Is there a European wage leader? Wage spillovers in the European Monetary Union

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The introduction of the euro had been accompanied by expectations of increased inflationary pressures due to a de-coordination shock to national wage bargaining systems. Though, if anything systematically happened after the introduction of the euro, wage restraint increased. This paper argues that an interdependency of wage setting under German dominance has emerged in Europe, which fuelled the transmission of mutual wage restraint. We will investigate wage and nominal unit labour cost spillovers in the European Monetary Union (EMU) exploring a panel of 13 manufacturing sectors from 1992 to 2005 and quantify the effects of different countries. Strong interdependencies across EMU member countries with regard to nominal wage growth are found. A leading role accrues to Germany, which is responsible for a cumulative reduction of trans-European wage growth rates of 0.62% by conservative estimates. Remarkably, the influence of Germany is strongest on Southern Europe with regard to wage growth interdependencies. However, the situation is inverted with regard to the development of nominal unit labour costs where the German influence on Southern Europe is substantially weaker than on neighbouring economies.

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JEL classifications: L16, J31, J52, F42

1. Introduction

The moderate rates of inflation in the euro area after the introduction of the European Monetary Union (EMU) came as a major surprise to many observers (De Grauwe, 2009). The broad and distinguished stream of literature on wage bargaining[1] had, almost unequivocally, predicted a substantial *release* of wage restraint after the introduction of the

EMU. This was based on what might be labelled a *transnational Calmfors–Driffill hump hypothesis*. That is, it was argued that medium levels of wage bargaining coordination would create the most detrimental bargaining outcomes. Wage bargaining units would have a size that was still capable of triggering macroeconomic effects but that would render them sufficiently small to ignore the negative implications of these effects. The introduction of the common currency, in the view of this literature, would create this situation, since wage bargaining coordination remained high at a national level but there would be no trans-European coordination effort. However, if the EMU had any impact at all on wage setting behaviour, wage restraint increased (Posen and Gould, 2006). What has happened?

Recently, a stream of literature (Traxler *et al.*, 2008; Traxler and Brandl, 2009) has emerged that provides an explanation of this development from the point of view of the wage bargaining literature. Competition between national sectors prevents excessive wage increases, even if wage bargaining systems stay highly coordinated at a national level. As countries of different sizes participate in the EMU, the sectors of the biggest and most competitive countries could act as (implicit) pattern setters of trans-European wage bargains. The German manufacturing industry is the most obvious candidate for this role and other bargaining units are thought to imitate (at least partly) their wage accords. This idea, therefore, might be referred to as the *peer-wage-setting hypothesis*. It has the capacity to explain the events after the introduction of the EMU. The crucial question that remains is: Did Germany indeed become the pattern setter of European wage bargains?

This article demonstrates that a process of mutual- and reciprocal-wage-following behaviour across EMU members under German dominance has emerged. Using a panel of 13 sectors, the influence of the trade-weighted wages of the EMU partners of 11 early members of the currency union is investigated. It will be shown that the process of international competition has led to a situation in which national wage setters are heavily influenced by developments abroad, most notably by the wage developments of their most important trading partners. This fuelled the transmission of wage restraint across the EMU, as Germany was dispersing the restraint of nominal wage growth rates across the currency area.

The remainder of the paper is structured as follows. First, the theoretical arguments that underlie the empirical project will be outlined. Then an overview of the state of the empirical research thus far will be presented. Thereafter, stylised facts, the estimation method and the key independent variable—whose construction and investigation forms the major contribution of this research—will be discussed. Finally, the discussion of the results is summed up in a concluding section.

2. Wage bargaining under the euro: theoretical considerations

Wages are one of the most important macroeconomic variables. The growth of nominal wages affects—via a variety of potential channels—inflation and employment. The processes and institutions that affect wage setting—henceforth referred to as wage bargaining systems—are consequently a crucial institutional ingredient to economic success or economic failure. The impact of national wage bargaining systems on the success of the EMU was consequently a highly disputed issue around the introduction of the common currency. Wage bargaining systems are determined by a complex set of institutions and regulations. While macroeconomic conditions such as the consumer price index (CPI) or exogenous demand shocks play a major role with regard to wage growth rates, wage bargaining systems are considered to be an important additional ingredient that may be conducive or detrimental to growth under *ceteris paribus* conditions.

The introduction of the common currency was accompanied by the adoption of the Maastricht criteria, which set limits to the independent fiscal scope of participating countries. The fact that next to monetary policy the possibility for expansive fiscal policies was limited left many commentators confident that inflation could be kept in check, since eventually unemployment would prevent excessive wage hikes. The literature on industrial relations and European monetary integration, nevertheless, was primarily concerned that the de-coordination shock to national wage bargaining coordination regimes might trigger hikes in inflation and wage growth. Like many other concerns around the introduction of the EMU, the inflationary fears of the industrial relations theory proved to be a chimera.

The industrial relations literature on the issue of wage bargaining coordination had always evolved around two competing paradigms. The corporatist hypothesis (Soskice, 1990; Iversen, 1999; Traxler, 2003) maintained that the higher the level of wage bargaining coordination is, the stronger the implementation of potential negative externalities into the wage bargains becomes, which implies a linearly beneficial relationship between the degree of wage bargaining coordination and economic outcomes.[2] Negative externalities in this context are wage growth rates that are incompatible with high employment. This was disputed by the literature inspired by Calmfors and Driffill's (1988) seminal contribution. This literature (Bleaney, 1996; Scarpetta, 1996)[3] maintained that internalisation only takes place at a very high level of aggregation, while at a low level of aggregation firm-based unions are eager to avoid losses in their competitive position, which prevents excessive wage claims.[4] At a medium level, however, the goods of the sectors under observation can no longer be considered to be close substitutes, which prevents wage excesses being limited by competition. This means that the cross-price elasticities are extremely inelastic, implying that price and wage developments of other sectors remain irrelevant. This argument will govern the design of the key independent variable in the empirical sections below. Still—the argument goes—the level of coordination is yet too small to lead to an internalisation of negative externalities (such as high inflation and the according reactions of the central bank). The result is that a hump-shaped relationship is stated between the level of wage bargaining coordination and macroeconomic outcomes such as unemployment and inflation.

This discussion is mirrored in the more contemporaneous literature on the effects of the EMU on wage bargaining coordination regimes. The two most important streams of this literature strongly reflect theoretical positions that already had been taken in the discussion on the national effects of wage bargaining coordination systems throughout the early 1990s. The first stream will be labelled the *transnational Calmfors–Driffill hypothesis* in the following. This literature (Hall and Franzese, 1998; Cukiermann and Lippi, 2001; Hancké and Soskice, 2003) primarily focuses on the effects of the interaction between wage

[2] Needless to say that the exact implication of this depends on the macroeconomic reference model. In the neoclassical case—which is the macroeconomic reference model of most of the literature on wage bargaining coordination—wage growth rates that are incompatible with high employment are growth rates of wages over and above productivity.

[3] The discussion, however, has further substantial implications and also covers the topic of wage convergence within national sectors. Recently, for instance, Stockhammer and Onaran (2009, 2006) found some weak evidence for a U-shaped relation between wage compression (measured in terms of wage differentials) and wage bargaining coordination in the CEEC, but framed their discussion in a different theoretical framework.

