Econometric Research and Special Studies Department

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Research Memorandum WO&E no. 677
December 2001

De Nederlandsche Bank

ON WAGE FORMATION, WAGE DEVELOPMENT AND UNEMPLOYMENT

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* We would like to thank Lex Hoogduin and Peter van Els for useful comments. All remaining errors are of course ours. Moreover, we thank Menno Grevelink and Peter Keus for assistance.

Research Memorandum WO&E no. 677/0132

December 2001

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ABSTRACT

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Since the mid nineties unemployment has substantially decreased in some EMU-countries. One important factor underlying this development is wage moderation. This paper investigates wage formation and wage development. Using a theoretical wage bargaining model main determinants of formation are described, a non-linear wage equation is derived and estimated with annual or quarterly data of the Netherlands, Spain and Ireland. The effects of the individual determinants on wages are calculated and, in addition, each determinant's contribution to the total wage developments is analysed over the last three decades. It follows that each decade is characterised by few dominating determinants. The contribution of unemployment has altered considerably.

Key words: wage formation, wage development, unemployment
JEL codes: C22, E24, J30

SAMENVATTING

Over loonvorming, loonontwikkeling en werkloosheid
H.M.M. Peeters en A.H.J. den Reijer

Sinds het midden van de jaren negentig is de werkloosheid in een aantal EMU-landen aanzienlijk afgenomen. Eén belangrijke oorzaak voor deze ontwikkeling betreft loonmatiging. Dit artikel besteedt aandacht aan de loonvorming en -ontwikkeling. Een theoretisch loononderhandelingsmodel is gebruikt om de determinanten van loonvorming te beschrijven, een niet-lineaire loonvergelijking af te leiden en te schatten met jaar- en kwartaalgegevens van Nederland, Spanje en Ierland. Aan de hand hiervan zijn de effecten van de individuele determinanten op de loonontwikkeling berekend. In aanvulling hierop is de bijdrage van elke loondeterminant in het totaal van de loonontwikkeling geanalyseerd gedurende de laatste drie decennia. Uit de analyse volgt dat elk decennium kan worden gekarakteriseerd door slechts een paar determinanten. De bijdrag van werkloosheid is aanzienlijk veranderd.

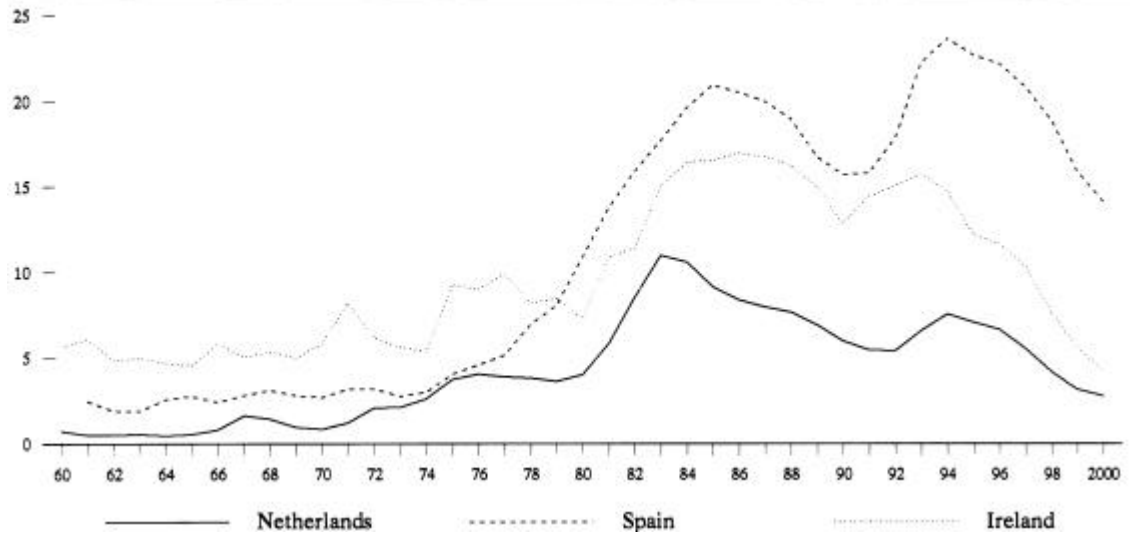
Trefwoorden: loonvorming, loonontwikkeling, werkloosheid
JEL codes: C22, E24, J30

