Generosity of the Unemployment Benefit System and Wage Flexibility in EMU: time-varying Evidence in five Countries

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1. Introduction

The rather smooth establishment of the European monetary union (EMU) in spite, Europe still faces a number of political and economic problems. The most acute one is the weak performance of various national labour markets. Different lines of research have been followed to address the causes of the rising European unemployment. One of the major efforts was the OECD Jobs Study (1994). The main conclusion from this study is that labour market institutions can explain much of the rise in unemployment in various European countries. Because labour market institutions generally favour insiders, the interests of the outsiders will hardly be taken into consideration at the bargaining table and cyclical unemployment tends to become structural. This is in line with the observation of rising equilibrium unemployment accompanying the rise in total unemployment in Europe. Labour market institutions influence the pressure the unemployed exert on wages, i.e. the responsiveness of wages to unemployment, commonly referred to as 'real wage flexibility'. Layard, Nickell and Jackmann (1991) showed that cross-country differences in labour market institutions can account for differences in wage flexibility. Proper redesigning of labour market institutions should therefore increase wage flexibility and reduce actual unemployment.

Blanchard and Katz (1997) argue however that the OECD approach faces some conceptual and empirical problems. According to their view institutions alone cannot explain the rise in unemployment. More recent work by Blanchard (1999a & b) focuses on the interaction between shocks and institutions as an explanation for the rise in European unemployment. The shocks then explain the rise in unemployment, while the institutions account for the differences among European countries. The study also acknowledges the possibility that changes in labour market institutions over time have influenced unemployment (be it in combination with shocks). However, in a 'traditional' framework (as proposed by Layard *et al.* (1991)) with unemployment as the dependent variable regressed upon shocks and time-varying institutions, little evidence is found for the effect of changes in labour market institutions over time. Several other studies also provide empirical evidence on the effect of labour market institutions on unemployment within this traditional framework (e.g. Nickell (1997), Scarpetta (1996)). But we are not aware of any consistent econometric setting that explores the relationship between institutions and wage flexibility *over time within* countries. This is where the contribution of this paper is situated. We define wage flexibility as the coefficient of unemployment in a 'bargaining augmented' wage equation, explaining wage growth. A time-varying parameter framework is then introduced to allow this coefficient to vary with labour market institutions. A significant relationship implies that (changes in) institutions also account for part of the rise in unemployment through changes in wage pressure.

Since the establishment of EMU, the wage flexibility issue has even become more relevant. With member countries being deprived of an independent monetary policy, alternative adjustment mechanisms to deal with (asymmetric) shocks have to be found. One of the possibilities is to enhance wage flexibility.

The remainder of this paper is organised as follows. In section 2 we point to the need for more real wage flexibility in Europe and the possible influences of EMU on real wage flexibility. In section 3 a basic wage equation is introduced and estimated. The relationship between labour market institutions and real wage flexibility is discussed in section 4 together with the possibilities to enhance real wage flexibility through labour market reform. At the empirical level we test whether the generosity of the unemployment benefit system, a labour market institution characterised as of predominant importance in many studies, limits wage flexibility. This was done through the estimation of the wage equation in a time varying parameter framework, where we allowed the generosity of the unemployment benefits to influence the parameter of the unemployment rate in the wage equation. Section 6 concludes with our main findings.

2. Why Europe needs more wage flexibility

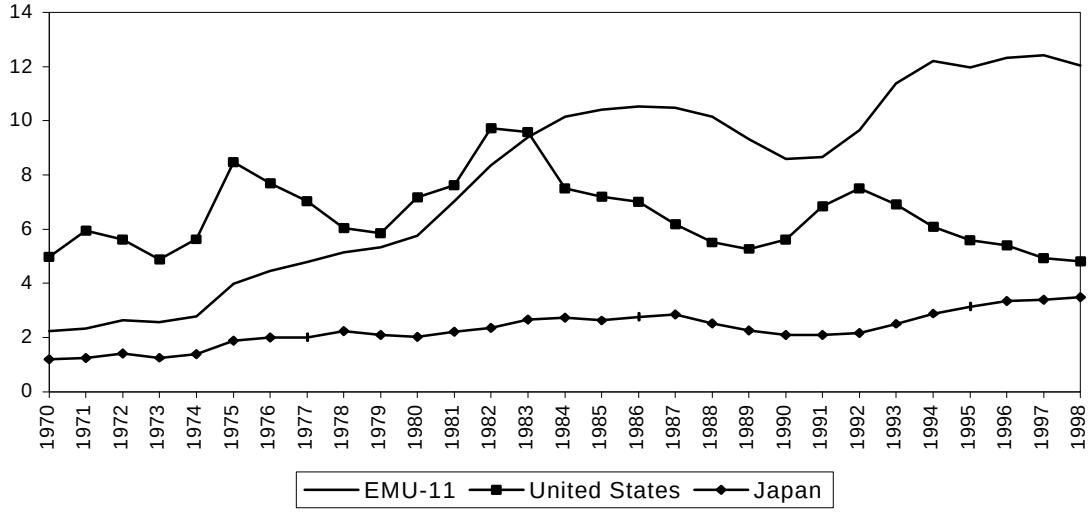
2.1 Europe's lack of wage flexibility

As figure 1 shows, the evolution of the unemployment situation of the EMU-11 compares poorly with Japan and the USA. In Japan unemployment rose from 1.2% in 1970 to 3.5% in 1998, which is still very low, although it tripled. In the USA unemployment rose in the aftermath of the oil shocks, but decreased afterwards. In 1998 unemployment was below 5% and it is still decreasing. In Europe, on the other hand, unemployment rose sharply in the same period from 2.3% to about 11% the last few years. Being an average this series of course conceals widespread differences between European economies, but the five economies we are focussing on below (Belgium, France, Germany, Italy and The Netherlands) all experienced about the same unfavourable evolution.

To explain the poor performance of Europe, it is interesting to study the reaction of its labour market during and after the oil shocks of 1973-1974 and 1979-1980 in comparison to the USA and Japan. Let us first consider the case of Japan. As can be seen in figure 1, unemployment rose only slightly after the oil shocks. A possible explanation is the higher real wage flexibility in Japan[1]. Based on estimates for the period 1964-1994, McMorrow (1996) finds that unemployment would have to increase by 0.1, 1.3 and 1.8 percentage above the natural rate in Japan, the US and the European Union respectively to offset the inflationary consequences of a real shock which temporarily increased inflation by one percentage point. So in Japan unemployment had to rise only little for wages to lower and accommodate for the oil shocks.

[1] Wage flexibility in Japan is over four times larger than in the USA and EU according to the estimates of McMorrow (1996).

Figure 1: Evolution of the unemployment rate in the EMU-11, USA and Japan



Source: OECD Statistical Compendium, Economic Outlook

On the basis of McMorrow's analysis, one would expect unemployment to rise significantly in the USA and the EU after the oil shocks, which is confirmed in figure 1. In the USA however unemployment returns more or less to the pre-shock level, whereas European unemployment remains high. To explain this one generally takes up the idea of the highly flexible American labour market versus the rigid European labour market. Since European labour market institutions tend to favour employed insiders, the increased level of unemployment does not result in a considerable downward pressure on wages. By consequence the bulk of cyclically unemployed persons become long-term unemployed, resulting in even less opportunities to have an impact on wage formation and in an increase in the natural rate of unemployment. At the empirical level this is confirmed by Heylen and Van Poeck (1995) who illustrate that EU countries are characterised by more persistence in their unemployment than the USA. In this context Mcmorrow (1996) also points to the much higher employment adaptability in the USA than in the EU. This means that, when the economy recovers from the shock, employment in the USA responds quicker to rising output and thus unemployment will decrease faster than in Europe (see also De Grauwe (1998)). To a certain extent this difference in employment adaptability can also be traced down to differences in labour market institutions (e.g. less stringent employment protection legislation in the USA). Proper redesigning of labour market institutions should therefore improve real wage flexibility (or employment adaptability), resulting in more downward pressure on wages (or a faster response of employment), reducing unemployment as such.

However, as pointed out by Nickell (1997), merely stating that unemployment in Europe is higher than in the USA because European labour market institutions result in a more rigid labour market is too large a simplification. Nickell (1997) shows that "many labour market institutions that conventionally come under the heading of rigidities have no observable impact on unemployment." We come back at this issue in section 4.

The previous analysis illustrates that Europe needs more real wage flexibility or employment adaptability. As from here we will focus on wage flexibility. With highly flexible wages, a country can afford a certain degree of employment rigidity, such as in Japan, where even a small rise in unemployment results in considerable wage moderation.

2.2 EMU increases the need for real wage flexibility

Since the establishment of EMU, member-countries are deprived of an independent national monetary policy.[2] This only increases the need for real wage flexibility. In the past national monetary policy could be used to stabilise output and employment after a country was hit by an asymmetric shock. There is however no consensus about the likelihood of these asymmetric shocks. Pissarides (1997) concludes from the examination of actual GDP data since 1950 that if the countries in the core formed a union the likelihood of large country-specific shocks would be small. Concerning the labour market, Viñals and Jimeno (1996) conclude (from historical evidence) that common European forces seem to have been very important in explaining national unemployment rates. Others (e.g. Krugman (1991)) are convinced that asymmetric shocks are very likely. To be on the safe side, alternative adjustment mechanisms have to be found to enable countries in the periphery and, if necessary, core countries to cope with asymmetric shocks. Possible alternatives include labour mobility, fiscal policy, and price and wage flexibility.

It is clear that labour mobility could have an equilibrating effect in case of an asymmetric shock. If labour moves to where it is needed, aggregate demand could change without too many consequences for employment. Because of cultural and linguistic barriers, labour mobility is limited in Europe. Eichengreen (1993) illustrates this very well: "Americans move between U.S. states about three times as frequently as Frenchmen move between *départements* and Germans move between *länder*."

Another way of dealing with asymmetric shocks is fiscal policy. Note that there is no E(M)U-wide fiscal policy, implying that there is no uniform tax system at the E(M)U level that could have a stabilizing effect. The scope for national governments to conduct a discretionary fiscal policy is also restricted since under EMU budget deficits are restricted to less than 3% of GDP and member countries agreed to work towards a balanced budget. Therefore fiscal policy can be ruled out as an option to deal with asymmetric shocks at present.