[4] To fully understand the argument it might be useful to bear in mind that a neoclassical labour market and a Stone–Geary (i.e. wage bill maximising) utility function are central to the economic core of these models.

bargainers and central banks. The main argument is that the relatively high national levels of wage bargaining coordination will be persistent after the introduction of the EMU, but will degenerate to being only medium levels of coordination in the context of transnational concentrated monetary policy conducted by a common European central bank.

However, a substantial tension accrues out of this discussion. While the argument of competition and trade is central to the original Calmfors–Driffill hypothesis within a *national* framework, its implications are transferred undisputedly to the *transnational* level by the transnational Calmfors–Driffill hypothesis. Hereby, a substantial discussion of the implications of international competition on wage bargaining and wage growth is tacitly avoided. This is problematic since the only reason why a hump emerges in the case of the transnational Calmfors–Driffill hypothesis is the (implicit) assumption that the cross-price elasticities between the industries *between* nations are comparably small to the cross-price elasticities between different industries *within* a nation. However, while the assumption of close-to-zero cross-price elasticities might be reasonable on a national level, it is extremely strong in an international context. If, this assumption does not hold, competitive considerations should limit overly excessive wage claims and render national wage bargainers in a prisoners' dilemma situation. This situation would be comparable to one in which firm-based unions are in the situation of low bargaining coordination within a nation. Even if isolated national coordination prevailed this would not thus lead to wage excesses.

This argument is the rationale (Traxler, 2009) of the second stream of thought—here labelled as the *peer-wage-setting hypothesis*—which maintains that the introduction of the EMU might even foster an implicit trans-European wage bargaining system. The basic argument is that a system of pattern bargaining, probably with Germany as the pattern-setting country, might have emerged. A possible transmission process might be in the form of 'wage imitations' (Pichelmann, 2001) facilitated by the common currency. Theoretically framed, there might be a trans-European efficiency wage process in the making that leads to the imitation of important neighbours. The implications of this for appropriate levels of wage growth, however, are analytically unclear. Soskice and Iversen (2001) maintain that after the introduction of the EMU, Germany has lost most incentives to exert wage restraint through the lack of certain institutional measurements. This is the case as, through the introduction of the common currency, the impact of German wage settlements on German inflation has been moderated, which has induced a release of wage restraint in Germany. An opposing position is taken by Dullien (2004), whose—Stackleberg-framed—argument is that Germany, being a wage leader, can be competitively exploited by its followers. The argument that Germany is potentially exploited by its followers, however, is disputed by Traxler *et al.* (2008) on empirical grounds based on evidence from the German and Austrian metal sector. Together with Traxler and Brandl (2009), this study maintains that Germany has become a traditional pattern setter and internalises potential negative externalities. The view that the metal industry is central as a pioneer of European wage coordination, again, is shared by Schulten (2002A, 2002B).

Whatever the exact theoretical implications might be—with the exception of the contributions of Traxler *et al.* (2008) and Traxler and Brandl (2009), who focus exclusively on the effects of the metal industry between Germany and Austria and the Nordic countries, respectively—the *peer-wage-setting hypothesis* remains empirically underevaluated. This study aims at filling this gap in the literature.

3. The convergence of wage growth in the EMU area: literature survey

Before moving to the econometric part, this section provides a brief overview of the empirical picture of wage convergence that is provided by the literature thus far. The most important part of the empirical literature mainly focuses on the state of wage convergence and the implications for macroeconomic performance. Pichelmann (2001) starts from the observation that 'wage imitations' might prevent structural readjustment in asymmetric labour productivity developments, and investigates the convergence of nominal wage and nominal unit labour cost (NULC) developments using cross-country correlation coefficients for two subperiods ranging from 1970 to 1985 and from 1986 to 1999, respectively. He finds a tendency towards stronger nominal and real wage convergence, which is mainly triggered by a core group of EU-11 countries and a particularly strong correlation with Germany, and concludes that there is some first tendency into the direction of coordinated wage bargaining.

A study by the European Commission (2003) also starts from the observation that limited wage flexibility contributes significantly to inferior labour market outcomes. It investigates cross-country coordination on a sectoral level, again mainly relying on the calculation of correlation coefficients for the period 1981–2001. The study finds that wages are interdependent at the sectoral level—particularly for traded sectors across European countries—but also notes that convergence did not wait for European unification to take place and in fact had already started in the 1980s.

This finding is shared by Andersson et al. (2008) in an analysis of the development of wage growth differentials. Based on similar techniques as the surveys above, it finds strong wage growth convergence while remaining differences in wage growth appear to depend on differences in CPI growth rates. Interestingly, the relation of wage growth differentials to productivity growth differentials turns out to be relatively weak. While this might also reflect healthy readjustment processes, the authors warn that some countries run the risk of accumulating competitiveness losses.

Mora et al. (2005) test the degree of convergence of wages and productivity in the euro area countries. They estimate the β-convergence of unit labour costs, nominal wages, real wages and labour productivity using cross-section and panel data for the period 1980–2001. Robust evidence is found for the convergence of unit labour costs, nominal wages and labour productivity. Real wages and productivity, however, converge less strongly. The implication is that higher inflation in poorer and less developed economies fuels the development of unit labour costs, which again is judged as a caveat to stability.

Arpaia and Pichelmann (2007) again are concerned with the capacity of EMU members to adjust to asymmetric shocks. Using FGLS they investigate the responsiveness of aggregate wage and unit labour cost growth to productivity, unemployment and the output gap for a cross-country pool of 12 euro area members for the period 1980–2005. A major finding is a significant degree of nominal wage rigidity with regard to inflation and a strong influence of unemployment and productivity. However, they also find significant cross-country heterogeneity and asymmetric adjustments to shocks, so their findings indicate that convergence is far from being complete in the EMU.

Traxler et al. (2008) and Traxler and Brandl (2009) are the only surveys that do not focus exclusively on the question of competitiveness but explicitly test the *peer-wage-setting hypothesis*. Thereby, they are primarily interested in the wage leadership of Germany. Traxler et al. (2008) test the effectiveness of coordination within the metal industry and try to find out whether coordination might only be achieved by an 'exploitation of the great by

the small' by estimating the impact of German wage increases in the metal industry on wage increases in Austrian wages for two distinct subperiods. While the first subperiod (from 1969/70 to 1979/80) shows no significant results, the second subperiod (from 1980/81 to 2002/03) shows a significant degree of coordination (based on parallel wage movements) amongst the two sectors. However, the hypothesis of the exploitation of the great by the small is rejected, as wage increases in the Austrian metal industry are on average higher than those in the German metal industry. Traxler and Brandl (2009), on the other hand, focus on the impact of the German metal industry on Nordic countries. They find a statistically and economically significant influence of German standard and actual pay on Nordic standard and actual pay.

The empirical picture on wage convergence in Europe is rich and mainly detects a strong convergence of nominal wage growth accompanied by weaker tendencies of NULC convergence. While this point appears to be undisputed, many questions regarding the convergence process and the trans-European wage bargaining system remain open. Only two surveys thus far have explicitly tested the *peer-wage-setting hypothesis* and have exclusively focused on the influence of the German metal sector without controlling for the influence of wage developments in a single other country. While it can be argued that for the metal industry sufficient anecdotal and sociological evidence can be produced to support this approach, this certainly is not the case for a large-scale analysis of wage setting across the EMU. For such an analysis a refined methodological approach is required, such as the one developed in the sections below.

