Wage and Employment Developments in the Euro Area; Key Understandings from a Multi-Country Macro-Econometric Model*

Camille Logeay, Katja Rietzler and Rudolf Zwiener

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1 Introduction

The fall of 2005 marks almost seven years since the European Monetary Union (EMU) was launched. After a long weak phase, the external value of the euro against the dollar has risen well above its initial rate. The euro area's inflation rate—as indicated by the HICP—was 2.1% in the summer of 2005, making it slightly higher than the inflation rate target of the European Central Bank (ECB). In previous years, which had seen occasionally hefty increases in energy prices, the HICP had fluctuated between 1.1% and 2.3%. On average price level stability goals were achieved for the EMU as a whole over the years since 1999.

This, however, does not apply to each individual member state. Since the introduction of the common currency, inflation rates have again begun to diverge. At the same time, the rates in some countries (especially Germany and Austria) have consistently remained well below the ECB's inflation rate target, while inflation rates in other countries (Spain, the Netherlands, Ireland, Portugal, and Greece) have at times topped 4%, putting them well above the ECB's target rate. The same is true of wage gains: wage growth in the euro area and in most of the individual member states was higher following monetary union than it had been in previous years, but in Germany was well below the euro-area average. At the same time, Germany has in recent years shown weaker growth on average than, for instance, Spain, whose inflation rate was higher than average.

Different inflation rates in EMU member states do not *per se* represent a problem for the stability of the currency or for the effectiveness of monetary policy. Rather, different inflation rates are one of EMU's remaining adjustment mechanism when economies are subjected to shocks of varying intensity. This is, after all, how the real exchange rate is altered. In addition, it is often argued that as a part of the process of real convergence—that is, the catch-up growth of countries with lower income levels—price levels would end up being brought into line by higher inflation rates. This would mean that differences in inflation are primarily structural in origin. However, the fact that inflation rates in some countries remain either above or below the EMU *over a considerable period of time* may reflect functional problems with monetary union that can end up hampering economic growth. The divergence of inflation rates could indicate, for one thing, that relative prices (real exchange rates) are being corrected only slowly and, for another, that more fundamental structural problems exist (with, for instance, the way that wages are set), which are in turn capable of setting off asymmetric shocks.

The study focuses on the countries **Germany**, **France**, **Spain** and the **Netherlands**, which represent nearly 70% of total economic output in the EMU. Furthermore, this group includes both large and small member states, which also differ in their degree of openness.

Since long-term divergence in the development of national price levels is for the most part due to differences in national wage policies, we present a benchmark for evaluating wage policy. Using the DIW Berlin's EBC model's wage, price, and employment equations, we then show how wages, prices, and employment are determined in the countries being examined and how these elements interact with one another. Next, we simulate a wage shock using the DIW Berlin's multi-country model (EBC model) and investigate its impact on growth and employment in the countries under observation. We finish with the economic policy conclusions that can be drawn on the basis of our study for wage policy in the euro area.

2 Price and Wage Development in the EMU

2.1 Possible causes of the differing inflation rates in EMU countries

After the beginning of monetary union, divergence in inflation rates in the EMU member states has again risen above the convergence-process level, at least in the first years. As Figure 2-1 illustrates, the monthly inflation rate in the euro area[1] fell during the run-up to monetary union from more than 2.5% to under 1%. In the two years following the introduction of a common currency, it again climbed to 3%. However, gradual decline has been recorded since mid-2001, and the euro-area inflation rate once again dropped briefly below 2% in the spring of 2004. On average, inflation in the euro area has been higher since the establishment of the EMU than in the two years before it began, i.e. in the reference period for the evaluation of nominal convergence. Both prior to and following monetary union, inflation in Germany was significantly lower than in the euro area as a whole. The difference in the last two years was roughly one percentage point.

A **multitude of causes** could be responsible for different inflation rates in the member states of EMU:

1) Dissimilar weighting of the individual categories of commodities in the HICP

2) Price level convergence via goods arbitrage or the Balassa-Samuelson effect

3) Adjustment of indirect taxes and regulated prices

4) Structural differences with regard to foreign trade integration with countries outside the euro area and different dependence on oil imports

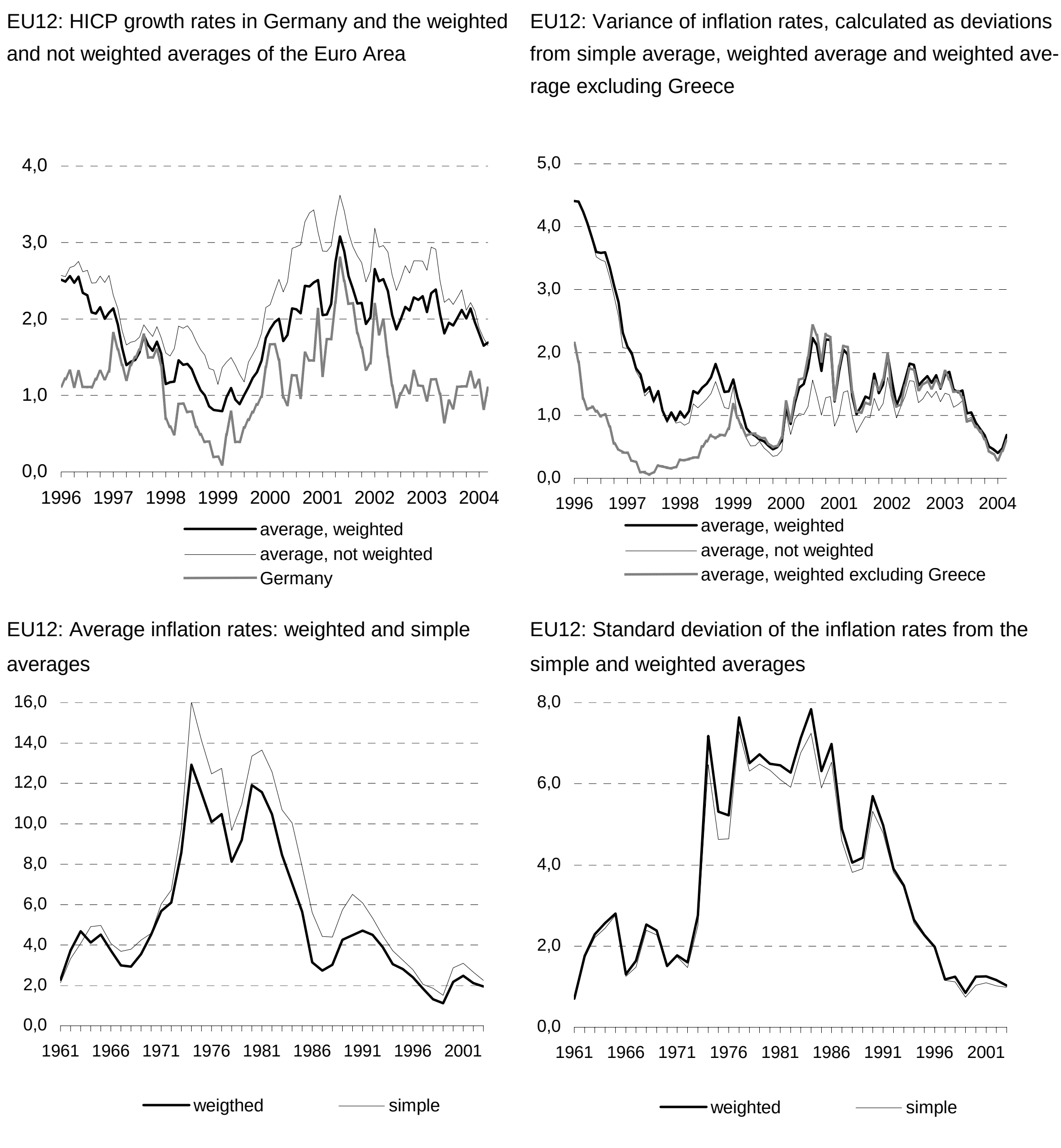
5) Different adjustment mechanisms following shocks and cyclical differences