1 INTRODUCTION

Only a couple of years ago the huge, strongly increasing, domestic unemployment was a source of concern for most European countries. Spain constituted the extreme upward peak. This country experienced an average unemployment of 19.7% during the period 1983-1996 en reached a top of 23.7% in 1994. Countries like Belgium, Denmark, Finland, France, Ireland and the United Kingdom reported during this period high unemployment rates of about 10% (OECD, 1997).

In trying to explain this phenomenon of persistently high unemployment many comparisons with the United States have been made. European labour markets are characterised in several studies as 'rigid' and 'inflexible'. Unemployment has on average been much higher in Europe than in the US, a country facing obviously less employee protection measures [1]. Nickell (1997) rebutted this criticism in an extensive study on the basis of different labour market criteria, emphasising the diversity of the European countries. Unemployment during the period 1983-1996 had been on average lower in five of the fifteen European Union countries than in the US. Moreover, the unemployment compensation payments had been more generous in the US than for instance in Italy.

Chart 1 Unemployment



[1] See e.g. Tables 1 and 4, p. 61, Nickell, 1997.

For some European countries unemployment 'persistence' is no longer applicable since the mid nineties. The unemployment rate has even fallen drastically with Ireland, the Netherlands and Spain outperforming the other EMU-countries [2]. As shown in graph 1, from 1993/1994 until 2000 the unemployment in the three countries has declined 9.6 percentage points in Spain, 11.4 in Ireland and 5.2 in the Netherlands. For the period 1995-2000 this boils down to an increase in employment of 2.2 million persons in Spain, over 400,000 in Ireland and nearly 1 million in the Netherlands. Despite its superior behaviour, Spain experiences the highest number of unemployment persons within the European Economic and Monetary Union (EMU). Ireland and the Netherlands conversely seem to have reached the point of a tight labour market, approaching nearly the case of 'full employment'.

Table 1 Wage increase (%) due to a 1 percentage point decrease in unemployment

	Short term	Long term
Ireland	0.80	1.82
Netherlands	0.66	2.28
Spain	0.17	1.21

Source: Layard, Nickell en Jackman (1991, Table 2, page 406).

The sharp reduction in unemployment provokes a positive effect on the economies. The question rises however to what extent this reduction will upwardly influence wages, that might in the long term counter the positive effects of additional employment creation. Moreover, wage rigidity seems downward more rigid than upward. Different kinds of methods exists measuring this (real) wage rigidity. Layard, Nickel and Jackman (1991) calculated for instance that the wage elasticities of the unemployment rate are relatively low for the countries that we have under investigation here (see Table 1), but relatively high in the long term. This fact implies that a change in the unemployment rate affects the wage formation mainly in the long term.

This paper deals with these long-run wage elasticities. Furthermore, apart from unemployment, attention is paid to other factors that determine wages. Various determinants of wage formation are discussed according to a theoretical model from which a non-linear wage equation is derived, developed by Graafland and Huizinga (1999). This model is estimated for the Netherlands, Spain and Ireland and the

[2] Finland fits also in this list as Finnish unemployment declined from 1994 to 2000 by almost 7 percentage points. We have however not included Finland in the analyses here.

accompanying elasticities are calculated. The non-linear nature of the wage equation has the advantage that the wage elasticities need not necessarily be constant. So, instead of the (constant) elasticities presented in Table 1 according to Layard *et al.* (1991), this framework enables us to compute elasticities that differ in time. We can therefore analyse specific changes that have been taking place during past years. Moreover, we are able to quantify the partial contributions to the wage increase of the different determinants. These calculations are performed over a sample of almost thirty years. Different determinants turn out to be dominant during the different decades.