4. Data coverage

For the empirical analysis conducted in this paper, sectoral data for output, employment, compensation and capital from the EU KEMS are used. These data start in 1970 and ranges to 2005. For bilateral trade, data are used from the OECD Structural Data Analysis (STAN) Bilateral Trade Database, which provides bilateral sectoral import and export data. The time span for this data starts in 1970 and ranges to 2005, a period that, due to the choice of the key independent variable, limits the scope of our investigation. Macroeconomic control variables are taken from the *OECD Economic Outlook*. Countries included in the analysis are the early EMU members—Austria, Belgium, Finland, France, Greece, Germany, Ireland, Italy, the Netherlands, Portugal and Spain.[5] Due to data availability (the longest range being 1988–2005), the analysis is restrained to a single period. For economic reasons the starting point is 1992, the year of the Maastricht Treaty. The key sectors observed are sectors 15–45. This confines our analysis to the manufacturing sector and thus limits the results to this area. Given that this is the exposed sector of an economy, the results do not necessarily apply to other sectors of the economy, such as the services industry or the public sector. For the data used here, information on the ISIC classification system on the 1.5 digit level is available. This means that 14 available sectors of the manufacturing industry can be covered. Outlier analysis showed that certain attention should be paid to small sectors. Particularly problematic is sector 30 (office, accounting and computing machinery), where wages appear to decline by more than 40% in two successive years in France. This is untenable by any realistic economic reasoning and is due to the use of different statistical sources by disaggregation. According to KLEMS staff, the data still should be reliable but particular attention should be paid to smaller sectors

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[5] Insufficient trade data in the case of Luxembourg leads to the exclusion of this country from the analysis.

where disaggregation problems tend to be larger.[6] This information combined with the inspection of the residuals leads us to use heteroscedasticity-consistent estimation methods throughout the econometric analysis. Since sector 30 is extreme and relatively small, but in some cases has substantial power, I decided to exclude it from the sample altogether, reducing its size to 13 sectors over 14 years (the period 1992–2005) for most countries. Except in the case of France, the results are robust against the exclusion of this sector. Austrian trade data only start in 1995, reducing the available years here to ten. This also is the case for sectors 30–33 in Italy and Finland, reducing the sample of available sectors here to ten. Still, the shadow values of the trade data of these countries are available, but may not be used due to different Incoterms. Union density, on the other hand, restricts the Portuguese sample to the period 1992–2004 and CPI data only start in 1992 in Spain.

5. Stylised facts

Before moving to the econometric part, I want to provide a brief overview of the stylised facts of wage and unit labour cost developments in the EMU member states over recent decades. To make things easily tractable, two groups of countries have been generated. The one referred to as 'Core' includes Austria, Belgium, France and the Netherlands. These countries form a group in which stable monetary ties with Germany were established and credibly enforced as early as in the 1970s and early 1980s, and for this reason the group has also been labelled 'core Deutschmark bloc' elsewhere (Johnston, 2009). The second group, which is referred to as 'Periphery', includes Finland, Greece, Ireland, Italy, Portugal and Spain, and constitutes a group of countries where the credible enforcement of monetary ties to Germany began no earlier than in the late 1980s. Since a special role might accrue to Germany, German development is displayed separately (otherwise it would conceptually belong to the Core group). In order to wipe out business-cycle effects, ten-year moving averages are used. Comparing the two groups reveals the following picture. In general it is possible to observe a substantial moderation of wage growth during the period of monetary integration observed here. While, of course there are differences within the respective groups, the growth rates of the nominal wages of the Periphery—on average still being roughly 50% higher than those of the Core—have been reduced substantially more than those of the Core (Figure 1).

It is interesting to observe that the substantial moderation of wages in the Periphery did not result in a comparably clear picture with regard to the development of NULC growth (Figure 2). While Core countries only succeeded in stabilising the growth rates of NULC on average, Germany substantially reduced them. The picture is even worse for the Periphery, which slightly succeeded in reducing NULC growth rates in the early years after the Maastricht Treaty, but where the crisis of 2001 apparently triggered a renewed tendency of increases in the growth rates of NULC and losses in competitiveness. This is a worrying result, since the gap in nominal wage growth narrowed constantly.

Germany thus has had considerable successes with regard to the reduction of NULCs and was even more successful in reducing its unit labour costs relative to its peers. It will be further demonstrated below that Germany also exerted a relatively high influence on the nominal wage restraint of other members of the EMU. Nonetheless, competitiveness within the EMU diverged substantially. How could this be the case? In principal there are two possibilities. First, Germany and the Core exert higher wage moderation—defined as

[6] Correspondence with Mary O'Mahony of the EU KLEMS staff, 26 November 2009.
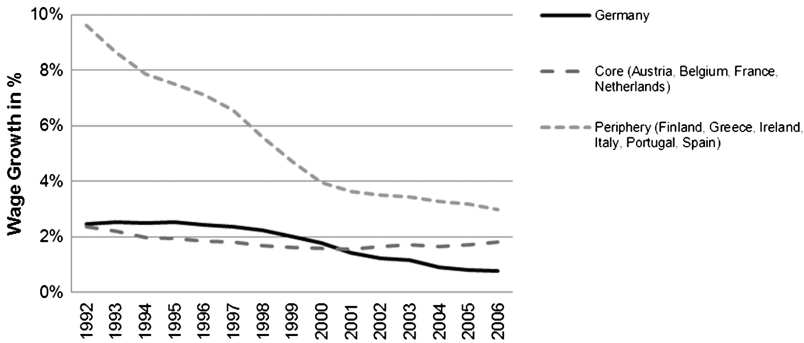
Fig. 1. *Wage growth (ten-year moving averages).*
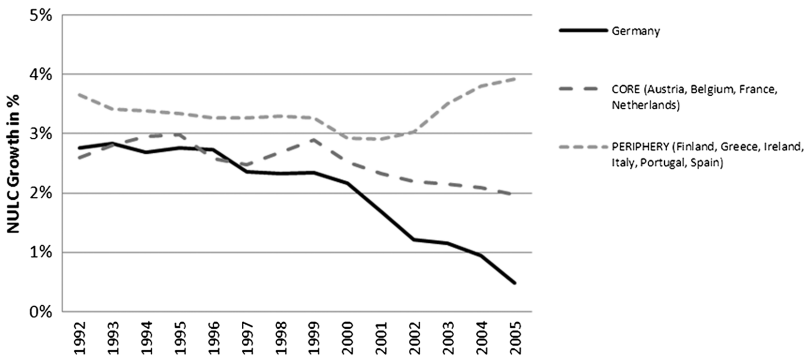
Fig. 2. *NULC growth (ten-year moving averages).*

real wage growth minus productivity growth—than the Periphery. Second, price pressure is higher in the Periphery than in Germany and the Core. As a matter of fact, both factors affected the divergence of NULCs within the EMU. Germany indeed exerted the highest wage restraint during the period of observation. However, there also remained substantial differences in inflation.[7] Both developments are demonstrated in Table 1.

6. Estimation method and the construction of the key independent variable

The idea of the econometric section is to investigate the effects of nominal wage developments of the most important trading partners within the EMU on national wage growth rates. Given the sectoral structure of the panel it is advisable to use fixed cross-section

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[7] The reasons for these differences are manifold. Different inflation histories, differences in the commodity intensity of the economy, as well as higher price pressure originating from the sheltered sectors of the economy might be the cause of inflation differentials.