6) Frictions related to transition, such as the ECB’s initially ambiguous inflation target, the substantial drop in interest rates in some countries during the run-up to monetary union, and, possibly, the need to correct the conversion exchange rates.

[1] This is the inflation rate of the EU12, whereby the inflation rates of the individual member states were weighted according to their share of GDP.

Figure 2.1
Inflation rates and its variance in EMU member states

monthly data January 1996 - March 2004 and annual data 1960 - 2003



Sources: Eurostat, IMF IFS; own calculations.

The wage-setting mechanism is crucial for inflation differences and adjustment after shocks. Wage reactions in individual countries to external and internal shocks, as well as the wage-setting process as such, can trigger either more prolonged or recurrent disturbances within the monetary union. A monetary union is characterized by uniform monetary policy and a common currency. Following external or internal shocks, neither monetary policy nor the exchange rate can be used as a country-specific adjustment instrument to modify one country's price competitiveness relative to the other members of the monetary area. Fiscal policy, as an element of macroeconomic management, can be utilized at most for the short-term stabilization of fluctuations in demand, if this is—given the Stability and Growth Pact—allowed to happen at all. Of course, fiscal policy otherwise does influence economic growth: on the revenue side in the area of taxes and duties, and on the spending side by providing infrastructure in the area of human resources and investment capital, and by giving incentives as part of the transfer system. However, in a monetary union it is inevitable that wages take on greater importance as an adjustment variable. They are supposed to maintain or improve the country's price competitiveness, while at the same time not weakening domestic demand.

Inflation differentials will continue to be inseparable from monetary union in the future as well, since changes in relative prices are one of the remaining mechanisms available to adjust to shocks. However, it can be anticipated that their extent and persistence will decline.

1) Wage policy is critical to the duration of the adjustment process and to differences between countries. A more protracted period of inflation differentials can be expected if reactions to shocks differ in the various member states.

2) The interest rate and trade channels have less impact in the EMU than when monetary policy is independent, but the (adverse) real interest rate effect will not be as great as it was in the early years of monetary union following the convergence process. The trade effect, furthermore, can not only be impeded by compensatory capital flows, but it is also contingent on the development of the exchange rate against the US dollar.

3) After almost seven years of monetary union, almost all of the transitory frictions may be considered solved. The experience gained here, however, should be taken into account when the euro area is enlarged. Although the economies being added are too small to have a significant impact on the euro area as a whole, an enlargement of the EMU might lead to a new increase in the divergence of inflation rates in the future as well.

4) In the long run it can be anticipated that differences in inflation rates resulting from regulated prices and taxes will continue to occur. Countries with high dependency on the exchange rate against the US dollar will show greater fluctuation in inflation rates.

2.2 A benchmark for evaluating wage policy

The following section discusses the question of the 'right' wage policy. One important question raised by the establishment of monetary union was whether wage policies, as conducted in the individual countries up till then, could continue unchanged even after 1999. The prevailing view is that the discontinuation of national monetary policy reduces the incentive of those setting wages within a given country to pursue moderate wage policies, since each country in a monetary union contributes only to a certain (greater or lesser) degree to European price increase averages, and the excesses of an individual country are thus almost never directly penalized. In other words, the internalization of the economic consequences of national wage policy for employment declines in the individual countries. There was particular apprehension regarding German wage trends following the accession to the EMU. However, the moderate wage trends of the period that began in 1994/1995 continued in Germany after 1999 as well, including 1999 and 2000, which were stronger years for the economy. The original fears—at least with respect to Germany—proved to be unfounded. This study does not, however, analyse why German wage-setting behaviour did not change with the advent of EMU, but instead explores the question of the right wage policy recommendation within a monetary union and of whether such a recommendation can be the same for every member state.

A normative **wage formula** is needed, which supports the process of economic convergence by allowing countries with higher productivity increases to agree on above-average wage increases. At the same time all countries do have to respect the ECB's price target. In view of the ECB's price target, the maximum upper limit of 2% as the target inflation rate, rather than the actual price trend, should be used in the wage formula. At the same time, wage increases in the individual EMU countries are to be based on average productivity increases in each country. This permits above-average nominal wage increases in countries that have attained higher gains in productivity. This concept of a normative wage formula uses the change in unadjusted average productivity. If we assume, moreover, that production elasticity remains constant at least over the longer term, then the unadjusted average productivity trend approximates that of marginal productivity in a Cobb-Douglas function. Trend developments in productivity are used as a benchmark in order to also shut out cyclical fluctuations in productivity that have nothing to do with wage policy.

The wage variable under consideration here is the cost of labour (i.e., employee compensation per wage and salary earner, which includes income tax and the social security contributions paid by both sides). The wage formula is thus as follows:

$$(6)\ \Delta \ln(W_t) = \Delta \ln \left[\frac{Y}{L}\right]_{average} + 2\% .$$

This wage formula raises two questions, one of which relates to the aggregate level it should apply to and the other of which asks how wage growth above or below this formula should be identified and corrected.

Both possibilities—undercutting or exceeding the wage formula—are not sustainable over the long term. Before monetary union began, the necessary corrections could have been made in less time with the national monetary policy of the country in question. Applying the wage formula makes sense also on the level of the individual countries, and it should therefore as well be used as a national wage benchmark. Countries would then not be creating a competitive advantage for themselves at the expense of other countries through low-wage dumping; all of them would be helping to promote European growth with their domestic demand, meeting the ECB's price target, and thereby facilitating a growth-friendly monetary policy.