The last alternative adjustment mechanism is price and wage flexibility. E.g. if aggregate demand falls, the economy will slide into a recession, with higher unemployment and lower factor utilisation as a result. This will have a depressing effect on wages and prices. They will rise slower relatively to other member states or even decrease, which will bring about the depreciation of the real exchange rate and a rise in net exports. However, as wages (and prices) are rigid in Europe, this process occurs only very slowly, allowing persistence effects to work on

[2] Some EU-countries were de facto already deprived of an independent monetary policy when they started pegging their exchange rate to the DM.

unemployment. In a situation of flexible exchange rates, the immediate adjustment of the exchange rate would exclude persistence effects (Pissarides (1997)).

Given the limited availability of fiscal policy, EMU member states should concentrate their efforts on improving price and wage flexibility and/or labour mobility. One could also think of "direct" alternatives for fiscal policy, such as Calmfors (1998b), who proposes variations in payroll taxes paid by employers, compensated by changes in other taxes or government expenditures (thus leaving the fiscal balance unchanged) as a substitute for exchange rate changes. However, unless an automatic system for these variations is installed, this alternative is likely to suffer from inertia in the political decision process.

2.3 The effect of EMU on real wage flexibility is uncertain

It is interesting to examine how EMU -being a regime change- influences the flexibility of wages. Economic agents just might behave differently in the new environment, resulting in a changed degree of flexibility. From a theoretical point of view different scenarios are possible (see Calmfors *et al.* (1997), Heylen (1998), Pissarides (1997) and Van Poeck (1997)). Calmfors (1998b) makes a distinction between the direct and the indirect response of wage setters. The latter results from governments having an incentive to implement labour market reforms in order to achieve more real wage flexibility.

Concerning the direct response of wage-setters, a change in bargaining behaviour of employers and employees -given the existing labour market institutions- as a reaction to the establishment of EMU may result in different bargaining outcomes and a change in money-wage flexibility. From the existing literature Calmfors (1998b) concludes that "the unsatisfactory state of knowledge regarding the causes of money-wage rigidity makes it difficult to predict to what extent EMU-membership will contribute to more money-wage flexibility; both theoretical reasoning and empirical experiences would seem to warn against too great optimism."
If an EMU-member faces a larger demand variability, this will induce a reduction in contract length because the cost of a fixed-term wage contract increases with output variability. Qualitatively, flexibility clearly increases, while quantitatively, the effect might be rather small because of the existence of externalities[3]. The effect of EMU on wage flexibility should also be qualified in another way: employees with a secure job might just not take flexibility issues into account when negotiating for new wages, because they have no interest in it (Calmfors *et al.* (1997)). If unemployment rises, this happens to a great extent to the detriment of young and recently hired workers, leaving older employees untouched. To the extent that these insiders dominate wage setting, the effect of EMU on flexibility will be reduced. Nevertheless, *employers* might still want to take flexibility into account to protect their business in case of an asymmetric shock.
Another issue is the enlarged transparency of wages. This could have a serious impact on wage setters. Bearing in mind the evolution of the wages in Eastern

[3] If all other firms in society reduce the length of their contracts such that the variability in demand for the remaining firm is unchanged, it has no longer an incentive to reduce the length of its own contracts (Calmfors 1998b).

Germany after the unification, it is not difficult to imagine a scenario of perverse wage catching-up in the low-wage countries of the union, without a rise in labour productivity. Unions in high-wage countries might react by bargaining higher wages in order to stick to their relative wage positions (Peters (1995)), resulting in an upward wage spiral.[4]

This brings us to the influence of the government on wage flexibility through labour market reform. Proper labour market reform is aimed at enhancing outsiders' bargaining power in wage negotiations (i.e. at increasing wage flexibility). This type of reform leads to lower bargained wages at the existing unemployment level and, consequently, to a lower unemployment rate. The changes in the nominal wage then reflect an evolution to a new equilibrium level of employment. In this new equilibrium the higher real wage flexibility implies faster reactions of wages to rises in unemployment as a consequence of a shock. Proper labour market reform is therefore welfare improving. This is confirmed by van Aarle *et al.* (1999). From a simulation study they conclude that higher labour market flexibility entails considerable welfare gains w.r.t. macro-economic adjustment in an EMU-setting (i.e. with fixed exchange rates).

There are however some political constraints to labour market reform: employed insiders will oppose to reforms because their wages are lowered, their exposure to unemployment is increased and -when unemployment benefits are reduced- the consequence of job loss is more severe. Moreover unemployed outsiders are likely to be the first to oppose to reforms that e.g. lower their unemployment benefits.
Calmfors (1998a) investigates differences in incentives for labour market reform for countries inside and outside a monetary union. National governments are assumed to attach a cost to the divergence of unemployment from the unemployment goal, to the divergence of inflation from the inflation goal and to labour market reform. The latter is a cost because labour market reform harms the employed insiders, who also are the political majority. Welfare improvements of reform are twofold: on the one hand unemployment is reduced, on the other hand the lower equilibrium unemployment reduces the inflation bias for the monetary authority. The net effect of belonging to a monetary union (relative to being outside one) is however ambiguous. Reform in an individual country reduces EMU-wide equilibrium unemployment to a small extent and therefore has only a small effect on aggregate inflation. This lies at the heart of the problem, the combination of *national* labour-market policy and a *common* monetary policy meaning that each member country in the EMU internalises only a fraction of the benefits of reform (see Calmfors (1998a)). Whereas EMU clearly increases the need for real wage flexibility, it remains unclear whether *national* governments will actually increase reform of labour market institutions.

In conclusion, the effects of EMU on (real) wage flexibility are very difficult to predict. Qualitatively EMU-membership is likely to increase flexibility (w.r.t. wage setters' behaviour). The quantitative effect however might be very small if wage setters fail to internalise the externalities accompanying reductions in

[4] A downward wage spiral (cf. wage dumping) should not be excluded *a priori* but given that the EU prefers to have some social safety net, this is less likely to occur (Pissarides (1997)).

contract-length or if insiders dominate wage setting. Nevertheless proper labour market reform is welfare improving, it is not clear whether national governments will actually bring (more) reforms into force.

In the remainder of the paper we take it for granted that Europe needs more real wage flexibility. We explore whether labour market reform can improve real wage flexibility.

3. The wage equation

3.1 Justification of the specification for the wage equation

Empirical findings suggest a *Phillips curve* relationship between wages and unemployment, i.e. a negative relationship between the rate of change of wages and the unemployment rate. Theoretical models (such as bargaining models) suggest however a negative relationship between the level of the wages and the unemployment rate, given the reservation wage and the level of productivity. This is the so called *wage curve* relationship. Blanchard and Katz (1999) reconcile the theoretical and empirical specification of the wages-unemployment relationship by interpreting the reservation wage as depending on productivity and lagged wages. This results in the following specification:

$$\Delta w_t = c_w + (pc_t^e - pc_{t-1}) - j\,(w_{t-1} - pc_{t-1} - z_{t-1}) - b\,U_t + d\,\Delta z_t + e_t \qquad (1)$$

where *w* and *pc* are the logarithms of the wage and (consumption) price level, ^{e} denotes expectations, *U* is the unemployment rate and *z* is labour productivity. Wage growth is determined by inflation expectations, the level of unemployment (the Phillips curve effect), the change in productivity and an 'error correction' term $(w_{t-1} - pc_{t-1} - z_{t-1})$, implying an adjustment of real wages to (trend) labour productivity over time. In fact real wages adjust to marginal productivity, but assuming a Cobb-Douglas production function, marginal productivity ($\partial Y_t / \partial L_t$) equals average productivity ($Y_t / L_t = z_t$). A specification along this line is a/o used in OECD (1997) and is similar to the equation in the OECD's macroeconomic model INTERLINK, where some other variables may still be added (e.g. tax variables). They estimate the following specification:

$$\Delta(w_t - pc_{t-1}) = c_w + a\,\Delta\Delta pc_t - b\,U_t - g\,\Delta U_t - j\,(w_{t-1} - pc_{t-1} - z_{t-1}) + q\,(\Delta p_t - \Delta pc_t) + e_t \qquad (2)$$

where *p* is the GDP-deflator and inflation expectations are assumed to be adaptive[5]. Changes in unemployment are introduced to test for hysteresis effects[6];

[5] Inflation expectations are a weighted average of current and lagged inflation. Some rewriting of equation (2) shows the following relationship between nominal wages and inflation:

$\Delta w_t = c + aDpc_t + (1\text{-}a)Dpc_{t-1} + \ldots$

$(\Delta p_t - \Delta pc_t)$ is included to reflect the idea of unions (employees) searching for compensation for changes in consumer prices (Δpc_t) and employers offering wages which include compensation for changes in GDP-prices (Δp_t). This can be seen as a proxy for the internal terms of trade of firms. It indicates the degree to which firms can influence the prices of their output (and consequently their degree of bargaining power in terms of wage negotiations). For our own estimations we add labour productivity growth (Δz_t), which is present in equation (1), a tax variable relating to the employers (T^{er}) and a tax variable relating to the employees (T^{es}) to the set of regressors in the OECD-specification. The specification we estimate then becomes (where all parameters are assumed to be nonnegative):

$$\begin{aligned}\Delta(w_t - pc_{t-1}) = c_w + a\,\Delta\Delta pc_t - b\,U_t - g\,\Delta U_t - j\,(w_{t-1} - pc_{t-1} - z_{t-1}) + d\,\Delta z_t \\ + q(\Delta p_t - \Delta pc_t) + m\,T_t^{es} - s\,T_t^{er} + e_t\end{aligned} \tag{3}$$

A theoretical justification of this "bargaining augmented Philips curve" can already be found in Knoester and Van der Windt (1987). Wage growth in the private sector (Δw) is shown to be the outcome of negotiations between unions and employers, more specifically a weighted average of wage growth claims of unions and wage growth offers of employers. Unions' claims are assumed to reflect compensation for changes in consumer prices (Δpc), labour productivity growth in the private sector (Δz) and the burden of direct taxes and social security contributions (T^{es}). Employers' offers are derived from marginal productivity conditions for profit maximising firms. The wage offers are shown to include compensation for changes in *GDP-prices* (Δp), changes in labour productivity (Δz) and a correction for employers' social security contributions (T^{er}). Finally the Philips curve effect is introduced by the assumption that the respective bargaining power of unions and employers depend on the labour market situation, reflected by the unemployment level (U_t).

