic specification proved a better fit for the data, in terms of the usual statistical diagnostics, across the different samples and in the way in which we have tried to model the leadership effect. For that reason, we have used the logarithmic specification to describe results in the main text.

Table 3: Results for the reciprocal wage specification ($\lambda = 1$), Euro-zone economies

Dependent variable:	$\dot{W}_t$			$\dot{W}_t$			
a) Germany Dominates	$\beta_{1,1}$	$\beta_{1,1}\,h$	h	$\beta_{1,1}\,h$	h	lag	R^2
1984q1-2007q4	**16.11**	**11.75**	0.73			5	0.93
	(4.15)	(4.53)					
1984q1-1996q4	**24.17**	17.15	0.71			5	0.91
	(2.64)	(1.86)					
1997q1-2007q4	9.25	3.78	0.41			5	0.40
	(1.84)	(0.81)					
b) The US Dominates							
1984q1-2007q4	**11.70**			-1.03	-0.09	5	0.91
	(2.61)			(-0.36)			
1984q1- 1997q4	**44.27**			**-14.90**	-0.34	5	0.93
	(5.35)			(-2.25)			
1998q1-2007q4	2.82			3.70	1.31	5	0.37
	(0.37)			(0.86)			

Note: **Bold** indicates significance at the 5% level, (t-ratios in parentheses).

A. 2 Results for the 1980s and early 1990s: a comparison.
Next we compare the results as they appeared in our earlier study, using data to 1997. This is for information only since the specification of the estimated wage equation is different. Nevertheless the qualitative comparison of the results is instructive.

Table 4 shows that behavior among the EU11 and the EU15 is really quite similar in the first sub-sample in this period. That suggests that labor market behavior in the period of setting up and adjusting to the European exchange rate mechanism (ERM) was not much different between the eventual insiders and outsiders. Only in the sensitivity to domestic market conditions (the parameter β_1), and perhaps expected future losses in competitiveness (β_4), is there much difference. In the same way, the results for the second sub-sample are also similar; they differ only in the labor market integration parameter h, and possibly in the reaction to expected losses in competitiveness. But this is a crucial difference as far as convergence is concerned. Moreover, the estimates in both sub-samples are statistically significant. Consequently, the differences, when they come, are between the sub-samples rather than between the two groups.

The next point is that h is negative, implying locational competition across all countries in the EU in the first sub-sample. Thus locational competition is very significant, even if less so in the EU15 than in the EU11. That suggests there may be differences in the degree of competition offered by outsiders. However that is a small point compared to the change in the h parameters when we come to the second sub-sample. Here the value of h halves for the EU11, although it remains significant and negative. But for the EU15, h actually turns positive and insignificant. Hence, as we move into the 1990s, the degree of locational competition is drastically reduced; and wages may even have followed Germany's lead (that is, Germany's wage restraint) in some of the "*out*" economies.

Table 4: the Euro-Zone (EU11) and Euro-area (EU15) results for 1975-97.

Whole Sample: 75-97							
	β_0	β_1	β_3	β_4	h	$\chi^2_{(k)}$	
EU11	25.66	-20.25	0.67	-1.31	-.64	7.42	obs = 70
	(6.10)	(6.04)	(31.68)	(4.22)	(3.62)		$k = 8$
EU15	-7.88	6.55	0.42	1.42	-.69	12.4	obs = 70
	(1.79)	(1.71)	(4.36)	(7.53)	(1.35)		$k = 8$
1st sub-sample: 75-87							
	β_0	β_1	β_3	β_4	h	$\chi^2_{(k)}$	
EU11	41.11	-32.78	0.47	-1.08	-.77	6.07	obs = 38
	(6.8)	(6.99)	(10.16)	(5.50)	(10.18		$k = 8$
					)		
EU15	18.42	-13.53	0.67	-0.55	-.71	6.43	obs = 38
	(3.11)	(2.93)	(11.87)	(2.34)	(2.27)		$k = 8$
2nd sub-sample: 87-97							
	β_0	β_1	β_3	β_4	h	$\chi^2_{(k)}$	
EU11	34.33	-27.39	0.17	-0.84	-.27	5.42	obs = 32
	(22.85)	(20.80)	(3.12)	(9.80)	(2.66)		$k = 8$
EU15	33.89	-26.46	0.28	-1.29	.13	5.48	obs = 32
	(12.98)	(12.56)	(7.36)	(8.51)	(1.62)		$k = 8$

Notes: This table is for illustration and contrast only. It is not directly comparable to Table 1 because: a) GMM estimates have been used, b) the sample is earlier and shorter, finishing in 1997, and c) the set of explanatory variables is different.

t-ratios: numbers in brackets

k: degrees of freedom – number of over-identifying restrictions = (number of instruments less the number of estimated parameters)

Equation: $\dot{W}_t = \beta_0 + \beta_1 \Sigma \alpha_i f(u_{it}) + \beta_3 \dot{P}_t + \beta_4 (\dot{W}_t^e - k_0 \dot{P}_t^e) + \beta_5 A_t^e + e_t$

At the same time, the market sensitivity parameter β_1 also changes between the two sub-samples. It remains negative and significant throughout, in both the EU11 and EU15 equations, so wages respond convexly (as expected) to the excess supply of labor. But whereas wages are much more responsive to shifts in demand and supply in the EU11 before 1986, they are about equally responsive in the EU11 and EU15 after 1986. That must imply a slight fall in market sensitivity among the "*ins*" since 1986, but a sharp rise in that sensitivity for the "*outs*". At the same time, the significance of both market sensitivity terms has risen dramatically.