Table 2-1
Wage, Price and Productivity Development in the EMU

% change on the previous year

	EMU	Germany	Spain	France	Italy	Nether-lands	**EMU**	Germany	Spain	France	Italy	Nether-lands
	HICP						**nominal wage[1]**					
1991				3,4	6,2	3,2						
1992				2,4	5,0	2,8	**7,3**	10,5	11,2	3,8	5,4	4,6
1993			4,9	2,2	4,5	1,6	**4,0**	4,1	7,3	2,4	4,0	2,9
1994			4,6	1,7	4,2	2,1	**2,9**	3,0	3,7	1,4	3,6	1,9
1995			4,6	1,8	5,4	1,4	**2,1**	3,6	3,7	2,0	4,3	1,2
1996	**2,3**	1,2	3,6	2,1	4,0	1,4	**2,4**	1,3	4,6	1,9	5,7	1,4
1997	**1,7**	1,5	1,9	1,3	1,9	1,9	**1,8**	0,8	2,5	2,0	4,1	2,1
1998	**1,2**	0,6	1,8	0,7	2,0	1,8	**1,1**	1,0	3,0	1,6	-1,7	3,8
1999	**1,1**	0,6	2,2	0,6	1,7	2,0	**1,9**	1,2	2,8	2,1	1,9	3,1
2000	**2,1**	1,4	3,5	1,8	2,6	2,3	**2,6**	2,1	3,8	2,0	2,9	4,3
2001	**2,4**	1,9	2,8	1,8	2,3	5,1	**2,7**	1,7	4,0	2,9	2,8	4,8
2002	**2,3**	1,3	3,6	1,9	2,6	3,9	**2,5**	1,5	3,8	2,7	1,8	5,5
2003	**2,1**	1,0	3,1	2,2	2,8	2,2	**2,4**	1,6	4,2	2,5	2,9	3,2
	productivity[2]						**real wage[3]**					
1992	**2,5**	3,7	2,3	2,1	1,2	0,1						
1993	**0,9**	0,3	1,8	0,4	1,6	0,3						
1994	**2,7**	2,5	2,9	1,9	3,7	2,2						
1995	**1,4**	1,5	0,9	0,8	3,0	0,8			-0,9	0,2	-1,1	-0,2
1996	**0,9**	1,1	1,2	0,7	0,5	0,7	**0,1**	0,1	1,0	-0,2	1,7	0,0
1997	**1,4**	1,6	1,1	1,5	1,6	0,6	**0,1**	-0,7	0,6	0,7	2,2	0,2
1998	**1,1**	0,9	0,5	1,9	0,7	1,7	**-0,1**	0,4	1,2	0,9	-3,7	2,0
1999	**0,9**	0,8	0,7	1,2	0,6	1,4	**0,8**	0,6	0,6	1,5	0,2	1,1
2000	**1,2**	1,1	0,7	1,1	1,1	1,2	**0,5**	0,7	0,3	0,2	0,3	2,0
2001	**0,1**	0,4	0,5	0,4	-0,2	-0,6	**0,3**	-0,2	1,2	1,1	0,5	-0,3
2002	**0,3**	0,7	0,6	0,5	-1,5	0,2	**0,2**	0,2	0,2	0,8	-0,8	1,6
2003	**0,3**	0,9	0,6	0,4	-0,9	-0,5	**0,3**	0,6	1,1	0,3	0,1	1,0
	real GDP growth						**unemployment rate (%)[4]**					
1991									13,2	9,1	8,5	5,5
1992	**1,5**	2,2	0,9	1,5	0,8	1,5		6,4	14,9	9,9	8,7	5,3
1993	**-0,8**	-1,1	-1,0	-0,9	-0,9	0,7	**10,1**	7,7	18,6	11,1	10,0	6,2
1994	**2,4**	2,3	2,4	2,1	2,2	2,9	**10,8**	8,2	19,8	11,7	11,0	6,8
1995	**2,2**	1,7	2,8	1,7	2,9	3,0	**10,6**	8,0	18,8	11,1	11,5	6,6
1996	**1,4**	0,8	2,4	1,1	1,1	3,0	**10,8**	8,7	18,1	11,6	11,5	6,0
1997	**2,3**	1,4	4,0	1,9	2,0	3,8	**10,8**	9,7	17,0	11,5	11,6	4,9
1998	**2,9**	2,0	4,3	3,4	1,8	4,3	**10,2**	9,1	15,2	11,1	11,7	3,8
1999	**2,8**	2,0	4,2	3,2	1,7	4,0	**9,4**	8,4	12,8	10,5	11,3	3,2
2000	**3,5**	2,9	4,2	3,8	3,0	3,5	**8,5**	7,8	11,3	9,1	10,4	2,9
2001	**1,6**	0,8	2,8	2,1	1,8	1,4	**8,0**	7,8	10,6	8,4	9,4	2,5
2002	**0,8**	0,1	2,0	1,2	0,4	0,6	**8,4**	8,7	11,3	8,9	9,0	2,7
2003	**0,5**	-0,1	2,4	0,5	0,3	-0,9	**8,9**	9,6	11,3	9,4	8,6	3,8

1 Per head.
2 GDP per persons employed (domestic).
3 Deflator HCIP.
4 Standardised.

Sources: European Commission; DIW Berlin calculations.

3 Stochastic equations and model simulations

3.1 Wage, price and employment equations for selected EMU countries

This empirical analysis focuses on four countries: Germany, France, Spain, and the Netherlands. These countries were chosen for the following reasons: Germany, as the largest country in the EMU and with below-average wage and price increases since the beginning of monetary union, is particularly interesting, although it must be noted that Germany's adjustment patterns are heavily influenced by the consequences of German reunification. France, as another large EMU country, can here be considered representative of more 'normal' adjustment patterns. The Netherlands, on the other hand, is both a smaller country and one that is particularly open with regard to trade integration. Spain is representative of the countries that joined the European Union only later. Spain profited in the run-up to the EMU and after its start in particular from the sharp decline in real interest rates.

'Internal' determinants of wage, price, and employment trends in the four countries were examined first by conducting econometric estimates and simulating and analysing adjustment patterns. A key objective here was ascertaining whether a change in behaviour following monetary union could be observed. As a rule, this was not the case, although the tests have only limited value as evidence given the amount of data available. However, out-of-sample forecasts were used; these constitute a rigorous test and showed **no structural break** in the current situation. It must be further emphasized that the **'internal' adjustment pattern of wages, prices, and employment** to their respective determinants often **differed entirely from country to country**. This applies to the strength of the influencing factors, the chronological order of events, and the choice of the influencing factors as such.