3.2 Estimation results

Equation (3) is estimated by OLS.[7] A "general-to-specific" approach[8] is used to identify the variables significantly influencing wage growth (for later use in a time-varying framework). The sample consists of annual observations for the period 1960-1995 and the variables are taken from OECD Statistical Compendium,

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The closer α to one, the larger the influence of current inflation (a = 1 is full indexation) and consequently a small effect of lagged inflation. Note that in this specific setting with adaptive expectations nominal and real wage flexibility (with real wage $w_t - pc_{t-1}$) can be used interchangeably.

[6] In a Phillips curve type equation, wage growth in fact depends on the gap between actual and equilibrium unemployment. If the equilibrium rate is assumed to be constant, it can be subsumed to be in the constant term in the wage equation. If, however, the equilibrium rate itself depends on the actual rate (e.g. a long(er) period of unemployment eventually leads to the deterioration in skills and motivation; the pressure exerted on the labour market becomes smaller, the negative effect of unemployment on wages disappears in the long run), there is hysteresis and, consequently, wage growth will be influenced by past changes in the unemployment level.

[7] Using instruments to account for possible simultaneity bias and inconsistency does not alter the results significantly, this is also confirmed by OECD (1997).

[8] See Hendry (1995); the technique used also accounts for possible multicollinearity among the explanatory variables.

Economic Outlook (1998). *w*, *pc*, *p* and *z* are expressed in logarithms (prices and wages are denoted in home currency), the unemployment rate is expressed in levels (as a decimal). Wages and productivity refer to the private sector. For the construction of the error correction term trend labour productivity (based on a Hodrick-Prescott filter) is used rather than actually measured productivity.

The best results are shown in table 1. The adjusted R^2 is fairly high for all wage growth equations and the Durbin-Watson statistic is above the inconclusive region for all equations, except for Germany, where it is close to the upperbound (1.08-1.89). Because in the case of Belgium and Germany estimation results were very poor (especially with respect to the error correction term) over the entire period but quite good for the 1970-1995 subperiod[9] a dummy variable was included in the regression for the 1960-1969 subperiod. Given the negative sign, this might be related to the Newell-Symons "wage explosion" dummy for the seventies (see Layard *et al.* (1991)). Layard *et al.* (1991) also use this dummy but carry it through to the end of their sample period (1990) because of the not suitable original dating.

The tax variables proved to be insignificant, perhaps because the variables are not disaggregated enough or because of a too limited sample size (starting in 1970). We opted not to go into further detailed tax measures because –given the limited sample size- we prefer a parsimonious specification. Changes in unemployment turned out to be insignificant too, i.e. there is none of the countries an indication of hysteresis effects. This turns out to be in line with other estimations (see e.g. Lauer (1999) and OECD (1997)). Using different sample periods they find no or only marginal significance (hardly 10% for the Italian and German estimates in both studies).
The unemployment level enters significantly in all five wage equations. Only in Italy the point estimate of the $|b|$-coefficient (1.37) is significantly higher than in the other countries. Since the Italian unemployment benefit system is extremely strict (see OECD (1994)) this might be a crude indication that generosity matters for the level of real wage flexibility. Flexibility in the other countries is about 0.6; an increase of one percentage point in unemployment then increases the downward pressure on wages exerted by unemployment with 0.6%. The rising unemployment following the oil crises did have a significant mitigating effect on wage growth. The effect was too small however to get unemployment down. The error correction term always enters significantly with the expected negative sign. If wages in the previous period were higher than the productivity level, this has a mitigating effect on wage growth in the current period. The coefficients of unemployment and the error term do not seem to be in contradiction with OECD (1997).
Exception made of Belgium, the coefficient on inflation growth is close to one. This implies that in Belgium current inflation is not immediately passed entirely into wage growth, therefore lagged inflation still has an impact on wages. Changes in productivity have a significant positive influence on wages in Belgium, Germany and The Netherlands. $(\Delta p_t - \Delta pc_t)$ turns out to be significant for wage formation in France, Germany and Italy. The degree to which firms can influence the prices of their output is probably smaller in Belgium and The Netherlands, two small open

[9] Most recent empirical work uses samples starting in 1970 (see e.g. OECD(1997) and Lauer (1999)). Given the fact that we want to estimate the wage equation in a time-varying parameter framework, restricting ourselves to the 1970-1995 period implies a considerable loss of observations.

economies; hence the insignificance of the difference between GDP-prices and consumer prices.

Table 1: Wage equations - dependent variable: $D(w_t - pc_{t-1})$
(standard errors between brackets) [10]

	Belgium[a]	***France***	***Germany***[a]	***Italy***	***The Netherlands***
Sample	*1962-1995*	*1963-1995*	*1962-1995*	*1962-1995*	*1962-1995*
Const.	0.2387 *(0.0741)*	0.3354 *(0.0851)*	0.3573 *(0.1228)*	3.2791 *(0.5801)*	0.2205 *(0.0472)*
Dummy	-0.0315 *(0.0084)*	-	-0.0336 *(0.0097)*	-	-
$\Delta\Delta pc_t$	0.5752 *(0.1017)*	0.8966 *(0.1176)*	1.2092 *(0.1647)*	1.0508 *(0.1067)*	0.9157 *(0.1021)*
U_t	-0.6382 *(0.0762)*	-0.7110 *(0.0954)*	-0.5117 *(0.1144)*	-1.3655 *(0.1554)*	-0.6483 *(0.1000)*
$\Delta p_t - \Delta pc_t$	-	0.3921 *(0.2251)*	0.9741 *(0.1537)*	1.2589 *(0.3461)*	-
Δz_t	0.2257 *(0.1420)*	-	0.7324 *(0.0607)*	-	0.5272 *(0.1474)*
$w_{t-1} - pc_{t-1} - z_{t-1}$	-0.0837 *(0.0375)*	-0.1364 *(0.0409)*	-0.1710 *(0.0612)*	-0.3614 *(0.0654)*	-0.0893 *(0.0247)*
Adj. R^2	0.88	0.92	0.94	0.89	0.88
DW	1.85	1.75	1.78	2.16	1.76

[a] dummy: 1962-1969=1

[10] Estimating a Seemingly Unrelated Regression model yields the following results. Pooling the data adds little to our analysis, only in case of The Netherlands the terms of trade is now significant at the 10% level. Wald tests reject the hypothesis of equal coefficients across countries.

	Belgium[a]	***France***	***Germany***[a]	***Italy***	***The Netherlands***
Sample	*1962-1995*	*1963-1995*	*1962-1995*	*1962-1995*	*1962-1995*
Const.	0.1875*	0.3645***	0.3643***	3.1933***	0.1520**
Dummy	-0.0263**	-	-0.0341***	-	-
$\Delta\Delta pc_t$	0.6627***	0.8885***	1.2273***	1.0404***	1.0662***
U_t	-0.5881***	-0.7824***	-0.5117***	-1.3350***	-0.5019***
$\Delta p_t - \Delta pc_t$	0.2506	0.3931*	0.9741***	1.2641***	0.9570*
Δz_t	0.2799*	-0.1594	0.7324***	0.0403	0.4431***
$w_{t-1} - pc_{t-1} - z_{t-1}$	-0.0604**	-0.1464***	-0.1710***	-0.3520***	-0.0574**
Adj. R^2	0.88	0.93	0.94	0.89	0.89
DW	1.84	1.79	1.77	2.17	1.78

[a] dummy: 1962-1969=1

[b] * significant at the 10% level ** significant at the 5% level *** significant at the 1% level

4. The wage equation in a time-varying parameter framework

4.1 Wage flexibility and labour market institutions

As already indicated in the introduction different labour market institutions can be linked to the idea of wage flexibility. Given our definition of (real) wage flexibility as the responsiveness of (real) wages to unemployment, the parameter b ($g=0$ for all countries) in equation (3) can be interpreted as a measure of (real) wage flexibility (cf. footnote 5). The relationship between responsiveness and labour market institutions has already been investigated by e.g. Heylen and Van Poeck (1995), Scarpetta (1996) and Viñals and Jimeno (1996). A general consensus is that labour market reform should involve a combination of reform of different labour market institutions at the same time. We also confront some of the 'standard' intuitions about the effects of these institutions with the critical view of Nickell (1997). Although some empirical evidence was provided in several studies, we are not aware of any consistent econometric setting that explores the relationship between real wage flexibility and labour market institutions. To a certain extent this due to the limited availability of time series on labour market institutions. Fortunately we were able to construct a data series for the generosity of the unemployment benefit system allowing us to provide some empirical evidence (see section 4.3).
For expositional simplicity we treat the labour market institutions one by one here and define wage flexibility as the absolute value of the (semi-)elasticity of wages w.r.t. unemployment[11]. Based on earlier findings we then write the following relationship between (real) wage flexibility and labour market institutions:

$$\begin{matrix} & - & + & n.l. & - & \pm \\ |\beta| = f(\text{GUS}, & \text{ALMP}, & \text{CWB}, & \text{EPL}, & \text{TWC}) \end{matrix} \qquad (4)$$

with: *n.l.*: non-linear
GUS: generosity of the unemployment benefit system
ALMP: active labour market policies (expenditure as a percentage of GDP)
CWB: degree of centralisation of wage bargaining
EPL: degree of employment protection legislation
TWC: type of wage contracts (reflecting average duration of wage contracts and synchronisation)

Generosity of the unemployment benefits

High and prolonged unemployment benefits are believed to worsen the persistence and the level of unemployment. Since being unemployed under a generous unemployment benefit system is financially far less dramatic than under a stringent one, the unemployed will have a lower job search intensity and a lower willingness

[11] *Semi*-elasticity since unemployment is measured as a percentage and no logarithmic transformation is used.

to work, which is reflected in a higher reservation wage. Some persons might even be caught in an unemployment trap, i.e. benefits are so high compared to the net wage that it does not pay to be employed. Furthermore, unions will anticipate (high) unemployment benefits when negotiating wages and therefore adapt a more aggressive strategy (less wage moderation). In the present framework, a more generous unemployment benefit system (GUS) will lead to less real wage flexibility, denoted by the minus sign above GUS in (3). Theoretically, unemployment benefits could also have a positive impact on unemployment, because they give unemployed the financial means to bridge the period of frictional unemployment. We expect this effect to be small, however, in comparison with the negative effects (see e.g. Heylen and Van Poeck, 1995; Scarpetta, 1996 and Viñals and Jimeno, 1996).
The duration of entitlement should also be taken into account. Nickell (1997) states that "the impact of a *relatively* generous benefit system *might* be offset by suitable active measures to push unemployed persons back to work. Such policies seem to work rather well when allied to a relatively short duration of benefit entitlement." (italics added).