Table 1. *Wage Restraint and Inflation*

	Wage restraint index			CPI		
	Germany	Core	Periphery	Germany	Core	Periphery
1992	100	100	100	100	100	100
1993	103	103	99	102	103	104
1994	100	100	92	104	104	108
1995	97	95	84	106	106	111
1996	96	95	86	108	107	114
1997	92	92	86	109	108	117
1998	90	89	84	109	109	119
1999	88	88	82	110	110	121
2000	83	79	76	112	113	124
2001	83	80	76	113	115	127
2002	85	83	78	115	117	131
2003	83	85	80	117	118	133
2004	78	81	77	119	119	136
2005	72	74	76	121	120	138

Note: The growth of wage restraint is defined as the growth rate of real wages minus the growth rate of productivity.

effects to account for sectoral peculiarities. However, heteroscedasticity is a problem and OLS cannot be readily applied. Consequently, I resort to the use of the fixed-effects GLS (FEGLS) model, with the (cross-section) fixed effects being considered to account for sectoral peculiarities and the GLS accounting for heteroscedastic disturbances.[8]

Earlier studies (Traxler *et al.*, 2008; Traxler and Brandl, 2009) only tested the direct influence of Germany. However, exclusive German wage leadership is only a special case of the *peer-wage-setting hypothesis*. In an encompassing trans-European context this approach might suffer from an omitted variable bias due to the potential existence of multiple wage leaders and coefficients might turn out to be upwardly biased or entirely wrong. Consider, for instance, the case of Belgium where next (or alternatively) to German wage growth a strong influence might be exerted by the growth of wages in France. Using the wage growth of more than one country as independent variables to control for this potential effect though leads to a major problem. From a theoretical point of view, an endogeneity problem arises, since it is possible (but by no means inevitable) that there might be a direct effect on Belgium from two countries, of which one again might be dependent on the second country. Econometrically this problem materialises as a major multicollinearity issue, which is strong enough to invert the coefficient of respective wage growth variables. In order to overcome this problem a special variable of peer wages and peer unit labour costs is constructed using bilateral trade openness as a weighting factor. The investigation of this variable is one of the major contributions of this paper and is defined as follows:

$$WPH_{i,j}^{Peer} = \sum_{u \neq v}^{k} \frac{x_{v \to u} + m_{v \leftarrow u}}{X_v + M_v} \times WPH_{i,j}^{u}$$

[8] It can be noted, however, that the major results are also robust against the use of OLS estimators with White heteroscedasticity-consistent standard errors and covariances instead of an FEGLS estimator.

with

$$\sum_{u \neq v}^{k} \frac{x_{v \to u} + m_{v \leftarrow u}}{X_v + M_v} = 1$$

With $x_{v \to u}$ denoting bilateral exports from country v to country u and $m_{v \leftarrow u}$ denoting imports to country v from country u. X_v are aggregate exports from country v to the EMU and M_v are aggregate imports from the EMU to country v. k is the total number of countries other than v and in this sample is 11 due to the lack of Luxembourg data; i is an index denoting time and j is an index denoting sectors; u is an index for the respective countries. WPH stands for wages per hours. The sum of the fraction aggregates to one thus the weighting factor has the nice property of delivering a readily comparable variable. Put differently, the above exercise produces a variable that might be referred to as the wages per hour of the most important trading partners (weighted with their respective interrelated-ness to the observed country). As a shorthand we will talk about peer wages in the following. Analogously, using NULC for unit labour costs, peer unit labour costs are derived by:

$$NULC_{i,j}^{Peer} = \sum_{u \neq v}^{k} \frac{x_{v \to u} + m_{v \leftarrow u}}{X_v + M_v} \times NULC_{i,j}^{u}$$

with

$$\sum_{u \neq v}^{k} \frac{x_{v \to u} + m_{v \leftarrow u}}{X_v + M_v} = 1$$

The construction of this variable does not entirely come without sacrifice. It delivers a readily interpretable variable based on trade and competitiveness considerations, but to construct it the rather strong assumption of a linear relationship between a country's absolute trade position and the wage spillovers emerging from this country has to be imposed.

7. The interdependence of European wage growth: evidence for the peer-wage setting hypothesis and German dominance

We now want to proceed to the basic investigation. The primary interest is how the development of peer wages affects the development of national wages. To investigate this we will use the lagged ratio of national to peer wages as the key independent variable $WPH_{i,j-1}^{v} \big/ WPH_{i,j-1}^{Peer}$.[9] The rationale behind this is that through the increased exchange and cooperation among European wage setters that could be witnessed over recent years (Margisson and Sisson, 2006), as well as through increased price—and thus wage—transparency due to the introduction of the common currency, wages have begun to be increasingly interdependent. Theoretically this can be imagined as an efficiency-wage-setting process further fuelled by competitive forces in which the relative wage position of workers is relevant for what they perceive as a fair wage and therefore for their wage claims. For this reason it is the ratio that is considered here. The theoretical motivation behind this is simple. The literature on efficiency wages has demonstrated that

[9] Conceptional endogeneity problems prevent the use of contemporary variables here, since this would imply that contemporary national wage growth would appear as an independent variable in ten out of the 11 regressions while being the dependent variable in one regression. Using the level of the peer wage variable instead of the ration did not yield significant results.

the relative wage structure within an economy is relevant for wage outcomes due to imitation effects and benchmarking. Of course, in a transnational context the peer group is that of the relevant sector abroad, both for considerations about competitiveness and thus working place security as well as for considerations about prestige (and thus work effort). Altogether the following regression will be estimated:

$$d\log\left(WPH_{i,j}^v\right) = \beta_1 + \beta_2 \Delta\log CPI_j^v + \beta_3 UD_j^v + \beta_4 \Delta UR_j^v + \beta_5 \Delta\log\left(PROD_{i,j}^v\right)$$
$$+ \beta_6 WPH_{i,j-1}^v \Big/ WPH_{i,j-1}^{Peer} + \varepsilon_{ij}$$

The macroeconomic environment plays an important role in the determination of wage growth rates. In order to control for the effects of inflation and the business cycle, the growth of the CPI and unemployment are included in the regression. Hereby, ΔCPI is the change of the CPI, which is used to control for inflationary pressure on wage accords. UD is union density to control for the bargaining power of workers. ΔUR is the change of the unemployment rate to control for the business-cycle effect. $\Delta\log(PROD)$ is the productivity growth. $\Delta\log CPI$ and UD are expected to have a positive sign, since both inflation and union density should increase labour's wage pressure. A negative sign for ΔUR is expected, since an adverse economic situation increases the danger of becoming unemployed and reduces the bargaining position of employees. Lastly, $WPH_{i,j-1}^v \big/ WPH_{i,j-1}^{Peer}$ controls the effect of the relative position of national wages per hour to peer wages per hour. This is the key variable that is used to investigate whether wage relations are important. If a deterioration of the national wage position compared with that of the most important trading partners is relevant, a negative sign is expected. Conversely, if the wages of peers increase compared with national wages, an upward effect on national wage growth is expected, implying a negative sign as well (Table 2).

As can be seen in Table 2, the results for most of the control variables in the regressions show the expected signs or have negligible economic effects. An exception is $\Delta\log CPI$, which is negative and statistically as well as economically significant in Austria and Belgium. UD also is negative in several countries, but is hardly ever economically significant.[10] In the two cases where ΔUR is positive (the Netherlands and Spain) the economic significance is negligible.