The same framework is applied to all four countries (Germany, France, Spain, and the Netherlands) for all three equations (for wages, prices, and employment). The wage equations are derived from bargaining theory (see Layard/Jackman/Nickell 1991 for an exposition). In this context, wages are dependent on productivity, prices and unemployment. This last term is supposed to measure—inversely—the bargaining power (also named insider effects) of the employee side. The price and the employment equations are derived form the standard profit maximization of a representative firm with market power. Therefore prices are set as a mark-up on unit labour costs and import prices, and employment is dependent on real output and real wages. This means that all four countries start with the same specification of the stochastic equation, provided the relevant data is available. Differences then occur only in the estimated coefficients. Overcoming shocks in a monetary union is accomplished in large part with the adjustment mechanisms of wages and prices. Each country has its own specific features, and it is difficult to identify a common denominator. The chart below again summarizes the elasticities in the error correction terms.

Table 3-1
Long-run elasticities

	Germany	France	Spain	Netherlands
	Wage equations (Germany and France: gross wages. Spain and the Netherlands: wage costs)			
Private consumption deflator	0.60	0.68	0.90	1.00
Labour productivity	0.56	0.74	--	0.19
Unemployment rate (not in %)	-0.42	-1.16	--	-0.06 (in logs)
	Price equations			
Unit labour costs	0.31	0.70	0.35	--
Import deflator	0.29 (*trend)	0.20 (*trend)	0.16	0.32
	Employment equations			
Real GDP	0.45	0.59	0.94	0.82
Real wage costs	-0.52	--	--	-0.15

Gross wages are gross salaries including income tax and social security contributions paid by the employee only.
Wages costs include additionally social security contributions paid by the employers.
--: not significant variable that was consequently restricted to 0.

France is the country whose actual behaviour most closely approximates what would have happened had the normative wage formula been followed: **wages** relative to other countries do not entirely adjust to the actual price trend, but do conform closely to productivity trends. The unemployment rate also has a great impact. Failing to adhere to the wage formula can lead to a variety of sanctions that will not necessarily take the form of higher unemployment. The reverse is also true: not every increase in unemployment is the result of wage trends. Unemployment was thus not included as a determinant in the formula for calculating wage growth, but was used in the wage equation. Furthermore, it may also be considered a significant indicator of the market power of negotiating parties.

Prices in **France** are closely tied to wages—as a result of the influence of unit labour costs—so that real wage rigidity is created by the interaction between wage and price trends. It is thus not surprising that **employment trends** are aligned only with economic growth. As already mentioned, at equilibrium, real wages move proportionally to productivity (defined here as the quotient between real GDP and the number of employees). Thus, if real wages are relatively rigid, productivity should also be relatively stable and employment and real output will move closely together. This translates into a stronger effect of real GDP relative to real wage costs in the employment equation, which we observed for France. This is also what we would have been expected had the normative wage formula been followed (since nominal wages are the adjustment variable, employment does not need to adjust).

The **Netherlands** is a small, very open economy and, over the years, has developed a wage-price rule that is ideal for this kind of country. Because of size and dependence on external trade factors, producers in the Netherlands are unable to adjust their prices to internal (cost) shocks. This makes **prices** in the Netherlands—unlike in France—relatively rigid (with regard to wage trends). **Wages**, however, react quickly and strongly to price trends (unlike in France, where prices tend to adjust more to wages), which also creates a certain de facto real wage rigidity and explains the low coefficients of real wage costs in the employment equation. Adjustment to productivity, on the other hand, is relatively low, which means that **employment** responds to the economic situation more strongly than in France.

The Netherlands' wage-price system makes clear that there is no incentive for small and very open economies to aim for the ECB's target inflation rate or to follow the normative wage formula. In theory, relatively large or less-open economies (Germany, France, Italy, and Spain) have an incentive to agree on uniform behaviour in accordance with the normative wage formula, since their own behaviour could result in (wage) adjustments being made by the other countries. The Dutch variant will seem more advantageous to smaller and more open economies from the individual country's point of view. This variant, however, is detrimental to the other EMU countries, since unemployment—regardless of its origins—is 'exported' abroad by means of wage restraints and the resultant increase in competitiveness. Thus, from the point of view of the other EMU member states, this particular wage-price system has disadvantages.

With respect to elasticities, the wage-setting process in **Germany** is very similar to that in France. While **wage adjustment** following a shock takes place somewhat more slowly in Germany than it does in France, these differences are minimal compared to those seen with price and employment trends. The comparison with France is justified for a number of reasons: both countries are large, their economies are similarly structured (e.g., a similar degree of openness), and the wage-setting process is comperable. Nevertheless, the two countries differ markedly in terms of employment adjustment. **Employment** in Germany reacts less to demand, while responding strongly to changes in real wages. This phenomenon started with the wage and employment trends that were ushered in by German reunification. **Price adjustment** also plays an important role in Germany. Whereas prices in France are very sensitive to changes in unit labour costs—which generates something of a real wage rigidity—the opposite is true in Germany, giving rise to a certain real wage flexibility. Where there is real wage flexibility, productivity must—if real wages are changing as a result of rising prices—also change. This will then—if real GDP is considered exogenous—be achieved by the change in employment. This is why the link between employment and growth is so strong in France and so weak in Germany. What changes in wages and prices do not absorb is absorbed by employment. The final evaluation depends on the type of shocks that have occurred. If these are only shocks that should theoretically have no effect on the 'real wages equal productivity' relation (e.g., changes in oil prices, administrative price increases), real wage rigidity—like in France—is an asset, since employment does not have to absorb them. However, in the case of shocks that change this relation (e.g., the productivity shock initiated by German reunification), real wages must be able to adjust so that job losses can be avoided or at least reduced—like in Germany.

Wages in Spain deviate more sharply from the normative wage formula: they are linked to actual price trends and take neither productivity trends nor the unemployment rate into account. Prices in turn tend to follow wage trends closely, which creates a relative real wage rigidity that does not, however, include a sanction mechanism. Nevertheless, just as in France, employment trends here are dependent on demand. This model in its current form will probably not be sustainable over the long term. Spain's economy began to catch up with the rest of Europe much later.

However, once the EMU's initial expansionary impact on Spain tapers off, Spain will need wage behaviour capable of securing international competitiveness over the long term.

3.2 DIW Berlin's EBC model

DIW Berlin's European Business Cycle Model (EBC model) is used to predict economic development in Germany and important European countries in the short and medium term. It can also be used to analyse wage, monetary, and fiscal policy measures. It consists of country models (Duong, Manh Ha et al (2005), Logeay, Camille et al (2005a, 2005b), Rietzler, Katja (2005) for Germany, France, Spain, and the Netherlands, which are linked with one another by exports, imports, and the corresponding export/import prices. The model is data-based and not calibrated. The estimates are based on data from the quarterly national account statistics of the individual countries (source: DIW Berlin or Eurostat). The time series have not been seasonally adjusted. The stochastic equations are specified in the form of error-correction models, in which economic hypotheses are paramount for the specification of the cointegration relations. The model equation structure for all of the countries is uniform. The same equations are used for forecasts and economic policy analyses.