The organisation of this paper is as follows. Section 2 presents the theoretical model and the derivation of the non-linear wage equation. Section 3 discusses the main wage determinants according to this model. Section 4 to 6 report the estimation results. In section 4 this concerns the estimated wage equations for the Netherlands and Spain. Section 5 thereafter goes into the details of the elasticities and section 6 into the contributions of the determinants to the wage development. Section 7 finally provides background information about the labour market policies during the last three decades in the three countries under investigation. Section 8 summarises and concludes.

2 THE WAGE BARGAINING PROCESS ACCORDING TO ECONOMIC THEORY: A NON-LINEAR WAGE EQUATION

Literature describes the wage negotiation process in different ways. One of the most well-known economic models is the Nash bargaining model that originates from game theory [3]. The model distinguishes on the one hand employers (organisations) and on the other hand employees (organisations) or labour unions, wishing to reach an agreement on the employees' wage. The model deals thus with two 'players', being 'the' employer and 'the' employee, who negotiate on equal terms on an 'average' wage.

During the negotiation process the gross wage is at stake. The players bargain and have a strict conflict of interests. The employer´s aim is profit maximisation, while the employee aims at obtaining a net wage that is as high as possible. The employee maximises the 'utility' that depends proportionally on this net wage. A higher wage for the employee necessarily implies a lower profit for the employer and, *vice versa*, a higher profit can only be achieved by paying the employee a lower wage.

The wage, exclusive of sunk costs, is defined as the turnover per employee after deduction of the gross wage of the employee. This can be written as

$$P\,q - W, \tag{1}$$

where P is the value added price of production, q the production per employee (labour productivity) and W the gross wage. The employee receives a net wage, so a gross wage after deduction of the taxes and social contributions, t, paid by the employer as well as by the employee. The utility of the employee is defined as the net wage in deviation of the reservation wage $\underline{W}$,

$$W\,(1-t) - \underline{W}. \tag{2}$$

The reservation wage concerns the wage or benefit the employee would receive in case he would not fulfil the job under consideration. This is a so called opportunity wage. The employee's utility increases in case the net wage $W(1-t)$ increases or in case the reservation wage $\underline{W}$ decreases. The reservation wage is

[3] See for a detailed description Graafland and Huizinga (1999). We thank them for providing their data and software. They estimate with Dutch data the non-linear wage equation that results from the optimizing framework. They further examine the effects of the average and marginal tax rates and the role of unemployment in interaction with the replacement rate.

however not directly observable. It can be calculated as a kind of average earnings the employee would receive in case of being employed elsewhere or in case of being without a job. Otherwise stated, these cases concern having another paid job or being (in-)voluntarily unemployed. The reservation wage is therefore a weighted average of the wage income in the official and the informal sector,

$$\underline{W} = ß\ \underline{W}_{official} + (1-ß)\ \underline{W}_{informal}\,. \qquad (3)$$

The parameter *ß* represents the fraction of the official wage in the reservation wage. Searching for a job - in the official sector- may take some time, in particular in case of a loose labour market. During this search period the unemployed receives no wage, but an unemployment or social benefit. A tight labour market, on the contrary, raises the probability of finding a job. This probability can be assumed to equal the fraction of unemployed persons in de labour force, say u. The unemployment rate u and the so called replacement ratio R play a role in determining the wage of the official sector $\underline{W}_{official}$, that is

$$\underline{W}_{official} = u\ R\ \underline{\underline{W}}\,(1-t) + (1-u)\ \underline{\underline{W}}\,(1-t). \qquad (4)$$

The wage in the official sector $\underline{W}_{official}$ equals $\underline{\underline{W}}\,(1-t)$ in case of no unemployment (u=0) and, in case where the unemployment rate would be 100% (i.e. u=1), $R\ \underline{\underline{W}}\,(1-t)$. These cases are evidently two extremes. Usually the wage in the official sector will be somewhere in between. Wage $\underline{\underline{W}}$ is the gross average 'market' wage. The gross benefit received when unemployed equals $R\ \underline{\underline{W}}$ because the replacement rate R equals the 'average' unemployment benefit divided by the average market wage. This replacement rate plays an important part in this model. It can be seen as a sort of reduction in income in case a person, instead of working, does not work.