Active labour market policies

Active labour market policies include training and re-training programmes for the unemployed, as well as services to increase the allocational efficiency in the labour market and job-creation policies. They are expected to increase the skills of the unemployed persons, which strengthens their competitiveness and increases the pressure they can exert on the labour market. Active labour market policies therefore weaken the position of insiders. This positively affects real wage flexibility: Faced with a mass of competitive unemployed, insiders will be forced to restrain their wage demands. Increased effort of the government with regards to active labour market policy will increase real wage flexibility. In the end this will result in higher employment.
Active labour market policies will also increase search effectiveness, thereby reducing duration of unemployment. In sum, more active labour market programs will reduce both the level and persistence of unemployment. Empirical studies (e.g. Heylen (1993), OECD (1993) and Scarpetta (1996)) generally confirm this conclusion. When distinguishing between job-creation and training programms, the latter seems to have a more favourable effects on employment (Johansson (1998)). Moreover to the extent that active labour market policies increase the welfare of the unemployed (e.g. higher unemployment benefits when participating in a programm), they might even lower wage flexibility (Johansson (1998)). These negative effects are however only likely to occur with large programmes, suggesting a possible non-linearity. In practice only Sweden might suffer from these negative effects.

Level of wage bargaining

Highly centralised as well as fully decentralised wage bargaining levels seem to offer the best results. Calmfors and Driffill (1988) were the first to suggest the existence of a hump-shaped relationship between the level of real wages and the degree of centralisation of bargaining. If bargaining is fully centralised, unions realise that

moderate wage increases allow to incorporate several positive external effects, such as lower unemployment, prices and taxes. If bargaining takes place at the fully decentralised level, market forces are allowed to work freely. Individual workers will then restrain wage demands, because they face the threat of job loss when the firm loses competitiveness because of relatively high wage costs.
At the intermediate level of bargaining (sector-wide unions), however, no incentive will be present to moderate wage demands. Firstly, sector-wide unions will not be faced with massive job losses for their members if they raise wages, because wages will rise in the whole sector. Hence, an individual firm faces no fall in demand relative to other firms. There will only be some substitution to industries outside the sector. In open economies this should somewhat be qualified because of the international competition.[12] Secondly, the increased price level in the industry resulting from higher wages, will not affect consumer prices very much. Therefore, the nominal wage increase will not be fully absorbed by higher prices (Calmfors and Driffill (1988)).
It follows that wages will be more flexible when negotiations take place at the fully centralised or decentralised level. In this case $|\beta|$ will be higher than when the negotiations take place at an intermediate level.

Employment protection legislation

Employment protection legislation consists of all rules and laws that protect workers from being fired (e.g. notice period, severance pay) and thus make dismissals costly. It reduces employment variability, not only because it is more difficult and costly for firms to fire workers during recessions, but also because firms become cautious in hiring people during expansions, as they anticipate the difficulties in firing them again. Although this legislation might be appropriate to reduce arbitrary dismissals, it seems an important obstacle when it comes to bringing unemployment down. According to Nickell (1997) the overall impact might nevertheless be rather small because the reduced short-term unemployment and the raised long-term unemployment would tend to cancel out. However a more severe employment protection legislation creates a dual labour market because it increases the power of insiders. The labour market then consists, on the one hand, of protected insiders and, on the other hand, of outsiders, unable to find a job. As already stated before, insider power is shown to have an adverse impact on real wage flexibility (Heylen and Van Poeck (1995), Scarpetta (1996) and Viñals and Jimeno (1996)). By consequence $|\beta|$ in our framework is more likely to be negatively influenced by the degree of employment protection legislation. A more severe employment protection legislation will then ceteris paribus lead to lower real wage flexibility, i.e. a smaller $|\beta|$.

[12] e.g. in Belgium wage evolutions of important trade partners are taken into account to determine maximum wage growth

Wage contracts

The last variable influencing real wage flexibility consists of the type and duration of wage contracts (see Calmfors *et al.* (1997)). Wage agreements for a shorter period lead to more nominal flexibility than long term contracts. The degree of synchronisation of wage negotiations might also be important. When wage agreements expire at different times, unions will take past wage increases in other sectors into account and adapt their expectations accordingly. Because wages tend to be more rigid with lower synchronisation and longer term contracts, the possibilities for the unemployed to exert downward pressure on wages will be limited. Since duration is expected to influence |β| negatively and synchronisation positively, a plus-minus sign was used to denote the expected relationship in (3).

4.2 The time-varying parameter framework

The basic idea is the following: the unemployed exert downward pressure on wages. Longer term unemployed however show decreasing search intensity and start to loose skills, reducing their impact on wage formation or even making them totally irrelevant for it. Search intensity, skills, ... are in turn influenced by labour market institutions determining who can exert how much pressure on wages. Therefore, the parameter of the unemployment rate in the wage equation, reflecting wage flexibility, is influenced by different labour market institutions. Consequently we cannot expect this parameter to be constant over time if the underlying institutions change over time. This hypothesis can be modelled in the following manner[13]:

$$\Delta(w_t - pc_{t-1}) = c_w + b_t\, u_t + X_t C_X + e_t \qquad (5)$$

$$\text{with} \quad b_t = c_b + V_t C_V + u_t$$

$$\text{and} \quad X_t := [\,\Delta\Delta pc_t, (w_{t-1} - pc_{t-1} - z_{t-1}), \Delta z_t, (\Delta p_t - \Delta pc_t)\,]$$

$$V_t := [\text{GUS, ALMP, CWB, EPL, TWC}]$$

This model can be characterised as a systematically varying-parameter framework. For a mathematical description of the corresponding maximum likelihood estimation method, we refer to appendix 1. Since time series for most of the variables in the V-vector are not available, it is impossible to estimate the entire model. In the OECD Jobs Study (1994) a two-yearly time series to measure generosity, labelled replacement ratio, was constructed (*cf. infra*). Since this is only a two-yearly series (1961-1995), the number of observations (17) is too limited to use the varying-parameter method. To overcome this problem we created an annual time series based on total expenditures for unemployment benefits, measuring the generosity of the unemployment benefit system (GUS).

[13] Since the tax variables and changes in unemployment proved to be insignificant for all countries we do not include them in X_t.

The model to be estimated then becomes:

$$\Delta(w_t - pc_{t-1}) = c_w + b_t u_t + X_t C_X + e_t \qquad \text{with } e_t \overset{i.i.d.}{\sim} (0, s_e^2) \tag{6a}$$

where b_t is stochastic and is assumed to vary according to:

$$b_t = c_b + c_{GUS} GUS_t + u_t \qquad \text{with } u_t \overset{i.i.d.}{\sim} (0, s_u^2) \text{ and } u_t \text{ independent of } e_j \; \forall j,t \tag{6b}$$

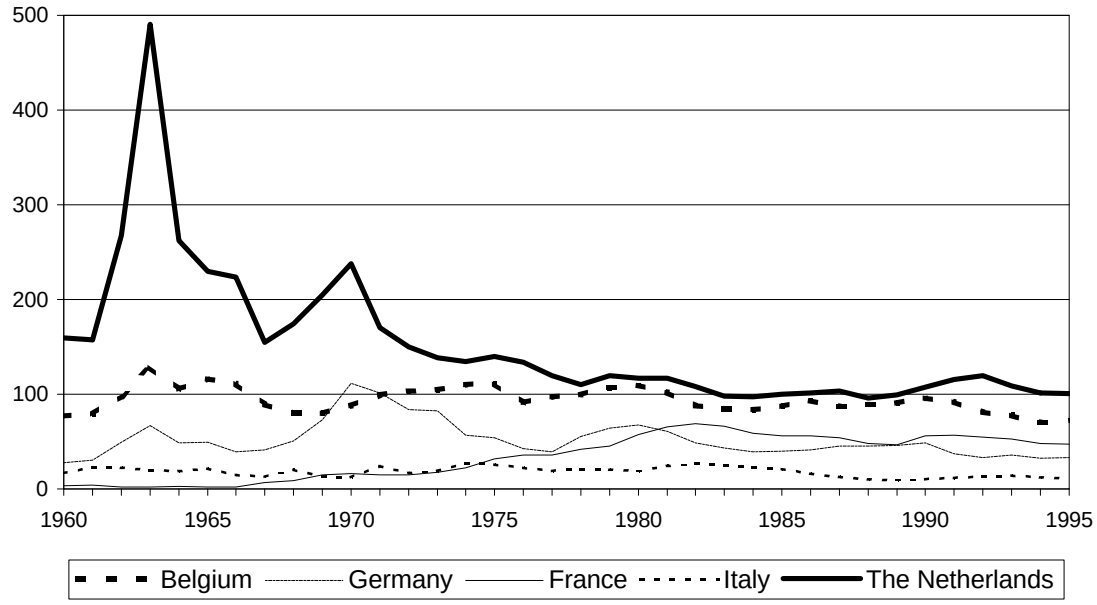
The model analyses the effect of (changes in) the generosity of the unemployment benefit system on real wage flexibility. Since b_t is negative and a more generous system decreases wage flexibility, we expect c_{GUS} to be positive. A general warning holds however. Labour market reform should include different labour market institutions. Reform of only one institution could result in an off-setting reaction by wage setters with respect to the other institutions. If e.g. unemployment benefits become less generous, wage setters may bargain longer notice periods or higher severance pays or conclude longer-term employment contracts. This suggests a careful interpretation of the impact of the generosity of the unemployment benefit system in explaining wage flexibility.

Before proceeding to the estimation we need to determine the appropriate transformation(s) of the expenditures on unemployment benefits to obtain a good measure of the generosity of the benefit system. Thinking about the 'generosity' of unemployment benefits, there are several sides to the story: criteria that need to be met in order to be eligible for unemployment benefits (e.g. an earlier employment record), the duration of the entitlement and the level of the benefits (possibly related to earnings in earlier work). Total government expenditures on unemployment benefits capture these aspects. An increase in the level of unemployment benefits or less severe entitlement criteria (i.e. a more generous system) imply *ceteris paribus* an increase in the government's expenditures. The effect of a prolongation of the entitlement duration can also be easily inferred from a time series on expenditures: a prolongation implies ceteris paribus that unemployed persons who would otherwise have lost their benefit entitlement in the next period, now still receive benefits, resulting in higher expenditures.
To have a good measure of generosity some modifications are needed. Expenditures without any additional transformation do not adequately reflect generosity for an increase in the number of unemployed results in an increase in expenditures. We define the following transformation: expenditures on unemployment benefits as a percentage of GDP, divided by the number of unemployed expressed as a percentage of total population (where GDP and unemployment benefits are measured both in value or both in volume). This is equivalent to expenditures per unemployed as a percentage of per capita GDP. This implies that when unemployment benefits are not adjusted to the prevailing welfare level, measured by per capita GDP, the generosity changes. By using per capita GDP, a bias towards small countries is ruled out.