One distinctive feature of the EBC model is that there are no restrictions on the equations with regard to homogeneity. Another feature is the regional disaggregation of goods exports by major sales markets, distinguishing at least between goods exports to the euro area and outside the euro area. The reasoning here includes, for one thing, the assumption that export demand in different sales markets varies in terms of income- and price-elasticity. Another consideration is that now that monetary union is complete, a large part of the merchandise exports of EMU countries is no longer affected by exchange rate fluctuations. The model currently includes exclusively adaptive expectations. It allows for nominal rigidities, real effects of economic policy, and market spillover. Unemployment is also able to exist over the long term.

The econometric estimation of the error-correction equations is an essential feature of the model. This includes a series of tests with which the predictive quality of the equations, the stability of the coefficients, and the ex post simulation characteristics of the equations within the model can be checked.

In order to reach conclusions on the effects of country-specific differences in wage, price level, and productivity trends on growth and employment in euro-area countries with the aid of the model, a series of 'shock simulations' are carried out. Here shocks are applied to the model as 'unexpected' and lasting changes in a selected variable in contrast to their actual development (exogenous variable or exogenous intervention in a behavioural equation). The 'shocked' model simulations are then compared with those of the endogenous variables that result when all exogenous variables take their actual values. Within the framework of the analyses done here, the simulation horizon was limited to eight years, with the fictional shocks starting in 1995. Placing the shocks' starting point at a time before the beginning of EMU is permissible in view of the reasonably linear adjustment pattern of econometric models. It has the technical advantage of making it possible to simulate over an eight-year period without having to create forecast values for the exogenous variables.

3.3 Simulation of a wage shock

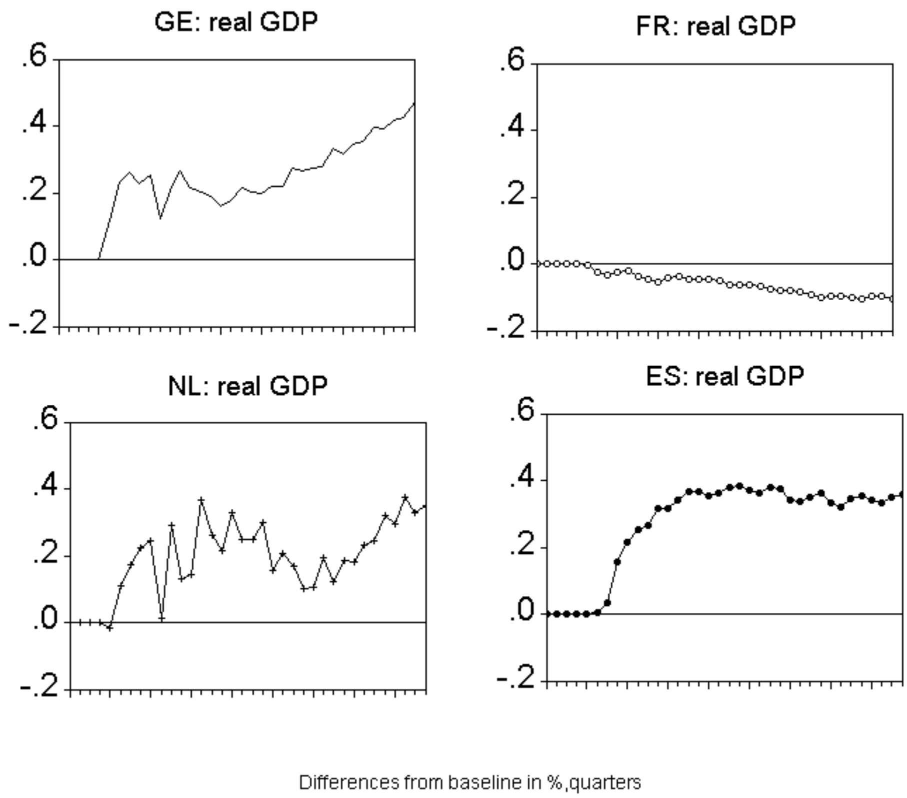
The way autonomous wage increases are adjusted to in the individual EMU member states is crucial to this study. In the simulation study, an **exogenous impulse** is applied to the wage function for all four countries, which in itself raises the **per capita nominal wage level** (total gross wages per capita) **or per capita labour costs** (per capita gross income of employees) **permanently in each country by 1%**. Endogenous processes will then be set in motion, as the result of which the nominal wage level can either continue to climb or decline. The nominal short-term interest rate is kept constant at its historal level. If a Taylor Rule had been applied for the ECB's monetary policy, interest rates would have increased even more than inflation rates and as a result, growth and employment effects would have been reduced. In the complete version of the study, the impact of interest rate changes is examined.

Figure 3-2 lists key macroeconomic variables for the **uniform (symmetrical) wage shock** in the four countries. A significant difference between the Netherlands and the other three countries can already be seen with the induced further **development of wages**. Following the 1% wage shock, nominal wages in the Netherlands tend to move back to the level of the reference scenario, while they continue to rise—price-induced—in Germany, France, and Spain. If we look at the development of real **private consumption**, we see a significant rise in the demand for consumer goods in every country except France. The new medium-term real consumption level is about 0.8% higher than that of the reference scenario. The fact that France shows almost no reaction in private consumption is explained by the specification of the French consumption equation,[2] which differs somewhat from the others. In the medium term, price increases following on from higher wages are then greatest in France. While this increases profits in and of itself, it curbs the development of real private consumption at the same time.

In all four of the countries examined here, **exports** sag as a result of wage-induced reduced international competitiveness. Only the Netherlands is able to turn this process around after four years. This is probably primarily attributable to the Netherlands' own wage-adjustment mechanisms. The Netherlands is able to improve its competitive position relative to Germany, France, and Spain relatively quickly, even though (in this simulation variant) its position relative to the rest of the world has deteriorated. Despite export losses, gross domestic product rises in the medium term in Germany, Spain, and the Netherlands by about 0.3% in comparison to the level of the reference scenario. GDP in France remains virtually unchanged as a result of the particularities of consumption trends in the model (see Fig. 3-1).

[2] Here corporate earnings—along with wage income—play an important role. In the short term, however, there is a virtually automatic connection between higher wages and lower profits. Another equation specification is necessary here.