The wage obtained in the unofficial sector can result from work done in the black market or saved expenditures due to homework. Examples of the latter are savings due to child care, cleaning or house (re-) decoration. It is assumed that productivity in the informal sector is linked to that of the official sector because of spillovers of technological progress improving labour productivity in general. A parameter g allows for a relatively low labour productivity of the informal vis-à-vis the official sector. Earnings in the informal sector consisting of savings and/or expenses, represented as $\underline{W}_{informal}$, is further assumed conditional on the consumer price $P_{c,}$

$$\underline{W}_{informal} = \gamma\ q\ P_c \quad \text{where} \quad \gamma < 1. \qquad (5)$$

The 'optimal' gross wage is derived from the wage bargaining model by maximising the combined objectives of the employer and the employee, i.e.

$$W = (P\,q - W)^{\alpha}\,(W\,(1\text{-}t)\text{-}\underline{W})^{1-\alpha} \tag{6}$$

where a is a parameter representing the bargaining power of the employer. The higher this parameter, the more power the employer has in comparison with the employee during the negotiation process.

After substitution of (1)-(5) into (6) and deriving the first order condition for optimality, the bargained wage is derived as

$$W = \frac{a\,\underline{W}/(1-t_m)+(1-a)Pq}{a(1-t)/(1-t_m)+(1-a)}. \tag{7}$$

In the extreme case where the employer dominates the bargaining process, i.e. $a=1$, the employee is paid just enough to keep him at work. In this case the employee receives the after tax reservation wage. In the other extreme where the employee fully dominates the bargain, i.e. $a=0$, the employee's wage equals the total profits of the employer, that is the gross wage W is equal to Pq.

In order to derive an equation that can be estimated, by using the equilibrium condition $W=\underline{\underline{W}}$ and some rewriting, the resulting wage equation reads as

$$\begin{aligned}\log W = {} & \log q + \log P + \log\left[1+\left(\frac{a(1-b)g}{1-a+a(1-b)g}\right)\left(\frac{P_c}{P(1-t_m)}-1\right)\right] \\ & -\log\left[1+\frac{a}{(1-a)}\frac{(1-t)}{(1-t_m)}\left[1-b(1-u(1-R))\right]\right]+\log\left[1+\frac{a(1-b)g}{(1-a)}\right]\end{aligned} \tag{8}$$

The optimal gross wage (W) depends on a couple of factors: labour productivity (q), the sales price (P), the consumer price (P_c), taxes and social contributions (t), the unemployment rate (u) and the replacement rate (R). These six determinants will explain the wage rate to a large extent provided that the actual bargaining process is specified appropriately by the model. The derived equation for the gross wage rate can be considered as a long-term Nash equilibrium. In the short run the gross wage can deviate from this equilibrium wage.

3 MAIN DETERMINANTS IN WAGE FORMATION

According to the model the value added price and consumption price exert a positive and strong effect on the wage rate in the long run. A 1% increase in the value added and consumption prices result eventually in an increase of the wage rate with 1%. *Mutatis mutandis* an increase in the *labour productivity* has an effect on the wage rate in the long run.

The wage effect of the wig, that is the difference between the wage that the employer pays and the wage that the employee receives, is not unambiguously positive or negative. To analyse this effect, a further distinction is to be made between the social security contribution paid by the employee, paid by the employer, as well as the marginal and average tax burden for the employee. An increase in the *average tax burden* will in general, given the *marginal tax burden*, result in a lower net wage. Such a decrease in the net wage makes it more attractive not to work, strengthening the bargaining position of the employee and for this reason eventually leading to a higher gross wage rate. The marginal tax rate influences the wage *ceteris paribus* negatively. In case of an increase in de marginal tax rate it is no longer attractive to earn additional money. This after all taxed more heavily. The employee therefore has an incentive to content himself with a lower gross wage.