The figures for total expenditures on unemployment benefits were taken from Eurostat, "Social protection expenditures and receipts: 1980-1995" and calculated back with growth rates of comparable data obtained from International Labour

Organization (ILO), "The cost of social security". Additional data for the transformations were taken from OECD, Statistical Compendium, 1998.
From figure 2 one can infer that according to our measure The Netherlands have the most generous system over the entire period. This also holds for the OECD measure. The observed spike (which is due to an increase in expenditures on benefits, not to one of the other elements of the transformation) is also present in the replacement ratio series of the OECD, with the notable difference that this series remains at the higher level. The Belgian system is also fairly generous and is -since the mid seventies- almost as generous as the Dutch system. At the bottom end we observe the almost non-existing Italian system. Since benefits in Italy are so small and since there are no large changes in the system, it does not make sense to perform the time-varying estimation for Italy.[14] The benefit systems of France and Germany are somewhere in between. The gradual increase in generosity in France is a feature that -to a certain extent- is also present in the OECD replacement ratio (*cf. infra*).

Figure 2: Expenditures on unemployment benefits per unemployed, as a percentage of GDP per capita



Source: own calculations with data from OECD, Statistical Compendium, 1998 and Eurostat, "Social protection expenditures and receipts" (calculated back with growth rates of comparable data obtained from ILO, "The cost of social security")

[14] We did test for the presence of a time-varying relationship between the coefficient of unemployment and the generosity of unemployment benefits, but the results were as expected, i.e. there is no relationship.

4.3 Empirical results

The variables of the OLS regressions in table 1 are used for the maximum likelihood estimation of model (6a-b) in a time varying parameter setting. We use (lagged) logarithms and (lagged) changes in logarithms of the generosity measure in the flexibility equation. In appendix the joint likelihood function for the time-varying model is derived, where error terms are assumed to be normally and independently distributed. It is shown that the maximisation of the likelihood function boils down to the maximisation of a function F with respect to the variance-ratio, i.e. the ratio of the variance of the error term of the wage flexibility equation and the variance of the error term of the wage equation. This maximisation can be solved by a simple random search procedure. We use a grid search procedure to find the variances-ratio that (indirectly) maximises the likelihood function and as such we find the most accurate estimates. To facilitate the comparison with the OLS estimations we also report an average value of b_t (b_{av}).

In addition to that we tested four hypotheses in order to get an idea of the significance of the estimated coefficients. We computed test statistics for the following hypotheses: TS1: $l = 0$, (where l is the ratio of the variances of u and e, cf. appendix); TS2: $l = 0 \Lambda c_{GUS} = 0$; TS3: $l = 0 \Lambda c_{GUS} = 0 \Lambda c_b = 0$ and TS4: $l = 0 \Lambda c_{GUS} = 0 \Lambda c_b = 0 \Lambda C_X = 0$. If all four hypotheses are rejected we have a significant time varying parameter model. Rejection of hypotheses 3 and 4 respectively imply that the unemployment rate, respectively the variables in the X-vector explain wage growth in the time-varying model. Since the selection of variables for the wage equation in the varying parameter model is based on the estimations of the previous section, it is not surprising that hypotheses 3 and 4 are rejected for all 4 (5) countries.[15] The main interest lies in hypotheses 1 and 2. If hypothesis 1 is not rejected our equation explaining the unemployment coefficient is only approximately stochastic. If at the same time hypothesis 2 is rejected we have that our GUS variable has nevertheless a significant influence on the unemployment parameter. This would imply an (approximately) exact relationship between b and the generosity of the unemployment benefit system, which is very hard to defend. Rejection of both hypotheses implies that the unemployment coefficient is constant over time.

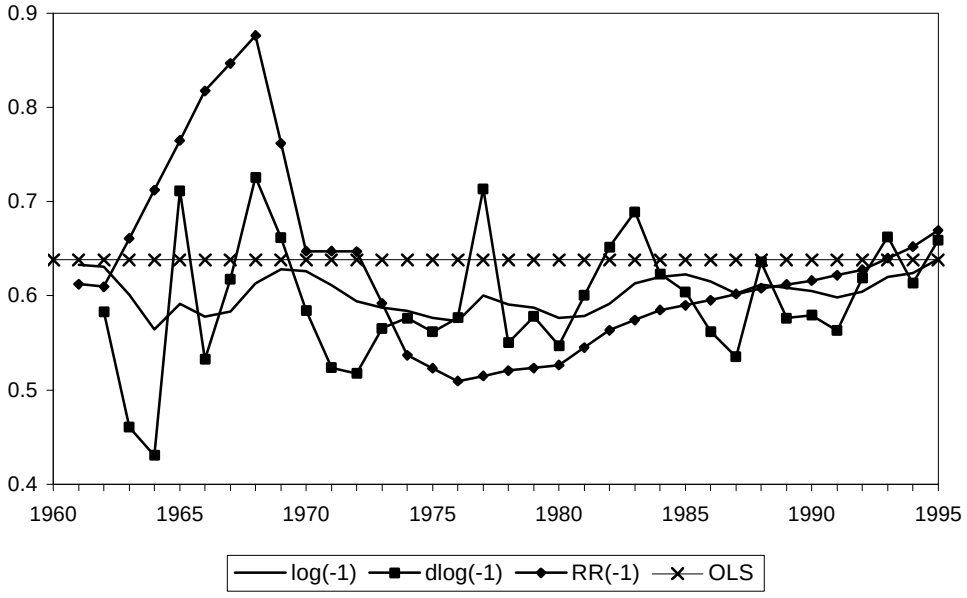
Estimation results

The estimation results are presented in table 2. Hypotheses 1 and 2 are only rejected in the case of Belgium. This implies that in France, Germany, Italy and The Netherlands (changes in) the generosity of the unemployment benefits did not have a significant impact on wage flexibility over the period 1960-1995. In Belgium however, the generosity of unemployment benefits is a significant determinant of wage flexibility over the period 1960-1995. In three of the four estimations the generosity measure has the expected sign. The estimated values of the parameters

[15] One might argue that making the coefficient of unemployment time-varying, could change conclusions with respect to the significance of other variables. Although no explicit tests were performed, the results below show that the non time-varying coefficents are fairly stable. This can be interpreted as an indication that making the coefficient of unemployment time-varying does not significantly alter the results with respect to wage formation.

of the variables in the wage equation have -as expected- approximately the same values as their OLS-counterparts in table 1. Figure 3 shows the estimated time-varying wage flexibility based on *log(GUS$_{-1}$)* and *Dlog(GUS$_{-1}$)*. The series based on the differences jumps up and down a lot, whereas the series based on levels (logarithms) shows a much smoother pattern. To some extent this is of course due to the differences-levels distinction. But given the fact that the standard deviations of both series do not differ very much (res. 0.11 and 0.14), there seems to be a stronger reaction to last year's changes in generosity than to last year's level of generosity (also reflected in a higher value of the likelihood function).

Figure 3: Estimated time-varying real wage flexibility, $|b_t|$, based on log(GUS), Dlog(GUS$_{-1}$) and the lagged replacement ratio as compared to the time independent OLS-estimate in Belgium



Robustness issues

A first crude way of testing the robustness of the obtained results consists in using the OECD replacement ratio series[16]. We generated a series with yearly observations by linearly interpolating[17] the two-yearly replacement ratio series. We then re-estimated model (6a-b) with the (lagged) replacement ratio as measure of the generosity of the unemployment benefits system. The values for TS1 and TS2 are in general higher for all countries, but the conclusions are very similar: only in the case of Belgium the replacement ratio significantly influences real wage flexibility (see table 2). In both cases the estimated c_{GUS} has the right positive sign. The differences in the estimated c_b and c_{GUS} are due to the different magnitude of the replacement ratio. From the beginning of the 70s onwards the series based on the lagged replacement ratio (see figure 3) and the one based on the lagged level of our own measure show the same trend (correlation coefficient of ±0.75).

[16] These series were taken from the OECD database on 'Unemployment Benefit Entitlements and Replacement Rates'. The 'replacement *ratio*' is calculated as an average replacement rate (benefits over income) over three periods of an unemployment spell (1st year, 2nd & 3rd year and 4th & 5th year), three family types (single, with dependent spouse and with spouse in work) and two different levels of previous earnings (at 100% & at 66.7% of average earnings). For further details see OECD (1994).

[17] Using a quadratic or cubic interpolation method did not alter the results.