The key independent variable $WPH_{i,j-1}^v \big/ WPH_{i,j-1}^{Peer}$ is statistically and (to varying degrees) economically significant in all observed countries. By far the strongest effect of the ratio is experienced in Greece (-1.340) followed by Portugal (-0.622). Then there is a medium group of countries composed of Ireland, Italy, Belgium and Spain, with coefficients in the bandwidth roughly between -0.17 and -0.27. Lastly, the weakest influence is experienced in Austria, Finland, France and the Netherlands, with values roughly ranging between -0.07 and -0.12. These results indicate that over the entire observed period a strong influence on national wage growth has been exerted by the relation between national and peer wages.

Our results thus strongly support the validity of the *peer-wage-setting hypothesis*. The transnational Calmfors–Driffill-hypothesis -according to which competitive considerations should play no important role - is rejected. To investigate the effect that wage outcomes of

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[10] A possible explanation is that high union density in some national wage-bargaining-system environments might help to increase the bindings to the international developments. Unfortunately there is not the space to explore the full theoretical and empirical implications of this possibility, but it should be noted that the results are robust against the exclusion UD as well.

Table 2. *The effects of peer wages on national wages*

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain
Period	10	13	14	14	14	14	13	14	14	13	13
Cross-sections	13	13	13	13	13	13	13	10	13	13	13
Observations	130	160	182	182	182	182	169	140	182	157	169
C	0.179***	0.313***	0.069	0.042	0.011	0.778***	0.285***	0.277***	0.173***	0.382***	0.214***
	(3.817)	(4.852)	(1.061)	(0.809)	(0.298)	(8.251)	(3.712)	(3.367)	(3.598)	(3.309)	(3.659)
$\triangle logCPI$	−0.850***	−0.640**	0.503**	0.884**	0.292	−0.395	0.588**	0.847***	0.679***	1.031***	−0.386
	(−3.686)	(−2.261)	(2.604)	(2.156)	(0.898)	(−1.275)	(2.089)	(3.487)	(3.785)	(4.187)	(−1.519)
UD	−0.002***	0.000	0.000	0.011***	0.005***	−0.009**	−0.002**	−0.002	−0.003**	−0.007**	−0.003***
	(−3.422)	(−0.020)	(0.766)	(3.540)	(5.730)	(−3.145)	(−2.600)	(−1.061)	(−2.419)	(−1.936)	(−1.338)
$\triangle UR$	−0.018***	0.005**	−0.002**	−0.002	−0.005	−0.014	−0.007**	−0.002	0.003*	−0.020***	0.008***
	(−5.237)	(2.224)	(−2.171)	(−0.750)	(−1.368)	(−1.637)	(−2.109)	(−0.453)	(1.697)	(−5.526)	(5.033)
$\triangle log$ $(GDPR/EMP)$	0.369***	−0.168***	0.074***	0.139**	0.252***	0.347***	0.233***	0.122***	0.148***	0.040	0.173***
	(6.852)	(−3.804)	(2.953)	(2.384)	(4.451)	(8.738)	(4.421)	(2.990)	(4.232)	(0.774)	(5.158)
$W_{T-1}/WPEER_{T-1}$	−0.065*	−0.225***	−0.076**	−0.115***	−0.089**	−1.340***	−0.274***	−0.262***	−0.100***	−0.622***	−0.167***
	(−1.869)	(−6.157)	(−2.499)	(−2.773)	(−3.017)	(−11.461)	(−3.447)	(−3.793)	(−3.236)	(−4.458)	(−2.794)
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.568	0.415	0.172	0.196	0.590	0.643	0.326	0.476	0.330	0.497	0.477
Adj. R^2	0.503	0.345	0.086	0.113	0.547	0.606	0.250	0.418	0.260	0.436	0.418
F-statistic	8.665***	5.923***	2.004**	2.357***	13.860***	17.381***	4.303***	8.121***	4.749***	8.079***	8.105***
Prob. (F-statistic)	0.000	0.000	0.014	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DW	2.146	2.023	2.364	1.918	2.093	1.727	2.448	2.435	1.854	2.262	2.256

Note: The dependent variable is the lagged percentage change of national wages per hour ($\triangle WPH$). C is the intercept, $\triangle CPI$ the change of the CPI, UD is union density, $\triangle UR$ is the change of the unemployment rate and $W_{T-1}/WPEER_{T-1}$ is the lagged ratio of national over peer wages. T-values are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

one country have on other countries—and in particular Germany—the results of separate countries have been isolated. This is done by recalculating the effects by weighing the coefficients of the respective countries with the average country share in the bilateral trade of each other country $\left(\sum_{u \neq v}^{k} \frac{x_{v \to u} + m_{v \leftarrow u}}{X_v + M_v} \times coef^v \right)$ and by calculating the effect that a 1% reduction in the growth of a country would have had on the wage growth of other countries on average over the observed period. At the same time this exercise makes it possible to calculate the average effect of wage setting in other countries on national wage outcomes (Table 3).

The results of the wage spillovers originating in a country are displayed in Table 3. The table reads as follows. The value -0.21% in the first line indicates that -0.21% of a reduction of wage growth in Belgium are passed on to Austria. With a reduction of Belgian wage growth by 1% Austrian wage growth will be reduced by 0.0021%. Germany has had by far the strongest net influence on the national wage growth of EMU member states. Approximately 10% of a 1% reduction in German wage growth is passed on to other countries. Put differently, a reduction of wage growth in Germany reduces average wage growth across the EMU by 0.1%. Only roughly 6% of the results of national wage policies in France and Italy are passed on to other members of the EMU. The next most important countries are the Netherlands and Spain with an impact of 3.29% and 4.28% respectively.

With regard to economic significance it can be noted that the average reduction in nominal wage growth in Germany (compared with the year ahead) has been 0.6% since 1992. This means that on average the behaviour of German wage setters has reduced nominal wage growth within the EMU by 0.07% a year since the Maastricht Treaty. While this might not appear to be an overly strong effect, the cumulative reduction in wage growth that has been triggered by the strong influence of German wage setters has been 0.80% over the entire period. Given that the average nominal wage growth in the EMU was 4.14% during the observed period and 3% in the last observed year, this is a quite substantial effect. Put differently, without *German* wage restraint, *European* wage growth would be higher by about one-fifth of actual wage growth.

The above exercise was also conducted with peer wages calculated using exponential weights. This implies that countries with high levels of exports and imports have stronger weights in the construction of the peer-wage variable (and vice versa). Spillovers of Germany in this case even appear to have an average effect of 17.5% while the overall picture is broadly maintained. Also using German wages directly (including all caveats mentioned above) yields significant outcomes for most countries.[11] We prefer to stick to the most conservative approach, so the basic regression results for all succeeding considerations are those displayed in Table 2.

Through the design of the key independent variable, a great weight accrues to the trade share of a respective country with other countries. Given that Germany by its size is one of the most important EMU trading partners of each country in our sample, it hardly comes as a surprise that a leading role accrues to Germany once our coefficients turn out to be significant. Neverthetheless, the analysis puts us in a position in which we can identify Germany as a key player in transnational wage bargaining. Given the lag structure of the analysis, it is not too exaggerated to argue that Germany, to some extent, leads the wage bargains of its fellow EMU colleagues. The term 'pattern setter' for Germany might exaggerate the results. Though, Germany definitely acts as a *primus inter pares* in the trans-European wage-setting process. In combination with the stylised facts presented above, it

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[11] Presentation of these robustness tests is omitted due to space limitations.