Important determinants in the wage formation are the *unemployment* and the *replacement rate* that influence the wage rate interactively according to the bargaining model. As explained before, the replacement rate measures the financial distance between working and not working. A common definition reads as

$$\textit{Replacement rate} = \frac{\textit{average net unemployment benefit}}{\textit{average net wage income in the official sector}}.$$

The definition of the replacement rate can vary. Sometimes ‘minimum’ instead of ‘average’ income and/or social security benefit is used. Moreover, the replacement rate can be calculated for different groups of unemployed, like short- and long-term unemployed, or different family compilations. The measurement of the replacement rate is thus not unambiguous.

As working in the official sector will be more profitable than the social benefit for an unemployed person, the replacement rate is smaller than one. It approaches one if there are hardly any differences between working and not-working. It approaches zero if working is extremely profitable.

Often the replacement rate is used to explain labour supply. If, for instance, working is made more profitable compared to not-working, more persons outside the labour market will be inclined to start looking for a job. The replacement rate reduces in this case and the labour supply rises. The effect of the replacement rate on the labour supply is therefore negative.

Empirical evidence also shows that the replacement rate affects the wage rate. In contrast with the relation with labour supply this relation is positive. The case of an increasing replacement rate, so a smaller distance between working and not-working, will put an upward pressure on the wage rate in the long term. The wage rate has in a sense to compensate for the difference in both situations. The smaller the distance, the larger the wage compensation. In the extreme case where the distance is zero, so the replacement rate equal to one, the employee has no financial incentive to work. He will require a wage compensation before taking part in the paid labour process. A tight (loose) labour market will increase (decrease) the denominator of the replacement rate. Shortage (abundance) of the work force exerts expectedly more (less) pressure on the wage rate. This pressure will raise (lower) the average wage in the economy. The numerator of the replacement rate on the other hand experiences more influence from changes in social security, like unemployment benefits, other social security payments, taxes, social contributions, etceteras.

A higher unemployment rate exerts, as one may expect because of the higher demand for than supply of paid jobs, a downward pressure on the wage rate. The effect of the unemployment rate on the wage rate is thus negative. The extent of this effect depends on the replacement rate. The unemployment rate moderates the wage rate most when unemployment is high and the replacement rate low. This situation is a combination of a loose labour market where at the same time working is much more profitable than not working. In this situation many people are involuntarily unemployed. The wage moderating effect of unemployment will be higher as long as not working is less remunerative. In times of a relatively high replacement rate that is almost equal to one, the difference between remuneration in case of working as compared to non-working is by definition small. The replacement rate itself exerts a positive effect on the wage rate. The reservation wage increases, which causes the employee to require a higher wage claim in order to achieve his optimal level of utility. The effect on the wage rate depends at the same time, as stated earlier, on the unemployment rate. So the unemployment and replacement rate interactively affect wages.

The formulated wage bargaining model tries to describe the wage formation suitably. The special feature of the resulting wage equation concerns the non-linear character. As a consequence an identical alteration in, for example, the unemployment rate affects the wage rate not necessarily to the same extent at different

points in time. The (real) wage flexibility can thus change over time. These partial effects or elasticities are calculated for all six determinants for a certain sample based on estimated parameters that appear in the model. These are presented and discussed in the next section.

Some remarks are to be made concerning deficiencies of the model. One of the points is the constancy of the negotiation power of the employer and employee, represented in the model as parameter a. Due to, for instance, a tightening labour market a shift of the relative power position from employers to employees may in reality take place. The specified model as such does not allow such shifts. A second remark is that alternative factors relevant to the negotiation process, like working hours, refresher courses and other secondary labour conditions, are not included. Moreover, institutional alterations and government regulation affecting the labour market can exert influence on the bargaining process.