Table 2: Estimation results for the time-varying parameter model

		C_w	*RWF (b)*			C_Y [a]	*Max. F* [b]
			C_b	C_{GUS} [c]	b_{av} [d]		
Belgium	log	0.1474	-0.8809	0.0605***	-0.6059**	-0.0226 0.6797 -0.0376 0.2075 -	157.36
	log_{-1}	0.1639	-1.2278	0.1375***	-0.6027**	-0.0238 0.6762 -0.0460 0.1994 -	157.41
	Δlog	0.1538	-0.6274	-0.1312***	-0.6271**	-0.0235 0.6735 -0.0399 0.1864 -	157.36
	Δlog_{-1}	0.1335	-0.5931	0.6112***	-0.5948***	-0.0212 0.6649 -0.0304 0.1923 -	158.90
	RR_{-1}	0.1520	-1.4939	2.0845***	-0.6276***	-0.0188 0.7019 -0.0409 0.2206 -	159.14
France	log	0.3615	-0.9599	0.0511	-0.7948	- 0.9014 -0.1480 - 0.4032	165.47
	log_{-1}	0.3597	-0.9454	0.0471	-0.7976	- 0.9001 -0.1470 - 0.3966	165.42
	Δlog	0.3357	-0.7091	0.0218	-0.7071	- 0.8971 -0.1367 - 0.3953	165.33
	Δlog_{-1}	0.3564	-0.7122	0.2146	-0.6968	- 0.9207 -0.1474 - 0.4692	166.61

Germany	log	0.4719	-1.5947	0.2852	-0.4750	-0.0388 1.1550 -0.2304 0.7209 0.9216	165.72
	$\log_{-1}$	0.3687	-0.6942	0.0499	-0.4986	-0.0338 1.2082 -0.1772 0.7343 0.9788	165.11
	$\Delta\log$	0.3961	-0.5424	0.2147	-0.5419	-0.0365 1.1705 -0.1899 0.7148 0.9114	165.40
	$\Delta\log_{-1}$	0.3379	-0.5031	-0.1411	-0.5037	-0.0319 1.2487 -0.1613 0.7306 0.9916	165.27
The Netherlands	log	0.1918	4.0279	-1.0412	-1.1128	- 0.9629 -0.0695 0.5615 -	147.02
	$\log_{-1}$	0.2078	-0.1480	-0.1154	-0.7194	- 0.9538 -0.0826 0.5891 -	146.46
	$\Delta\log$	0.2228	-0.6946	-0.6599	-0.6859	- 0.9487 -0.0898 0.5225 -	146.75
	$\Delta\log_{-1}$	0.1997	-0.6375	0.8384	-0.6487	- 0.9322 -0.0799 0.6399 -	147.01

[a] The vector associated with γ includes: $[\,dummy, \Delta\Delta pc_t, (w_{t-1} - pc_{t-1} - y_{t-1}), \Delta z_t, (\Delta p_t - \Delta pc_t)\,]$; for all countries TS4 (as well as TS3) is rejected at the 1% level

[b] Maximum value of the loglikelihood function *F*, see appendix 1 for a description of *F*.

[c] *, **, *** denote rejection of TS2 at the 10%, 5% and the 1% level

[d] *, **, *** denote rejection of TS1 at the 10%, 5% and the 1% level

In the above we let the generosity of the unemployment benefit system determine who is relevant for wage formation. When the relevant category of unemployed persons -those influencing wage formation- is *ex ante* (and correctly) determined, one would expect the relationship (if any) to break down within a country over time. An exception to this might be a situation where considerable changes in the unemployment benefit system (or more general in institutions) occur at a 'high' frequency, implying large fluctuations in the future prospects for the relevant unemployed facing a chance to become irrelevant. In reality institutional changes are most of the time only modest, with considerable changes only occurring at a very low frequency.
In what follows we define the cyclically unemployed persons as the relevant category. The relevant category can then be determined as actual unemployment minus equilibrium unemployment, defined as the non-accelerating wage rate of unemployment (NAWRU). The reader is referred to appendix 2 for a discussion of the calculation of the NAWRU.

Before re-estimating model (6a-b) with cyclical unemployment, i.e. U_t-U_t^*, where U_t^* is the calculated NAWRU-value, we re-estimated equation (3). The best results (obtained by the same procedure as in section 3) are given in table 3. In all countries the point estimate of the coefficient on unemployment is -as expected- higher. Taking into account standard errors it only rose significantly in Belgium. In comparison with the results of table 1 productivity is no longer significant in explaining wage growth in Belgium.[18] Productivity in The Netherlands, on the other hand, has a larger positive influence. In France the internal terms of trade proxy is no longer significant, but productivity is now. This is also the case for the estimate with the Italian data. To deal with the poor Durbin-Watson statistic a lagged dependent variable was included among the regressors. All other coefficients do not differ for the five countries in comparison with table 1.

When we used the variables found in table 3 for the estimation in a time varying setting, we did not find a significant relationship between the GUS-transformation (or the replacement ratio) and (real) wage flexibility. It seems to be that the influence of the cyclically unemployed persons on wage formation does not vary with the generosity of the unemployment benefit system.
Of course, the most interesting case is Belgium. The results in this section indicate that the generosity of the unemployment benefit system does not matter for wage flexibility in Belgium if the relevant category is *ex ante* identified as the cyclical unemployed persons. Confronted with the evidence of a significant relationship when using total unemployment and the significant rise in wage flexibility when using cyclical unemployment, one would be tempted to conclude that the generosity of the unemployment benefit system is an element that generates the distinction between "relevant" and "irrelevant" for wage formation in Belgium. This would

[18] That the higher coefficient on unemployment is not due to the fact that changes in productivity are dropped can be seen from the following regression (which was not used because the low D-W statistic pointed to autocorrelation, 'error' equals $w_{t-1} - pc_{t-1} - z_{t-1}$):

$$\Delta(w_t - pc_{t-1}) = 0.14 - 0.02\ dummy + 0.56\ \Delta\Delta pc_t - 0.91(U_t - U^*_{t-1}) + 0.31\ \Delta z_t - 0.06\ 'error'$$
$$(0.07)\ (0.007) \qquad (0.10) \qquad (0.11) \qquad (0.14) \qquad (0.03)$$
adj. $R^2 = 0.87$ D-W = 1.59

however be too strong a statement. We can only state that the downward pressure on wages by all unemployed depends over time on the level of generosity, whereas the pressure by cyclical unemployed -which is significantly larger- does not depend on it. Naturally the reservations we made considering our NAWRU estimates *a fortiori* apply here.

Table 3: Wage equations using cyclical unemployment
dependent variable: $D(w_t - pc_{t-1})$ (standard errors between brackets)

	Belgium[a]	**France**	**Germany**[a]	**Italy**	**The Netherlands**
Sample	*1962-1995*	*1963-1995*	*1962-1995*	*1962-1995*	*1962-1995*
Const.	0.1574 *(0.0784)*	0.2630 *(0.1030)*	0.3157 *(0.1357)*	2.8358 *(1.0837)*	0.1897 *(0.0563)*
Dummy	-0.0199 *(0.0084)*	-	-0.0262 *(0.0098)*	-	-
$\Delta\Delta pc_t$	0.5071 *(0.1070)*	0.6875 *(0.0951)*	1.1024 *(0.2029)*	0.7349 *(0.1420)*	0.9307 *(0.1188)*
$U_t - U_t^*$	-1.0270 *(0.1002)*	-1.0921 *(0.2155)*	-0.7499 *(0.2067)*	-1.5154 *(0.5463)*	-0.7770 *(0.1600)*
Δp_t - Δpc_t	-	-	1.0139 *(0.1667)*	-	-
Δz_t	-	0.2395 *(0.1217)*	0.7684 *(0.0634)*	0.5374 *(0.1286)*	0.7836 *(0.1544)*
$w_{t-1} - pc_{t-1}$ $- z_{t-1}$	-0.0656 *(0.0404)*	-0.1156 *(0.0513)*	-0.1541 *(0.0683)*	-0.3217 *(0.1230)*	-0.0946 *(0.0287)*
$\Delta(w_t / pc_{t-1})_{-1}$	-	-	-	0.3480 *(0.0981)*	-
Adj. R^2	0.85	0.87	0.93	0.83	0.84
DW	1.96	1.70	1.75	-0.27[b]	1.71

[a] dummy: 1960-1969=1
[b] Durbin-h

Given the results above, we are confident that for Belgium the relationship between wage flexibility and the generosity of unemployment benefits is present. It is of course possible that the effect of the generosity of unemployment benefits would be modified if more labour market characteristics (and interactions) would be taken into account.

Given the almost non-existence of the Italian unemployment benefit system and the fact that there are only small changes in the generosity, it is straightforward not to expect any time-varying behaviour of wage flexibility due to changes in generosity in Italy. This was confirmed by the data (results are not reported).

Although the French, German and Dutch unemployment benefit systems are also quite generous and the systems show some (considerable) evolutions (cf. figure 2), we find no evidence of a relationship between wage flexibility and the generosity of the

unemployment benefit system. There are three possible explanations for these findings:
1) there is no relationship in reality, i.e. the changes over time in generosity are too small to have an effect on flexibility or simply do not matter; 2) the datasets are too limited to draw any firm conclusions and 3) there are interactions with other labour market institutions that are not present in the estimated model (cf. Nickell (1997)). Given these last remarks we are not able to make any definitive statements with regards to these three economies.

5. Conclusions

The well-known comparison of the European labour market with its Japanese and American counterparts reveal that Europe needs more real wage flexibility or employment adaptability, irrespective of the EMU-aspect. The deprivation of an independent monetary policy as an instrument to deal with (asymmetric) shocks under EMU only increases this need. From the existing literature we learn that paradoxically the effect of EMU on wage flexibility is not unidirectional positive. The effect will depend on the reaction of wage setters as well as on the reaction of the government. The latter referring to the question whether national governments will (have an incentive to) implement and/or increase labour market reform.
Using the existing literature we illustrate that different labour market institutions determine who can exert how much pressure on wages. We relate these different labour market institutions to wage flexibility, indicating some possible advantageous reforms. Confrontation with the critical view of Nickell (1997) teaches us that one should not be too optimistic about the effects of labour market reform and that a careful study is therefore needed to retrieve the optimal reform-mix.

At the empirical level we first estimated a 'bargaining-augmented' wage equation for five important EMU-countries, allowing us to identify (real) wage flexibility in these countries as the parameter of unemployment in the wage equation. Wage flexibility in Italy -where the unemployment benefit system is very strict- proved to be significantly larger than in other countries.
Then we proceeded with an estimation in a coherent time-varying setting, where we allowed a transformation of the expenditures on unemployment benefits to influence wage flexibility. Given the very strict and stable unemployment benefit system in Italy, a relationship between the generosity of unemployment benefits and wage flexibility is not expected. This was confirmed by the data. For Belgium we find a significant time-varying influence of the generosity of the unemployment benefit system on wage flexibility. For France, Germany and The Netherlands we do not find an indication of such a relationship. These results are confirmed when using the OECD measure for generosity of the unemployment benefits. Although no other institutions (nor interactions with them) are considered, we are quite confident that in Belgium the relationship between wage flexibility and the generosity of unemployment benefits holds. Concerning France, Germany and The Netherlands we find no evidence on such a relationship, but due to our limited datasets we are not able to draw any definitive conclusions. Therefore the possibility of a time-

varying relationship between wage flexibility and labour market institutions in general should not be excluded for these countries.

When we determine the relevant category of unemployed (influencing wage formation) *ex ante* as actual unemployment minus equilibrium unemployment, we find that this category of unemployed persons has a significantly larger negative impact on wage formation in Belgium. In the other countries the coefficient is also higher, though not significantly. In this case, the generosity of the unemployment benefits does no longer limit wage flexibility in Belgium. This also holds for the other countries. In the case of Belgium, given the previously found significant relationship when using total unemployment, this is an indication that the generosity of the unemployment benefits is an important element in determining to what extent which type of unemployed persons can exert pressure on wages in Belgium.