Table 3. *The size of the spillovers of a 1% reduction in national wage growth on other countries*

	Effecting country											
Effected country	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain	Average effect OF other EMU members
Austria		−0.21%	−0.06%	−0.47%	−4.10%	−0.04%	−0.06%	−0.84%	−0.30%	−0.05%	−0.20%	−0.63%
Belgium	−0.32%		−0.20%	−5.75%	−7.03%	−0.14%	−0.59%	−1.77%	−4.84%	−0.26%	−0.94%	−2.18%
Finland	−0.25%	−0.56%		−1.01%	−3.05%	−0.11%	−0.16%	−0.78%	−0.89%	−0.13%	−0.42%	−0.74%
France	−0.22%	−1.74%	−0.10%		−3.77%	−0.11%	−0.25%	−2.06%	−0.96%	−0.28%	−1.60%	−1.11%
Germany	−0.96%	−1.17%	−0.21%	−2.17%		−0.12%	−0.22%	−1.50%	−1.36%	−0.20%	−0.69%	−0.86%
Greece	−2.69%	−8.12%	−0.37%	−17.48%	−41.28%		−1.81%	−35.82%	−13.24%	−0.97%	−8.08%	−12.99%
Ireland	−0.35%	−3.92%	−0.44%	−5.13%	−8.05%	−0.24%		−2.54%	−3.94%	−0.30%	−1.53%	−2.64%
Italy	−1.21%	−2.00%	−0.26%	−6.44%	−9.25%	−0.66%	−0.42%		−2.15%	−0.48%	−2.56%	−2.54%
Netherlands	−0.19%	−2.09%	−0.17%	−1.51%	−4.06%	−0.10%	−0.21%	−0.82%		−0.45%	−0.12%	−0.97%
Portugal	−0.75%	−3.73%	−0.47%	−10.91%	−15.14%	−0.23%	−0.52%	−5.91%	−4.40%		−18.43%	−6.05%
Spain	−0.27%	−0.92%	−0.08%	−5.02%	−4.20%	−0.16%	−0.25%	−2.71%	−0.99%	−1.53%		−1.61%
Average effect ON other EMU members	−0.72%	−2.69%	−0.26%	−6.16%	−10.65%	−0.21%	−0.49%	−5.99%	−3.29%	−0.51%	−4.28%	
Cumulated economic effect on the EMU	−0.04%	−0.08%	0.00%	−0.37%	−0.80%	0.02%	0.02%	−0.14%	−0.06%	−0.07%	−0.30%	

Note: Percentages imply that during the observed period X% of a 1% reduction in wage growth are passed on to other countries on average. The calculation is based on the recalculation of the key independent variables using average weighting factors and coefficients.

should become clear that Germany has induced substantial wage restraint across Europe in the exercise of this dominating role.

Of course, the fact that wage bargainers tied national wage accords (irrespective whether this has been done implicitly or explicitly) to the development of the wages of their most important trading partners implies that this has been done based on the expectation that productivity growth is thereby linked to competitors. Consequently, a strong connection of wages leads to the expectation of a strong connection of unit labour costs. But has this actually been achieved in reality?

8. Unit labour cost developments in the EMU and the competitive position of individual countries

This section investigates the development of NULC in the EMU, since from a competitive view their development is the most important outcome of national wage policies. To do this the following regression is estimated for each of the observed countries:

$$d\log\left(NULC_{i,j}^v\right) = \beta_1 + \beta_2\Delta\log CPI_j^v + \beta_3 UD_j^v + \; + \beta_5\Delta\log\left(EMP_{i,j}^v\right)$$

$$+ \beta_6 \log ULC_{i,j-1}^v \Big/ ULC_{i,j-1}^{Peer} + \varepsilon_{i,j}$$

Variables are defined as above with the same expected signs. Instead of ΔUR, the number of hours worked—labelled EMP—is used since this also accounts for different sectoral effects of business cycles.[12] $ULC_{i,j-1}^v \big/ ULC_{i,j-1}^{Peer}$ is the ratio of national to peer NULC, so we perform a direct test of the cross-influence of changes in competitive positions. The results can be seen in Table 4.

Again there is an unexpected result of ΔCPI for the case of Austria and Belgium. All other control variables either show the expected sign or are statistically insignificant.

Similar to the results for the wage regressions, $ULC_{i,j-1}^v \big/ ULC_{i,j-1}^{Peer}$ turns out to be statistically significant in all cases. Given the analysis above, the results are surprising since the country order with regard to economic significance is somewhat inverted. Austria (-0.346) and Belgium (-0.387) show the strongest relation of national unit labour cost developments to the unit labour cost developments of their peers. There still is a notable influence in Germany (-0.170) and the Netherlands (-0.158). However, the link-up of wage bargaining outcomes for the trans-European competitive situation of the other observed countries is significantly weaker, ranging from -0.113 in Ireland to only -0.011 in the case of Greece.[13]

It is noteworthy that the development of the competitive position of those countries whose wage developments show the strongest interdependencies is actually weakest. This reflects a major warning of most of the earlier studies on wage convergence, namely that high wage-interdependencies might lead to a diminishing possibility of correcting asymmetric labour productivity developments. This appears to be exactly what has happened in the EMU during 1992–2005 (Table 5).

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[12] Since the independent variable is constructed by using EMP it is not used in the wage regression.

[13] Also in the case of NULC robustness tests using exponential weights and a second lag of the key independent variable have been used. Again, the results turn out to be robust against the use of the second lag, with only Spain becoming statistically insignificant. The use of exponential weights, however, appears to be an inferior model to the use of linear weights, yielding only significant outcomes for a few countries. Again, space limitations prevent the presentation of these results.

Table 4. *The effects of peer unit labour costs on national unit labour cost growth*

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain
Period	10	14	14	14	14	14	14	14	14	13	14
Cross-sections	11	11	11	11	11	11	11	11	11	11	11
Observations	110	154	154	154	154	154	154	154	154	142	154
C	0.348***	0.600***	0.222***	−0.310***	0.055	0.807***	0.284***	0.815***	0.394***	0.347***	0.507***
	(6.210)	(4.753)	(2.757)	(−3.457)	(1.213)	(4.671)	(3.206)	(3.843)	(5.029)	(2.828)	(3.369)
$\Delta \log CPI$	−0.240	−1.083*	0.669**	2.751**	1.780***	0.044***	0.540	3.608***	2.634***	1.435***	0.013**
	(−0.565)	(−1.899)	(2.248)	(2.248)	(3.392)	(5.453)	(0.841)	(3.060)	(5.477)	(4.171)	(2.586)
UD	0.000	−0.003**	−0.002**	0.056***	0.003**	−0.024***	−0.003**	−0.024***	−0.013***	−0.009**	−0.027***
	(−0.064)	(−2.120)	(−2.157)	(4.176)	(2.110)	(−4.683)	(−2.065)	(−3.634)	(−5.453)	(−2.386)	(−3.602)
$\Delta \log$ $(GDPR/EMP)$	0.188	−0.671***	0.627***	−0.116	0.195	0.285**	0.657***	−0.302	0.103	0.009	0.231*
	(1.508)	(−5.352)	(12.048)	(−0.393)	(1.792)	(2.528)	(4.603)	(−0.879)	(0.773)	(0.061)	(1.929)
$NULC_{T-1}/$ $NULCPEER_{T-1}$	−0.346***	−0.387***	−0.057***	−0.033***	−0.170***	−0.011***	−0.113***	−0.084**	−0.158***	−0.101***	−0.068*
	(−8.531)	(−5.719)	(−3.112)	(−5.862)	(−3.502)	(−5.225)	(−4.238)	(−2.194)	(−2.932)	(−3.265)	(−1.894)
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.575	0.354	0.630	0.336	0.490	0.530	0.325	0.249	0.349	0.471	0.208
Adj. R^2	0.513	0.289	0.593	0.269	0.438	0.483	0.257	0.173	0.283	0.413	0.128
F-statistic	9.193***	5.442***	16.911***	5.021***	9.527***	11.198***	4.775***	3.290***	5.317***	8.087***	2.608***
Prob. (F-statistic)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
DW	1.884	2.080	2.326	1.785	1.711	2.040	2.066	2.293	1.802	2.140	1.777