4 ESTIMATION RESULTS

Equation (8) is estimated by non-linear least squares (NLS). A second estimation procedure is applied and concerns applying NLS to the wage equation in an error-correction specification, formulated as

$$\Delta \log W = \sum f_i \Delta \log X_i + h\left(\log W_{-1} - \log W^*_{-1}\right). \tag{9}$$

The first terms consider the short-term effects f_i of the explanatory variables X_i. The term in brackets is the error resulting from (8). Specification (9) allows for both long-term and short-term elasticities to be estimated simultaneously. Table 2 presents the estimation results for both procedures for the Netherlands and Spain. The coefficients of Ireland are calibrated at the Dutch equivalents.

Table 2 Estimation results

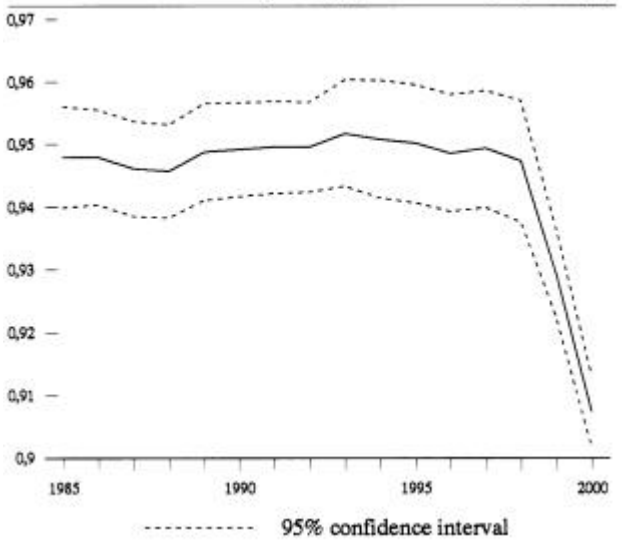
	Netherlands	Netherlands	Spain	Spain
Long-term coefficients				
α	0.93 (108.96)	0.92 (79.04)	0.87 (3.16)	0.79 (7.70)
β	0.96 (336.66)	0.96 (889.21)	0.77 (26.81)	0.86 (9.79)
γ	0.86 (31.79)	0.86 (-) [a)]	0.78 (-) [b)]	0.78 (3.99)
θ	-0.26 (3.14)	-0.22 (2.91)		
Short-term coefficients				
Δlog(w_{-1})				0.47 (2.87)
Δlog(q)		0.56 (6.25)		0.71 (2.56)
Δlog(P)		0.61 (3.20)		
Δlog(Pc)		0.74 (4.34)		0.98 (3.15)
Δ(1-t)		0.79 (3.57)		
η		-0.41 (5.18)		-0.60 (4.10)
Sample period	1966-2000	1966-2000	1970.1-2000.4	1970.1-2000.4
Statistics				
R^2_{adj}	0.99	0.94	0.99	0.91
Standard error(*100)	1.89	1.10	9.43	1.44
LM(2)	3.09 [p=0.06]	1.01 [p=0.38]	153.82 [p=0.00]	0.78 [p=0.48]
Jarque-Bera	0.30 [p=0.86]	1.59 [p=0.45]	2.70 [p=0.26]	8.13 [p=0.017]

a) Unrestricted regression resulted in g=16.76 However, a Wald Test on the calibration of g to it´s long run equivalent, γ=0.86 resulted in a F-statistic of 0.014 [p=0.91]
b) Unrestricted regression resulted in g=7.36 However, a Wald Test on the calibration of g to it´s short run equivalent, γ=0.78 resulted in a F-statistic of 0.0037 [p=0.95]

The results for the Netherlands and Spain in columns 1 and 3 concern equation (8) and the results in columns 2 and 4 equation (9). For the Netherlands a dummy was included that equals 1 during the period 1995-2000 and zero elsewhere is included. The associated parameter is q. The rationale for this dummy inclusion goes as follows.

Estimation of the model over the period 1965-2000 as compared to the period 1966-1993 shows a shift in the negotiating position of the employer in comparison with the employee. This implies a break in the parameter a as illustrated in Chart 2, showing estimates of the relative bargaining power based on recursive regressions. The sample period consists in 1985 of 20 observations, namely the period 1966-1985, and in 2000 of 35 observations (1966-2000). The dotted lines represent the 95%-confidence interval. The sharp decline in the end nineties confirms that the employee's influence has increased at the expense of the employer. The precise dating of the dummy included in the wage equation in order to capture this shift is determined by optimising the *t*-values belonging to the dummies starting at different dates in the nineties.