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Appendix 1: Estimation of time-varying parameter models

Consider the following model:

$$y_t = a_0 + b_t x_t + g\,\overline{w}_t + e_t \tag{1}$$

with: $$b_t = a + d\,z_t + u_t \tag{2}$$

Assume that $\begin{pmatrix} e_t \\ u_t \end{pmatrix} \overset{i.i.d.}{\sim} N(0, \begin{pmatrix} s_e^2 & 0 \\ 0 & s_u^2 \end{pmatrix})$ and that x_t and $\overline{w}_t$ are uncorrelated with e_t, so that by defining $l := \frac{s_u^2}{s_e^2}$, we find from substitution of (2) in (1):

$$\begin{aligned} \mathrm{E}[y_t] &= \mathrm{E}[a_0 + a\,x_t + d\,x_t z_t + u_t x_t + g\,\overline{w}_t + e_t] \\ &= a_0 + a\,x_t + d\,x_t z_t + g\,\overline{w}_t \end{aligned}$$

$$\begin{aligned} \mathrm{var}(y_t) = \mathrm{E}[y_t - \mathrm{E}\{y_t\}]^2 &= \mathrm{E}[u_t x_t + e_t]^2 = x_t^2 s_u^2 + s_e^2 \\ &= (1 + l\,x_t^2) s_e^2 \end{aligned}$$

The joint loglikelihood-function for n observations is then given by:

$$\begin{aligned} \log L(a_0, a, d, g, s_e, l) = const &- \frac{n}{2}\log(s_e^2) - \frac{1}{2}\sum_{t=1}^{n}\log(1 + l\,x_t^2) \\ &- \frac{1}{2s_e^2}\sum_{t=1}^{n}\frac{(y_t - a_0 - a\,x_t - d\,x_t z_t - g\,\overline{w}_t)^2}{1 + l\,x_t^2} \end{aligned} \tag{3}$$

With $r_t := \sqrt{1 + l\,x_t^2}$ this reduces to:

$$\begin{aligned} \log L(a_0, a, d, g, s_e, l) = const &- \frac{n}{2}\log(s_e^2) - \frac{1}{2}\sum_{t=1}^{n}\log(r_t^2) \\ &- \frac{1}{2s_e^2}\sum_{t=1}^{n}\frac{(y_t - a_0 - a\,x_t - d\,x_t z_t - g\,\overline{w}_t)^2}{r_t^2} \end{aligned} \tag{4}$$

Now determine the optimal estimator for the constant term α_0. The first order condition gives:

$$\left.\frac{\partial \log L}{\partial a_0}\right|_{\wedge} = 0 \quad \rightarrow \quad \hat{a}_0 = \frac{\tilde{y} - \hat{a}\,\tilde{x} - \hat{g}\,\tilde{\overline{w}} - \hat{d}\,\tilde{z}}{R} \tag{5}$$

where:

$$R := \sum_{t=1}^{n}\frac{1}{r_t^2} \tag{6}$$

$$\tilde{y} := \sum_{t=1}^{n} \frac{y_t}{r_t^2} \tag{7}$$

$$\tilde{x} := \sum_{t=1}^{n} \frac{x_t}{r_t^2} \tag{8}$$

$$\tilde{\overline{w}} := \sum_{t=1}^{n} \frac{\overline{w}_t}{r_t^2} \tag{9}$$

$$\tilde{z} := \sum_{t=1}^{n} \frac{x_t z_t}{r_t^2} \tag{10}$$

Define the sum of squared residuals (SSQ) as follows:

$$SSQ := \sum_{t=1}^{n} \frac{\left[\left(Ry_t - \tilde{y}\right) - a\left(Rx_t - \tilde{x}\right) - g\left(R\overline{w}_t - \tilde{\overline{w}}\right) - d\left(Rx_t z_t - \tilde{z}\right)\right]^2}{R^2 r_t^2} \tag{11}$$

The loglikelihood-function then can be written as:

$$\log L\left(\hat{a}_0, a, d, g, s_e, l\right) = const - \frac{n}{2}\log\left(s_e^2\right) - \frac{1}{2}\sum_{t=1}^{n}\log\left(r_t^2\right) - \frac{1}{2s_e^2} SSQ \tag{12}$$

From which we deduce: $$\hat{s}_e^2 = \frac{SSQ}{n} \tag{13}$$

The loglikelihood-function (12) strongly resembles the loglikelihood-function of the following linear relationship:

$$\frac{Ry_t - \tilde{y}}{Rr_t} = a\frac{Rx_t - \tilde{x}}{Rr_t} + g\frac{R\overline{w}_t - \tilde{\overline{w}}}{Rr_t} + d\frac{Rx_t z_t - \tilde{z}}{Rr_t} + e_t \tag{14}$$

For a given value of λ we find from OLS (14) the estimators for α, γ and δ which can be substituted back in the loglikelihood-function. This results in:

$$\log L\left(\hat{a}_0, \hat{a}, \hat{d}, \hat{g}, \hat{s}_e, l\right) = const - \frac{n}{2}\log\left(\hat{s}_e^2\right) - \frac{1}{2}\sum_{t=1}^{n}\log\left(r_t^2\right) - \frac{n}{2} \tag{15}$$

which is of the form: $$\log L\left(\hat{a}_0, \hat{a}, \hat{d}, \hat{g}, \hat{s}_e, l\right) = \tilde{c} + F(l) \tag{16}$$

where: $$F(l) = -\frac{n}{2}\log\left(\hat{s}_e^2\right) - \frac{1}{2}\sum_{t=1}^{n}\log\left(r_t^2\right) \tag{17}$$

Maximisation of the likelihood-function (3) is thus equal to the maximisation of (17) with respect to λ, which can be solved by e.g. a random search procedure.

Appendix 2: NAWRU calculations

The labour market equilibrium is assumed to be at the natural rate of unemployment or the non-accelerating inflation rate of unemployment (NAIRU). Part of the literature on 'NAIRU' focuses on the use of the NAIRU for policy making, our main interest, however, is to use the NAIRU for the calculation of 'cyclical unemployment' (i.e. actual unemployment minus NAIRU). That the computation of a consistent NAIRU is not that straightforward is illustrated by Blanchard and Katz (1997). The main conclusion from their study of the literature is that considerable theoretical progress has been made, but that "the empirical knowledge sadly lags behind" and that "economists are a long way from having a good quantitative understanding of the natural rate, either across time or across countries" (Blanchard and Katz (1997), p.52).

On the theoretical plan a framework has emerged, built around two central ideas. The first is that the labour market is characterised by large flows into and out of unemployment. This implies the existence of some optimal level of frictional unemployment. The other central idea is that in general the relations between employers and employees are such that wage setting differs from competitive wage setting. This implies that the observed actual unemployment level will differ from the efficient frictional unemployment level.
At the empirical level, different approaches to the computation of the NAIRU can be found in the literature. Since the NAIRU is an unobservable quantity, certain assumptions are needed to identify it. A first possibility is to use statistical assumptions in order to detect long run trends in equilibrium unemployment (e.g. Douven (1999)). Another possibility is to start from a certain model (using economic assumptions), where equilibrium unemployment then follows from the behaviour of workers and firms (e.g. Broer *et al.* (1999)). We largely follow the approach of McMorrow (1996). The approach is very simple, but since the obtained figures do not seem to be outperformed by more advanced econometric techniques or model estimates we restrict ourselves to this approach. The approach consists in calculating an equilibrium rate from a single wage equation and can therefore be linked to section 3. The obtained equilibrium rate is called NAWRU (non-accelerating wage rate of unemployment).

Rewriting equation (3) with Dw_t as the dependent variable and leaving out DU_t and the tax variables we get:

$$\Delta w_t = c_w + a\,\Delta pc_t + (1-a)\Delta pc_{t-1} - b\,U_t - j\,(w_{t-1} - pc_{t-1} - z_{t-1}) + d\Delta z_t + q\,(\Delta p_t - \Delta pc_t) \qquad \text{(A1)}$$

In the long run $w_{t-1} - pc_{t-1}$ equals z_t and Dpc_t equals Dpc_{t-1}. Notice that in the long run -given perfect foresight- the following also holds: $pc_t^e - pc_{t-1} = pc_t - pc_{t-1} = \Delta pc_t$. Following Blanchard and Katz (1999) we then restrict a to be equal to one (cf. (1)) then (A1) becomes:

$$\Delta w_t = c_w + \Delta pc_t - b\,U_t + d\,\Delta z_t + q\,(\Delta p_t - \Delta pc_t) \qquad \text{(A2)}$$

Since $w_t - pc_t = z_t$ in the long run, the growth of the real wage also equals the growth of the labour productivity in the long run, i.e. $\Delta w_t - \Delta pc_t = \Delta z_t$. Suppose also that in the long run the difference between consumer and producer prices becomes negligible, i.e. $\Delta p_t - \Delta pc_t \approx 0$. Now rewrite the above specification as follows:

$$\Delta w_t - \Delta pc_t - \Delta z_t = c_w + b\,U_t + (d-1)\Delta z_t + q(\Delta p_t - \Delta pc_t) \qquad \text{(A3)}$$

In the long run this reduces to:

$$0 = c_w + b\,U_t + (d-1)\Delta z_t \qquad \text{(A4)}$$

Some rewriting gives:

$$0 = b\left(U_t - \underline{\left[\left(-c_w + (1-d)\Delta z_t\right)/b\right]}\right) \qquad \text{(A5)}$$

The underlined part of the expression is the NAWRU. This NAWRU calculation also takes productivity growth into account. But Blanchard and Katz (1997) argue that 'pure' productivity growth should have no effect on the NAIRU in the very long run. Temporary effects are possible; if reservation wages include employees' aspirations dynamic effects of productivity growth cannot be ruled out. But then changes in productivity growth rather than productivity growth itself should influence the NAIRU (see for example Stiglitz (1997)).[19] Skott (1998) argues that the European data do not fit this story very well. He proposes a minor change to the "Stiglitz"-framework (in game theoretical form), yielding a better fit of the data. Unfortunately none of the mentioned contributions provides a thorough empirical examination of the proposed theories. However productivity growth (as a consequence of technological progress) will most of the time be accompanied by some structural changes; combined with possible labour market rigidities this yields more ambiguous effects on the natural rate.[20] Therefore we stick to the proposed expression.