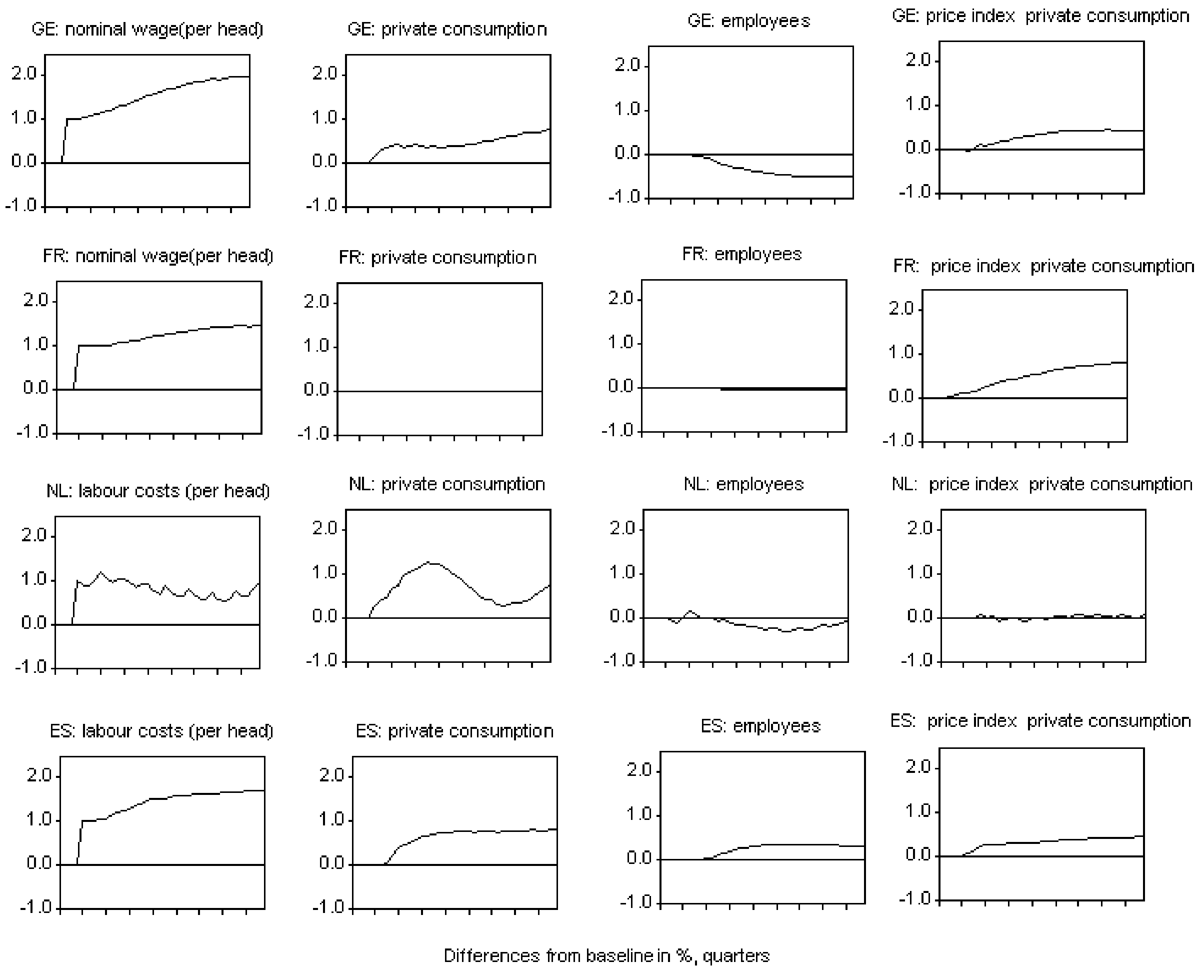
Figure 3-1
Symmetrical wage shock I



The **impact on employment** following the originally uniform increase in wages varies widely from country to country. The development of employment in Germany shows a clear response to the increase in real wages: despite light gains in growth, employment declines slightly. The employment equation incorporates the dramatic real wage increases and job losses following German reunification. This is why real wages, along with demand, are a significant factor in Germany. In Spain, on the other hand, wage increases are followed by increased employment, which accompanies the induced gains in growth. Various tests indicate that Spanish employment trends are not dependent on real wage trends. Employment in France and the Netherlands shows almost no reaction to the nominal wage shock, although the reasons for the lack of response differ. While there is no appreciable impact on growth in France, real wage increases and growth effects tend to balance each other out in the Netherlands in their opposing impact on employment.

The impact on the **consumer price index** that would in theory be expected can be observed in Germany, France, and Spain. The price index climbs steadily, reaching a high of 0.4% (Germany, Spain) or 0.8% (France) above the level of the reference scenario. Only the Netherlands, as a small and very open economy, shows no appreciable induced price effects. Import prices and the weighted foreign price level effectively determine the domestic price level there, which means that the country is largely unable to adjust price levels to changes in wages and productivity. The Netherlands is thus forced to adjust quickly to shocks and changed conditions of

Figure 3-2
Symmetrical wage shock II



competition using other adjustment mechanisms. The impact on growth and employment shown here is, however, too positive in the sense that the simulations did not assume a reaction by the ECB; nominal money market interest rates remain at their actual level and capital market interest rates change slightly.

4 Wage policy in the EMU

A sustainable, non-inflationary wage policy could be achieved if all the EMU member states geared their wage increases toward both the ECB target inflation rate of below 2% per annum and each country's medium-term productivity increase—according to the wage formula discussed at the outset of this study. Countries still undergoing catch-up growth have the potential to generate above-average productivity increases and thus also to permit above-average wage increases without the danger of higher inflation rates. If a country decides to pursue a path of increasing employment with low increases in productivity (per capita), e.g. by pushing through measures to reduce working hours and/or expand part-time work, then (per capita) wage increases would have to be reduced accordingly. If all EMU countries followed this simple formula, none would have a relative competitive advantage or disadvantage due to unit labour cost trends, and at the same time, the ECB would achieve its price target for the euro area. In a nutshell, those are the policy implications resulting from the concept presented here.

None of the EMU member states, however, appear to take the ECB's 2% inflation target as their point of reference. For the smaller countries in particular, this is in fact unnecessary in the short term. In the EMU area, there has never been any instrument for directly penalizing countries with higher inflation. Prior to EMU, the central banks could react immediately by raising interest rates. In the medium term, foreign exchange markets would have reacted as well. In a monetary union, however, each member state only contributes to average European inflation. When one country exceeds the price level, it is therefore seldom directly penalized. And in fact, sanctions taking the form of higher interest rates have a much more severe impact on those countries that are actually showing exemplary behaviour by orienting wages toward productivity growth. In these countries, real interest rates are higher, while in countries with above-average price increases they are correspondingly low. Countries with above-average price inflation also normally bring in above-average tax revenues because of the greater expansion of their nominal tax base. Experience shows that the state gains from inflation. Thus there is no significant impetus for countries with above-average price inflation to implement a restrictive fiscal policy. Instead very often the additional revenues do increase public expenditures. Furthermore, under this approach, nominal national debt depreciates faster. Hence, lower real interest rates and—presumably—a relatively expansive fiscal policy would actually even stimulate growth further. The only case in which growth would not be stimulated is if countries with above-average price increases implemented a relatively restrictive fiscal policy. Deviation from the ECB target inflation rate does not play any role in the Stability and Growth Pact, however. It may take years, depending on the degree of openness of the economy in question, for the sanction mechanism effective in the EMU—the contractionary effect of cumulatively worsening price competitiveness, which ultimately results from above-average wage and price increases—to produce results.