Chart 2 Relative bargaining position employers (α)

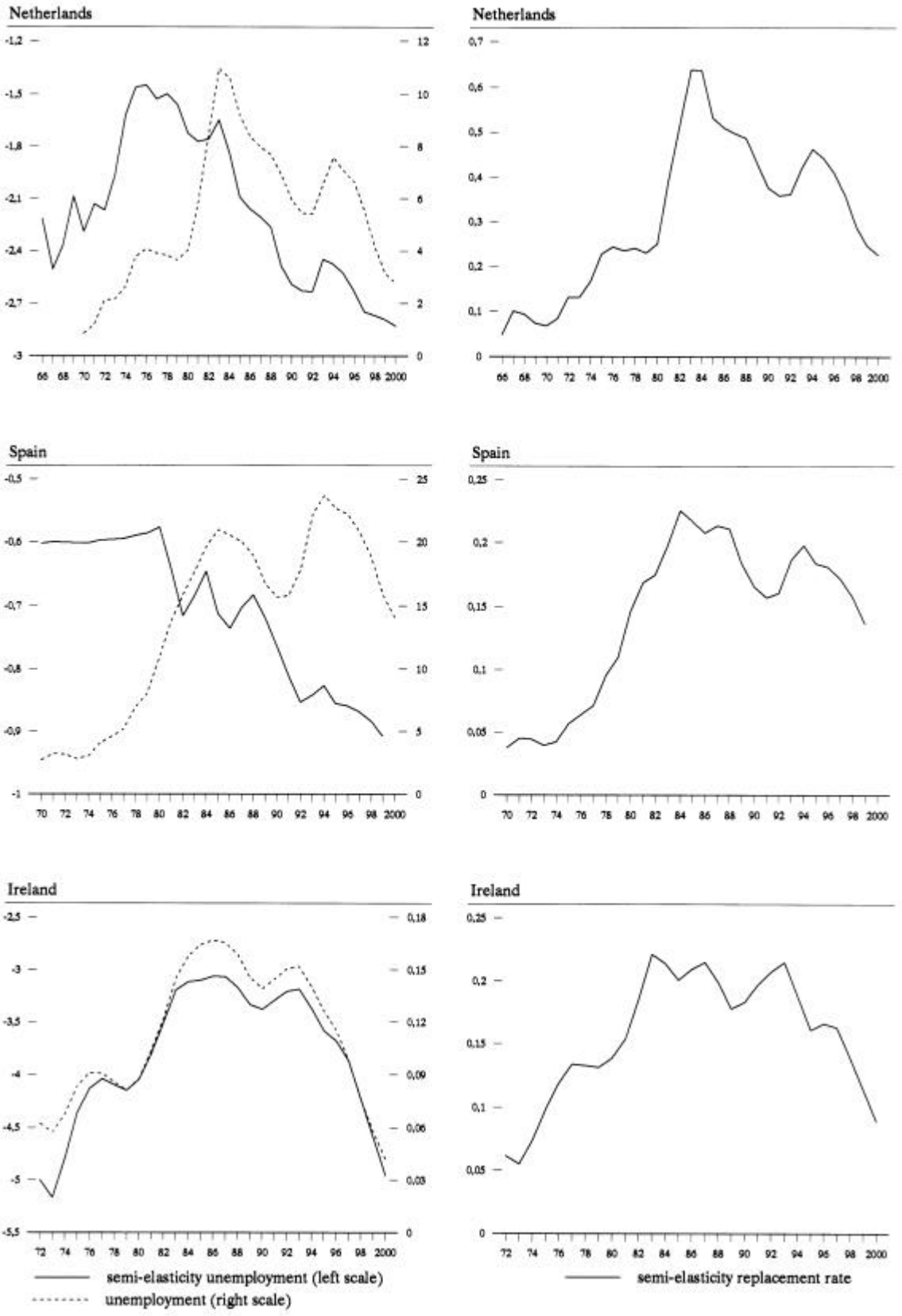


5 CALCULATED WAGE ELASTICITIES

The wage bargaining model explains the wage rate by the determinants. Both labour productivity and the sum of the two prices possess a semi-elasticity of 1 by definition. More interesting cases are the unemployment and the replacement rates. These semi-elasticities of these variables are plotted in Chart 3 together with the unemployment rates for the Netherlands, Spain and Ireland. The semi-elasticity of unemployment in the Netherlands decreased from –1.5 during the second half of the seventies to –2.6 during the first half of the nineties. The same holds for Spain where unemployment semi-elasticity ranges from –0.6 in the early seventies to –0.9 in the late nineties. In comparison with the Netherlands the Spanish elasticities are relatively low (in absolute terms), similar to Layard *et al.* (1991, see Table 1). These results confirm that the Dutch labour market is characterized as more flexible than the Spanish one. Given the high unemployment rate in Spain, about 10 percentage points more than the Dutch rate, this qualification seems plausible. Ireland's unemployment semi-elasticities are relatively volatile and fluctuate within a band of –5 and –3. So the pressure from unemployment on wages has changed more over time and is higher in absolute values than in the Netherlands. This suggests that Ireland´s labour market is both more flexible and more volatile than either the Dutch and the Spanish one. In accordance with the Netherlands and Spain the Irish results show increasing elasticities (in absolute values) and so an increasing upward wage flexibility during 1995-2000. For the three countries the elasticities (in absolute terms) are declining during the seventies, they are relatively low during the eighties, and in the Netherlands and Spain they are highest during the end nineties. Low semi-elasticities coincide with high unemployment rates and *vice versa*, implying that wages are more reactive to unemployment in times when unemployment figures are low. So, wages react asymmetrically with an upward tendency and downward rigidity in case of respectively low and high unemployment.