Note: The dependent variable is the lagged percentage change of national NULC. C is the intercept, $\triangle CPI$ the change of the CPI, UD is union density, $\Delta \log EMP$ is the percentage change of sectoral employment and $NULC_{T-1}/NULCPEER_{T-1}$ is the lagged value of national unit labour costs over peer unit labour costs. T-values are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 5. *The size of the spillovers of a 1% reduction in national unit labour cost growth on other countries*

		Effecting country										
Effected country		Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain	Average effect OF other EMU members
	Austria		−1.16%	−0.33%	−2.59%	−22.57%	−0.19%	−0.33%	−4.61%	−1.63%	−0.27%	−1.11%	−3.48%
	Belgium	−0.56%		−0.36%	−10.23%	−12.52%	−0.25%	−1.05%	−3.14%	−8.61%	−0.46%	−1.68%	−3.89%
	Finland	−0.19%	−0.44%		−0.79%	−2.36%	−0.09%	−0.12%	−0.61%	−0.69%	−0.10%	−0.33%	−0.57%
	France	−0.07%	−0.52%	−0.03%		−1.13%	−0.03%	−0.07%	−0.61%	−0.29%	−0.08%	−0.48%	−0.33%
	Germany	−1.90%	−2.31%	−0.42%	−4.30%		−0.24%	−0.44%	−2.97%	−2.69%	−0.40%	−1.37%	−1.71%
	Greece	−0.02%	−0.07%	0.00%	−0.14%	−0.34%		−0.01%	−0.30%	−0.11%	−0.01%	−0.07%	−0.11%
	Ireland	−0.15%	−1.67%	−0.19%	−2.19%	−3.43%	−0.10%		−1.09%	−1.68%	−0.13%	−0.65%	−1.13%
	Italy	−0.40%	−0.66%	−0.09%	−2.13%	−3.06%	−0.22%	−0.14%		−0.71%	−0.16%	−0.85%	−0.84%
	Netherlands	−0.32%	−3.40%	−0.27%	−2.45%	−6.61%	−0.16%	−0.34%	−1.33%		−0.20%	−0.73%	−1.58%
	Portugal	−0.12%	−0.62%	−0.08%	−1.82%	−2.52%	−0.04%	−0.09%	−0.98%	−0.73%		−3.07%	−1.01%
	Spain	−0.11%	−0.39%	−0.03%	−2.13%	−1.78%	−0.07%	−0.11%	−1.15%	−0.42%	−0.65%		−0.69%
	Average effect ON other EMU members	**−0.39%**	**−1.12%**	**−0.18%**	**−2.88%**	**−5.63%**	**−0.14%**	**−0.27%**	**−1.68%**	**−1.76%**	**−0.25%**	**−1.03%**	
	Cumulated economic effect on the EMU	**−0.03%**	**−0.09%**	**0.01%**	**−0.32%**	**−0.65%**	**−0.01%**	**−0.02%**	**−0.13%**	**0.04%**	**−0.05%**	**−0.05%**	

Note: Percentages imply that during the observed period *X*% of a 1% reduction in wage growth are passed on to other countries on average. The calculation is based on the recalculation of the key independent variables using average weighting factors and coefficients.

Again, Germany exerts the strongest influence on the other countries, but with roughly 4% the effect is substantially smaller than the effect of German wage developments. Furthermore, while the strong average effect of German wages on the wages of other EMU members is driven by Southern European countries, the effect of German NULC is driven by a core group composed of Austria, Belgium and the Netherlands. The effect experienced or exerted by other countries is substantially smaller (again with France as the second most important country), with Austria and Belgium experiencing a notable net influence from abroad. In terms of economic significance, the picture that arises again is similar to that above. Germany has induced a reduced NULC growth rate during 1992–2005 of 0.05% a year on average, cumulating to 0.65% for the entire period. Given that the growth rates of NULC averaged only 1.28% in the EMU since 1992, this effect is even more important than the effect on wages in relative terms. However, given the influence of NULC and the fact that the Core is more strongly tied to Germany in terms of NULC, this even increases the centrifugal forces in terms of competitiveness. The Periphery appears to be more detached from this development. As the stylised facts demonstrate, this development is combined with higher NULC growth rates. It is rather due to inflation differentials than to a significant difference in wage restraint. Via their effect on real interest rates, this might also have added to different developments with regard to GDP growth in the EMU. This has added to some of the developments that led to the imbalances that have been plaguing the EMU since the financial crisis hit the currency area in 2008.

9. Robustness tests

The results presented above are robust against a battery of robustness checks. Using the contemporaneous values of variables such as CPI, UR and PROD might raise concerns about endogeneity. With regard to wages, however, as shown in Table A1 in the Appendix, the results are economically and statistically robust against the use of the second lag of these variables, except for the Netherlands. This also applies to the use of the first lag of these variables.[14] Controlling for the endogeneity of the key dependent variable using internal instruments with diverse lags also supported the results (except in the case of Finland and Ireland). As a further robustness test the use of a second lag of the key independent variable was conducted. Again this supported the outcomes given above.

The same roughly applies to the results of NULCs. Using sector fixed-effects and the second lag of the control variables (see Table A2 in the Appendix) does not affect anything substantially. The results are stable for the use of the second lag of the control variables, except for Portugal where the ratio of national to peer NULC becomes statistically insignificant and for Spain where the F-statistic fails to become significant in the case of the second lag of the control variables. As a matter of fact, the key independent variable also becomes insignificant for those countries when using the first lag of the controls. Similarly, controlling for the endogeneity of the key independent variable renders Portugal and Finland insignificant. Finland, however, is fairly robust against all other robustness checks, so I am confident that a relationship—though economically weak—exists. In the case of Spain and especially Portugal, serious doubts about the interference of NULCs

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[14] France being a notable exception as it only is statistically significant at the 15% level using the first lag of the control variables and FEGLS. However, this is neither the case when applying OLS (with heteroscedasticity consistent standard errors) nor is it the case in any of a vast battery of alternative robustness tests. Consequently, I am confident that the detected relationship is valid for the case of France as well.