In both countries France and the Netherlands the wage-setting process takes the labour market situation (as reflected in the unemployment rate) strongly into account. When unemployment is low, wages increase relatively steeply and thus stimulate the growth of domestic demand. This has two main consequences. First, it produces a direct demand effect in other EMU countries, and second, it causes the country's own price competitiveness to decline. This, in turn, affects trade flows. The adjustment patterns ensure that rapid stabilization is brought about through both of these channels, with the labour market variable as well probably playing an important role. If the Dutch wage-setting process took average productivity growth more strongly into account, adjustments in the labour markets could be more moderate. This would produce a steadier wage trend overall. Unemployment in particular shows a delayed reaction: when unemployment is low, wage increases are too high, and when unemployment is high, wage increases are too low. The adjustment mechanism is effective in small and very open economies in maintaining a steady wage and employment trend, but it is not optimal. Furthermore, when there is unemployment, wage settlements are usually too low no matter what the concrete reason for the unemployment. From the point of view of the EMU member states, this pattern of reaction is also not optimal.

Looking at the actual wage-setting practices in individual EMU member states, we quickly see that in principle, not a single country uses as its compass the simple normative wage formula, which stipulates that nominal wages in each member state should only rise within the range allowed according to the ECB's target inflation rate and each country's specific medium-term productivity increases, in order to prevent distortions of competition between the countries and wage policy conflicts with the ECB. Is this nothing but a 'fair-weather formula' that can only work in the absence of shocks? After all, in reality there are:

- irregular (and asymmetrical) price and quantity shocks,
- different labour market situations in the individual EMU countries,
- transition problems at the inception of the EMU, which can also entail the necessity for some correction of the initial exchange rates,
- and a lack of direct, fast, and effective mechanisms to penalize 'erroneous' wage adjustments.

If the EMU countries were to follow the simple normative wage formula, their nominal wages—differentiated according to country—would rise at an almost constant rate from year to year. This would mean that wages would react very slowly in adjusting to shocks or correcting 'erroneous' initial exchange rates. The wage increases would depend on the country's medium-term productivity growth. Price adjustments only work to a limited degree in very open economies. What is left, then, are real wage adjustments—with slow adjustments of nominal wages—and the corresponding employment adjustments.

The wage estimations for all countries show that wages respond to price changes, although with major differences in how much and how fast adjustments are made, and in whether the GDP deflator or the consumer price index offers the point of orientation. The GDP deflator has the advantage of not being as heavily influenced by exchange rate fluctuations and energy price changes as the consumer price index. Any significant wage indexation connecting nominal wages to inflation is fundamentally undesirable because it can set a wage-price spiral in motion. Furthermore, some shocks demand adjustment of real wages.

What speaks against allowing unemployment to influence wage settlements? In reality, it already does in many countries—as attested by the market power of the bargaining partners in wage negotiations—and this influence can be very strong. In the wage equation, unemployment plays the role of a corrective element, counteracting excessively high past wage increases. If this is included in the wage equation, however, all unemployment—no matter what the cause—will always adjust wages downwards. This may occasionally be the wrong remedy for the disease. Nevertheless, within a monetary union, it can still work in a small and very open country by reducing unemployment. Decreasing wages relative to foreign countries changes a country's international competitive position: in a small, open country, its positive influence in terms of boosting exports is greater than its negative influence in terms of decreasing private consumption. The final result is that both growth and employment increase, while unemployment decreases. At this point, it is again possible for larger wage increases to take place because unemployment is no longer acting as a corrective element in the wage equation.

Over the whole period of adjustment, a small open country generates contractionary impulses that affect the other countries in the monetary union. Because of its reduced domestic demand, it imports less. From the point of view of the monetary union as a whole or of the neighbouring countries within the monetary union, it is only acceptable for a small, open country to implement a strategy of (relative) wage reductions when unemployment has been caused by excessively high wage costs or low international competitiveness, which could be corrected through a relative reduction in wages.

Even strictly from a country's individual point of view, this strategy of (relative) wage reductions could be less successful for countries with a large domestic market. First of all, prices react to wage changes, at least in countries like Germany, France, and Spain. In these countries, real wages do not fluctuate as much as nominal wages. Furthermore, wages are an important determining factor for private consumption and overall domestic demand. Reducing (relative) wages could curb private consumption more than it would boost exports, and this would reduce aggregate demand. If several countries in a monetary union—especially several larger ones—pursued a joint strategy of very low wage increases as a means of reducing unemployment, it would of course be impossible to improve competitiveness and increase exports for all these countries at the same time. All this strategy would produce is lower private consumption. In this case, the substitution effects of lower nominal—and in part also real—wage costs would barely succeed in generating any positive employment effects. Only a much more expansionary monetary policy could change this result.

The simulation results show that the country with the lowest wage increases in recent years actually shows among the worst growth and employment outcomes in the EMU. In the long term, each country should contribute to overall growth in the EMU by achieving strong growth of domestic demand. In this way, each country would also contribute to growth in its neighbouring EMU countries. The German strategy of weakening domestic demand through below-average wage increases and stimulating employment through increased net exports is counterproductive for the rest of the monetary union. It causes Germany—as a relatively large and less-open economy—to cripple its own growth through the steep decline in domestic demand. In this way, Germany's economic weakness also infects the other countries of the EMU.

In order for the wage policy of the EMU member states to avoid exceeding the ECB inflation target and at the same time, for 'unfair' competitive advantages over trade partners to be prevented, it is crucial that each of the EMU countries utilize the normative wage formula 'target inflation rate plus country-specific medium-term productivity growth' as its point of orientation. Any departure from this formula would only be permissible if a country's international competitiveness had suffered/improved dramatically due to excessively high/low wage increases.

Compared to a normative wage formula of this kind, the actual process of wage setting varies widely among EMU member states. This indicates an urgent need to reform the wage-setting process. By monitoring wages closely throughout the EMU, it would be possible to identify any significant deviations and discuss the problem in the countries affected. Since there are no quick and effective sanctions that can be applied in a monetary union, the only way of influencing the parties negotiating wage increases in the collective bargaining process is to stress the long-term consequences of steadily worsening competition due to excessively high overall wages. The corresponding warning applies to countries with excessively low wage-growth settlements.