The results of the estimation of specification (A5) are given in table A1. We use the estimated coefficients to compute the NAWRU, replacing actual productivity with trend productivity based on a Hodrick-Prescott filter. The resulting NAWRU time series are plotted in the figures A1-A5. The increase in equilibrium unemployment is present in all countries. Estimates are unfortunately not perfect. The rise in unemployment following the oil shocks is expected to result in a level of unemployment rising above the NAWRU; followed by a slow increase of the NAWRU after the oil shocks. This is only the case for France and Germany. Calculations for Belgium, Italy and The Netherlands do however not reflect this intuition. The NAWRU stays above the actual unemployment rate until about 1980. For Belgium and The Netherlands the calculated values in the 60s are also very high. In the

[19] For shorter periods of time wage aspirations of the employees can be out of line with productivity growth; if this is the case a decrease/increase in productivity growth will lead to a higher/lower NAIRU until aspirations have adjusted to the new productivity growth.

[20] See Blanchard and Katz (1997) for further details.

"golden" 60s it is not impossible that the actual unemployment rate is smaller than the NAIRU, but the differences seem to be very large.
More advanced econometric techniques used to calculate the NAIRU/NAWRU can be found in a/o Douven (1999), Broer *et al.* (1999), Madsen (1998) and Gordon (1997) (the latter only for the USA). Madsen (1998) finds in contrast to most other studies a declining NAIRU from the 60s to the late 80s. Douven (1999) calculates both a short and a long term equilibrium rate, based on quarterly data starting after the second oil shock. Broer *et al.* (1999) use a right-to-manage model to calculate a NAIRU for The Netherlands that follows actual unemployment more closely then ours, but structural unemployment nevertheless also exceeds actual unemployment from the sixties until 1982. None of the mentioned studies, however, provides a NAIRU that significantly outperforms -for the calculation of cyclical unemployment- our own estimate. We therefore restrict ourselves to the calculation as proposed by McMorrow (1996).

Table A1: TSLS estimations of wage equations for calculation of the NAWRU (dependent variable Dw_t)

	Belgium	***France***	***Germany***	***Italy***	***The Netherlands***
Const.	0.0440 *(0.0086)*	0.0363 *(0.0163)*	0.0126 *(0.0044)*	0.0586 *(0.0135)*	0.0420 *(0.0078)*
Δpc_t	1	1	1	1	1
U_t	-0.3616 *(0.0663)*	-0.3432 *(0.1098)*	-0.2369 *(0.0658)*	-0.6312 *(0.1427)*	-0.5188 *(0.1107)*
$\Delta p_t - \Delta pc_t$	0.8065 *(0.2030)*	0.5762 *(0.2151)*	1.2269 *(0.1616)*	1.1534 *(0.4566)*	1.2703 *(0.3550)*
Δz_t	0.4675 *(0.1512)*	0.3444 *(0.2847)*	0.7198 *(0.0680)*	0.2808 *(0.1400)*	0.3988 *(0.1542)*
Adj. R^2	0.89	0.93	0.91	0.87	0.91
DW	1.52	1.37	2.16	1.75	1.57

[a] instruments: *const.*, U_t, Dpc_{t-1}, Dw_{t-1}, $Dp_{t-1} - \Delta pc_{t-1}$, Dz_t

Figure A.1: Belgium

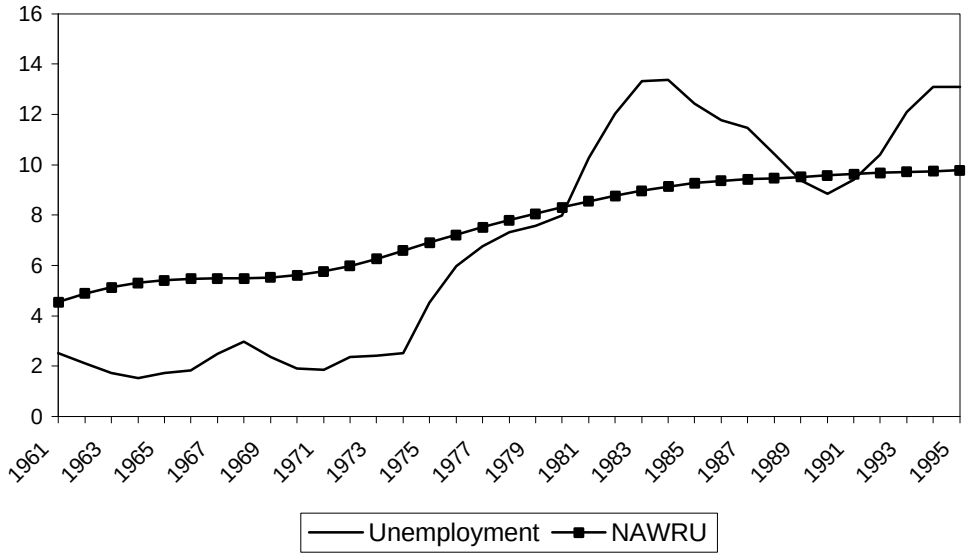

Figure A.2: France

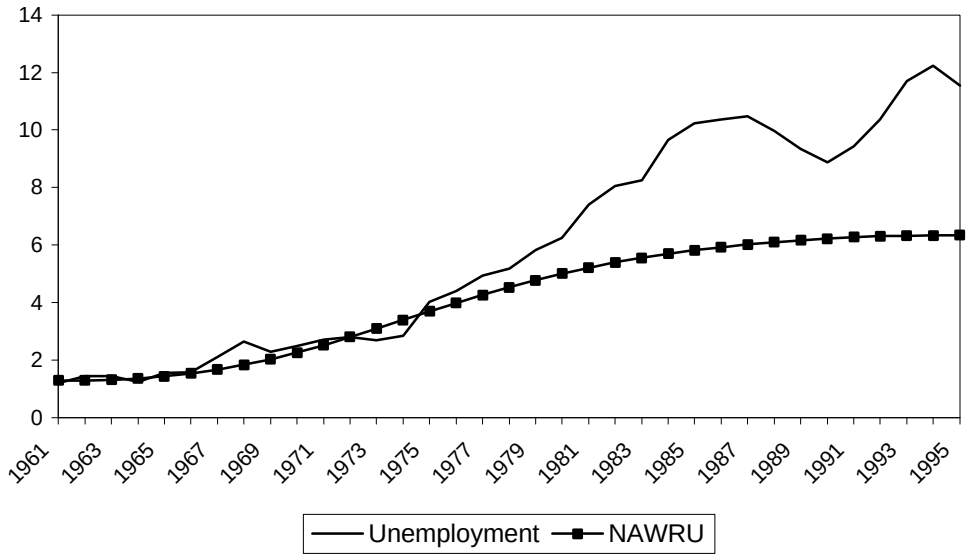

Figure A.3: Germany

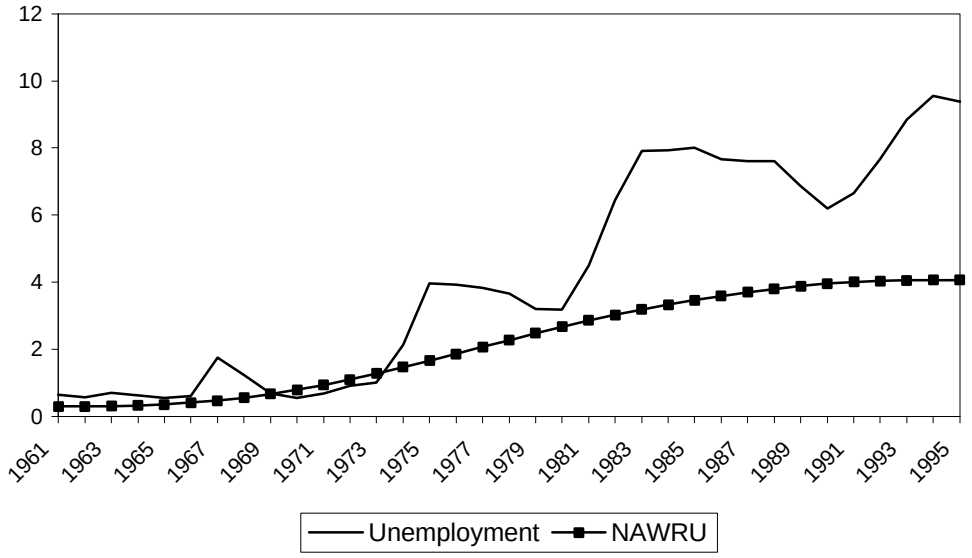

Figure A.4: Italy

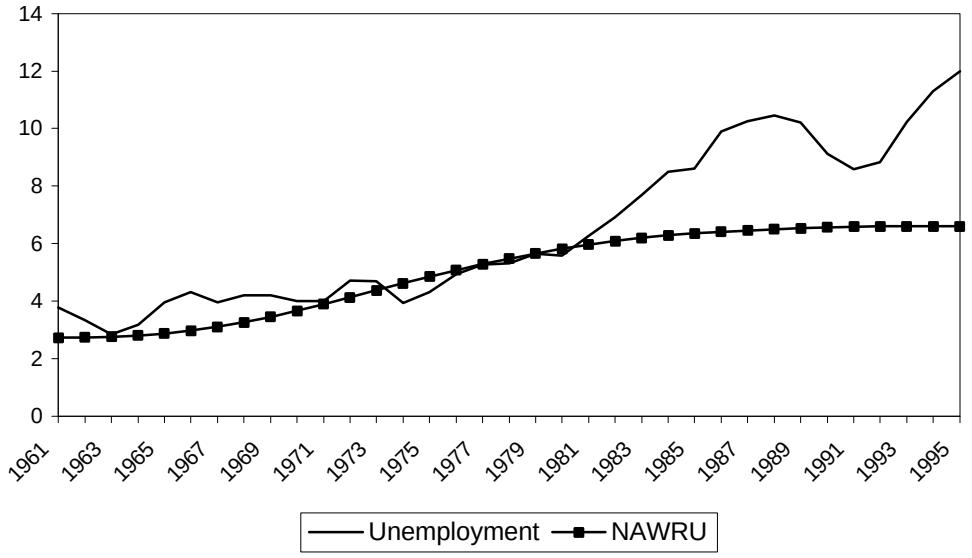

Figure A.5: The Netherlands