Table A1. *The robustness of the results for the effects of peer wages on national wages*

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain
Periods	10	14	14	14	12	14	14	12	14	13	14
Cross-sections	13	13	13	13	13	13	13	10	13	13	13
Observations	130	164	168	182	156	182	182	120	182	151	182
C	0.142**	0.270***	0.136*	−0.029	0.055	1.157***	0.449***	0.103	0.072*	0.193	0.228***
	(2.430)	(3.599)	(1.930)	(−0.553)	(1.232)	(7.295)	(7.058)	(0.998)	(1.743)	(1.443)	(3.625)
$\triangle logCPI_{T-2}$	−1.321***	0.969***	−0.153	−0.325	0.302	1.044**	−0.447	0.088	0.574***	0.015	0.011***
	(−6.681)	(3.077)	(−1.333)	(−0.888)	(0.751)	(2.253)	(−1.440)	(0.265)	(2.725)	(0.076)	(5.891)
UD	0.000	−0.007***	−0.001	0.018***	0.005***	−0.023***	−0.004***	−0.002	−0.002	0.002	−0.004**
	(−0.230)	(−2.839)	(−0.836)	(4.344)	(3.325)	(−3.873)	(−5.844)	(−0.685)	(−1.606)	(0.426)	(−2.480)
$\triangle UR_{T-2}$	−0.001	0.001	0.003***	−0.015***	−0.006	0.024**	0.001	0.012**	−0.014**	−0.009**	0.000
	(−0.211)	(0.561)	(3.730)	(−6.273)	(−1.604)	(2.111)	(0.538)	(2.051)	(−7.786)	(−2.454)	(0.122)
$\triangle log_{T-2}(GDPR_{T-2}/EMP_{T-2})$	−0.303***	−0.042	−0.018	−0.034	−0.113*	−0.092*	0.172***	0.099	0.055	−0.037	0.015
	(−6.607)	(−0.917)	(−0.747)	(−0.634)	(−1.662)	(−1.782)	(3.049)	(1.625)	(1.563)	(−0.629)	(0.341)
$W_{T-1}/WPEER_{T-1}$	−0.082**	−0.243***	−0.054*	−0.084**	−0.126***	−1.485***	−0.363***	−0.246**	−0.016	−0.507***	−0.353***
	(−2.064)	(−7.568)	(−1.703)	(−2.351)	(−3.437)	(−10.588)	(−4.928)	(−2.581)	(−0.603)	(−3.124)	(−5.142)
Cross-section fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.498	0.477	0.175	0.310	0.290	0.507	0.254	0.209	0.419	0.379	0.438
Adj. R^2	0.422	0.416	0.087	0.239	0.202	0.456	0.177	0.104	0.359	0.299	0.380
F-statistic	6.543***	7.842***	1.996**	4.340***	3.308***	9.914***	3.284***	1.982***	6.961***	4.767***	7.517***
Prob. (F-statistic)	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.026	0.000	0.000	0.000
DW	2.080	2.140	2.393	2.104	2.058	2.063	2.455	1.687	2.139	2.213	1.544

Note: The dependent variable is the lagged percentage change of national wages per hour ($\triangle WPH$). C is the intercept, $\triangle CPI$ the change of the CPI, UD is union density, $\triangle UR$ is the change of the unemployment rate and $\triangle W_{T-1}/WPEER_{T-1}$ is the lagged ratio of national over peer wages. T-values are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table A2. *The robustness of the results for the effects of peer NULC on national NULC*

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain
Periods	10	13	13	13	12	13	13	13	13	13	11
Cross-sections	11	11	11	11	11	11	11	11	11	11	11
Observations	110	143	143	143	132	143	143	143	143	142	121
C	0.335***	0.624***	0.261**	0.066	0.071	0.387*	0.358***	0.819***	0.738***	−0.017	0.480**
	(6.299)	(5.172)	(2.399)	(0.659)	(1.464)	(1.810)	(3.835)	(3.310)	(8.349)	(−0.327)	(2.375)
$\Delta logCPI_{T-2}$	0.360	1.775***	−0.739**	0.560	0.749*	−0.012	−1.986***	1.544	−0.185	0.704**	−0.816
	(1.340)	(3.126)	(−2.077)	(0.505)	(1.665)	(−1.030)	(−3.211)	(1.381)	(−0.330)	(2.598)	(−1.418)
UD	0.000	−0.005***	−0.001	0.016	0.000	−0.001	−0.003**	−0.022***	−0.019***	0.002	−0.020*
	(−0.478)	(−3.001)	(−1.269)	(0.991)	(−0.160)	(−0.094)	(−2.293)	(−2.936)	(−7.597)	(0.651)	(−1.951)
$\Delta logEMP_{T-2}$	−0.328***	0.232*	−0.107**	0.281	0.274***	0.001	0.141	−0.161	0.607***	0.204	−0.178
	(−3.356)	(1.819)	(−2.003)	(1.013)	(2.740)	(0.006)	(1.007)	(−0.434)	(5.059)	(1.607)	(−1.274)
$NULC_{T-1}/NULCPEER_{T-1}$	−0.342***	−0.362***	−0.096***	−0.318***	−0.078	−0.093***	−0.105***	−0.105**	−0.314***	−0.076	−0.085*
	(−8.673)	(−4.916)	(−4.255)	(−4.836)	(−1.533)	(−4.009)	(−3.664)	(−2.404)	(−5.489)	(−0.865)	(−1.891)
Cross-section fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^{12}	0.622	0.317	0.334	0.338	0.253	0.364	0.239	0.241	0.447	0.235	0.159
Adj. R^{22}	0.566	0.242	0.262	0.266	0.163	0.294	0.155	0.159	0.387	0.151	0.048
F-statistic	11.159***	4.234***	4.594***	4.675***	2.827***	5.234***	2.867***	2.911***	7.400***	2.786***	1.430
Prob.	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.001	0.152
F-statistic) DW	2.079	2.141	1.870	2.021	1.840	1.912	1.947	2.303	1.974	2.190	1.895

The dependent variable is the lagged percentage change of national $NULC$, $ULC_{ij-1}^v/ULC_{ij-1}^{peer}$. C is the intercept, ΔCPI the change of the CPI, UD is union density, $\Delta logEMP$ is the percentage change of sectoral employment and $\Delta NULCPEER_{T-1}$ is the lagged value of peer unit labour costs. T-values are in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

arise. This, however, supports the hypotheses that the interdependence in the case of unit labour costs is substantially weaker in the case of peripheral European economies.

10. Conclusion

The *peer-wage-setting hypothesis* for the EMU, according to which Germany acts as a pattern setter of trans-European wage bargains, has been tested in this paper. We found a strong and robust influence of the wage developments of the most important trading partners on national wage growth rates, which supports the *peer-wage-setting hypothesis*. While claiming that Germany has effectively become a pattern setter might be a slight exaggeration of the results, it is clearly shown that Germany is by far the most important actor in European wage bargains. Indeed, a cumulative reduction of 0.8% in nominal wage growth rates across the EMU can be attributed to the influence of Germany from 1992 to 2005. Further, 10% of the changes in German wage growth are transmitted to other EMU members. Germany acts as a *primus inter pares* of European wage bargaining and the *peer-wage-setting hypothesis* appears to be materialising. This has important implications for monetary policy as well as for wage policies; first of all but not exclusively for those in Germany.

A second major result of this paper accrues to NULC. In the face of the divergences within the EMU that have become obvious with the recent financial and economic crisis, these results are rather alarming. German influence is strongest on the Core group and the Southern European countries are influenced by German competitiveness only to a quite small extent. It is demonstrated above that this appears to be caused by stubborn inflation differentials between these areas.

In summary, the nucleus of an implicit trans-European wage bargaining system has been identified. Unfortunately this system is based on nominal wage growth rates and has not succeeded in avoiding the dangerous divergences of unit labour costs within the EMU that have become obvious in the recent economic crisis. While the data used for the analysis of this paper span the period 1992–2005, it remains to be seen whether the recent economic crisis and the massive austerity packages implemented in most countries of the Periphery did substantially alter the interdependence of wages and the divergences of NULC. This urgently needs to be closely monitored. In order to avoid a re-emergence of dangerous divergences within the EMU, a more institutionalised framework for coordinated economic policymaking over and above simple rules appears to be highly recommendable.

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