All of this suggests that, in the period leading up to monetary union, there has been less pressure for convergence or integration, than in earlier times. Indeed if there has been

convergence, it has been in terms of convergence onto a new paradigm. It appears that the European economies have progressively switched to basing their wages on local market conditions and hence local competitiveness (the incidence of price indexation, β_3, has also fallen). Thus, in place of integration, we have convergence on a more independent form of wage determination in Europe in which varying domestic and/or external conditions play a larger role. But that is not to rule out the possibility that these local decisions may have become more independent precisely because they are being judged against the yardstick of some external indicator of competitiveness. Our subsequent tests (in the main text) suggest that this is the case.

Appendix B: Data Sources

Data series are used for eleven original EMU countries (Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, The Netherlands and Portugal) and the US. The sample period ranges from Q1 1983 to Q4 2007.

Country variables

The analysis in this paper uses quarterly data on wage inflation, price inflation, the unemployment rate, employment and the nominal GDP of all EMU countries except Luxembourg. This section describes the sources and definitions of these variables for all the countries covered. The next section will then specify how these data were used to construct the aggregate EMU series actually analyzed.

Wage inflation
- Germany, Finland, France, Ireland, The Netherlands and Portugal: compensation per employee for the total economy is used. For Germany, wage inflation is calculated using data for Western Germany before 1992. After 1992, wage inflation is calculated using data that refer to unified Germany.
- For Greece, hourly earnings for the manufacturing sector are used to calculate the wage inflation before 1997. From 1997, wage inflation is calculated using the labor cost index (wages and salaries) for the industry and service sectors, excluding public administration.
- For Spain, wage inflation is calculated using the total wages index for the whole economy.
- For Belgium, hourly earnings for males in the industry sector are used.
- For Austria and Italy, the wage rate for the private sector is used (OECD Statistics Directorate, 2000).
- For the US, hourly wage rates from the OECD's *Economic Outlook*.

    In order to adjust for seasonal influences, each country's wage inflation is defined as the proportional change in the wage index with respect to the same quarter of the previous year:

    $$\dot{w}_i = \frac{w_i - w_{i(-4)}}{w_{i(-4)}}$$

Sources:	OECD data are used for all countries except Greece, Spain and Portugal. For Greece, data from both the Bank of Greece (for hourly earnings in manufacturing) and Eurostat (for the hourly labor costs: wages and salaries) are used. For Spain, data from both the OECD (for hourly earnings for all activities) and the Spanish National Statistics Institute (for the total wages index for the total economy) are used. For Portugal, data of the Bank of Portugal are used.

Price inflation

Definition:	Price inflation is calculated using the Harmonized Index of Consumer
	Prices (HICP), covering all household expenditures except owner-occupied housing. Reimbursements, subsidies and discounts are excluded.
	For Germany, data until 1991 refer to Western Germany. After 1991, data refer to unified Germany (OECD Statistics Directorate, 2000). In order to adjust for seasonal influences, the country price inflation is defined as the change of the HICP with respect to the same quarter of the previous year:

$$\dot{p}_i = \frac{HICP_i - HICP_{i(-4)}}{HICP_{i(-4)}}$$

Eurostat/OECD data are used for every country.

Unemployment rate

Definition:	The unemployment rate refers to the registered unemployed as a percentage of the civilian labor force. For Germany, data until 1991 refer to Western Germany. After 1991, data refer to unified Germany (OECD Statistics Directorate, 2000).
Sources:	OECD data are used for all countries.

Employment

Definition:	Employment is defined as the number of people registered as employed in country *i*. For Germany, data until 1991 refer to Western Germany. After 1991, data refer to unified Germany (OECD Statistics Directorate, 2000). For Greece, employment is calculated using annual labor force data and quarterly unemployment rates.
Sources:	OECD data are used for all countries.

Nominal Gross Domestic Product

Definition: The national gross domestic product (GDP) is defined as the sum of all income earned in country i (in volumes). For Germany, data until 1991 refer to Western Germany. After 1991, data refer to unified Germany (OECD Statistics Directorate, 2000).

Sources: OECD data are used for all countries.

Appendix C: The Aggregate European Variables

<u>Variable</u> <u>Description</u>   <u>Formula</u>

γ_i	GDP weights	$\dfrac{GDP_i}{\sum GDP_i}$
$\dot{W}$	wage inflation	$\dot{W} = \sum \gamma_i \dot{w}_i$
$\dot{P}$	price inflation	$\dot{P} = \sum \gamma_i \dot{p}_i$
α_i	employment weights	$\dfrac{empl_i}{\sum empl_i}$
U	Euro Area unemployment	$U = \sum_i \alpha_i u_i$
	Average unemployment	$U = \ln\left(\sum \alpha_i u_i\right)$
	Aggregate unemployment rate	$U_{Agg} = \sum \alpha_i \ln(u_i)$