During the first few years of the EMU, there was a widespread fear that the inflation rate could turn out to be too high and elicit strong interest rate hikes from the ECB. Even considering the multiple oil price increases and euro exchange rate fluctuations, inflation in the EMU over the last six years has been kept close to the upper limit of the ECB's target inflation rate. This can be counted as a success. A cautious forecast of future price development based on the analysis presented here would be that over the coming years, we will see a stabilization of inflation differences, perhaps accompanied by slight disinflation. This conclusion is based on the observation that the expansionary impulses generated at the inception of the EMU, which were achieved above all through a reduction of the nominal and real interest rate, have since tapered off. At the same time, the international competitiveness of some countries has diminished substantially. Sooner or later this will generate constantly intensifying pressure to curb wage and price increases. At the same time, it is unrealistic to expect Germany, the country with the lowest wage and price increases, to alter its course. Thus, the most likely scenario is that the EMU will experience a low rate of inflation and perhaps even low growth in the coming years. At this point monetary policy has the chance and the responsibility to act: it should be more expansionary now to increase economic growth, without the fear of high inflation rates during the coming years. And it should not wait too long. The current increase in inflation rates we are currently observing is merely a reflection of the sharp rise in oil prices.

5 References

Andersen, T. M. (2003): „Wage Formation and European Integration“. *European Commission, Directorate-General for Economic and Financial Affairs, Economic Papers*, No. 188.

Balassa, B. (1964): „The purchasing-power parity doctrine: a reappraisal”. *Journal of Political Economy*, Vol. 72, No. 6, S. 584-596.

Barrel, R./Dury, K. (2003): „Asymmetric labour markets in a converging Europe: Do differences matter?“. *National Institute Economic Review*, No. 183.

Blanchard, O. (1999): „*The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence*“. http://econ-www.mit.edu/faculty/blanchar/papers.htm.

Buti, M./Roeger, W./in‘t Veld, J. (2001): „Stabilising Output and Inflation in EMU: Policy Conflicts and Co-operation under the Stability Pact“. *Journal of Common Market Studies*, Vol. 39, No. 5, S. 801-828.

Calmfors, L (2001): „Wages and wage-bargaining institutions in the EMU-a survey of the issues“. *Institute for international economic studies, Stockholm University, Seminar Paper*, No. 690, http://www.iies.su.se/publications/seminarpapers/690.pdf.

Calmfors, L. (1998): „Macroeconomic Policy, wage setting and employment-what difference does the EMU make?“. *Institute for international economic studies, Stockholm University, Seminar Paper*, No. 657, http://www.iies.su.se/publications/seminarpapers/657.pdf.

Calmfors, L. (1998): „Monetary Union and Precautionary Labour-Market Reform“. *Institute for international economic studies, Stockholm University, Seminar Paper*, No. 659.

Calmfors, L. (1998): „Unemployment, Labour-Market Reform and Monetary Union“. *Institute for international economic studies, Stockholm University, Seminar Paper*, No. 657, http://www.iies.su.se/publications/seminarpapers/639.pdf.

Deroose, S./Langedijk, S./Roeger, W. (2004): „Reviewing adjustment mechanisms in EMU: from overheating to overcooling“. *European Commission, Directorate General for Economic and Financial Affairs, Economic Paper*, No. 198.

Duong, Manh Ha ; Logeay, Camille ; Stephan, Sabine ; Zwiener, Rudolf; Yahnych, Serhiy (2005) ;Modelling European Business Cycles (EBC Model): A Macroeconometric Model of Germany ; Version March 2005; DIW Berlin, Data Documentation 5

ECB (2003): *Inflation differentials in the euro area: Potential causes and policy implications*. Frankfurt.

European Commission (2004): „EMU after 5 Years“. *European Economy Special Report*, No. 1/2004

Fritsche, U./Horn, G. A./Scheremet, W./Zwiener, R. (1999): “Is There a Need für a Co-ordinated European Wage and Labour Market Policy?”. In: Huemer, G./Mesch, M./Traxler, F. (Hrsg.): *The Role of Employer Associations and Labour Unions in the EMU, Institutional requirements for European economic Policies.* Elgar, Aldershot.

Hancke, B./Soskice, D. (2003): „Wage-Setting and Inflation Targets in EMU“. *Oxford Review of Economic Policy*, Vol. 19, No. 1, S. 149-160.

Honohan, P./Lane, P.R. (2003): „Divergent inflation rates in EMU“. *Economic Policy*, 37, S. 357-394.

Horn, G.A./Scheremet, W./Zwiener, R. (1999): *Wages and the Euro*. Heidelberg

IMF (2002): „Monetary and Exchange Rate Policies of the Euro Area – Selected Issues“. *IMF Country Report*, No. 236, Chapter I, Washington D.C.

Layard, R./Nickell, S./Jackman, R. (1991). *Macroeconomic performance and the labour market*. Oxford University Press, Oxford.

Logeay, Camille ; Schwenkenberg, Julia ; Stephan, Sabine ; Proano-Acosta, Christian ; Yahnych, Serhiy (2005a*): Modelling European Business Cycles (EBC Model): A Macroeconometric Model of France*, DIW Berlin. Data Documentation 2

Logeay, Camille ; Proano-Acosta, Christian ; Stephan, Sabine ; Zwiener, Rudolf ; Yahnych, Serhiy (2005b): *Modelling European Business Cycles (EBC Model): A Macroeconometric Model of the Netherlands* ; Version April 2005: DIW Berlin, Data Documentation 3

Lommatzsch, K., Tober, S. (2003): „The Inflation Target of the ECB: Does the Balassa-Samuelson Effect Matter?”, *Mimeo*.

McMorrow, K. (1996): “The Wage Formation Process and Labour Market Flexibility in the Community, the US and Japan”. *EU-Economic Papers*, Nr. 118.

OECD (2002): „Inflation Persistence in the Euro Area“. *OECD Economic Outlook*, No. 72, Chapter 7, OECD, Paris.

Pauer, F. (1996): „Will asymmetric shocks pose a serious problem in EMU?“. *Österreichische Nationalbank, Working Paper*, No. 23.

Pochet, P. (Hrsg.) (2002): *Wage Policy in the Eurozone*. PIE Peter Lang, Brussels.

Rietzler, Katja (2005*): Modelling European Business Cycles (EBC Model): A Macroeconometric Model of Spain* ; February 2005.DIW Berlin. Data Documentation 4

von Hagen, J. (1999): „Macroeconomic consequences of the EMU“. *Empirica*, 26, S. 359-74.