The replacement rate is an interesting determinant because it reflects governmental policy decisions. The semi-elasticity, i.e. the wage rate change as a result of a percentage point change in the replacement rate, reflects in a sense the effectiveness of this policy. Chart 3 shows that the semi-elasticity of the replacement rate varied for the Netherlands from 0.1 during the late sixties to 0.6 in the eighties. A top is reached in 1983, the peak period where the unemployment rate was 11% or 600.000 persons. The elasticity then declined to 0.2 in the nineties. Spain and Ireland show a similar pattern with both countries showing lower elasticities, ranging from 0.05 to 0.25 and ending at 0.15. The pattern emerging from the three countries is that of increasing elasticities in the seventies, high elasticities in the eighties and declining ones in the nineties, but not reaching the lowest figures during the full sample. Government policy was therefore most effective on the wage rate when the unemployment figures were highest.

Chart 3 Unemployment and semi-elasticities of unemployment and replacement rate



6 ON WAGE FORMATION

According to the wage bargaining model the non-linear wage equation allows for time varying (semi-) elasticities of the determining components, as calculated in the previous section. These elasticities hold in the long term. They represent the cumulative effect during a long time period on the wage rate of a 1 percentage (point) change in the particular determinant. The actual changes in the determinants during the sample are however also known. The total effect on the wage rate of each alteration in each determinant at each period in time can thus be quantified. So, given the elasticity derived from the model and given the change in a determinant, the total actual impact according the model on the wage can be computed. This can be written in mathematical terms as a discrete time differential equation as

$$d\log W = \sum_{i=P,P_c,q,u,t,R,t_m} \partial \log W \Big/ \partial \log i * \partial i \Big/ i$$

that equals

$$\Delta W = \sum_{i=P,P_c,q,u,t,R,t_m} \in_{Wi} * \Delta i \qquad (10)$$

where ? W represents the percentage change of the variable W and $\in_{Wi}$ is the semi-elasticity of variable i with respect to W[4].

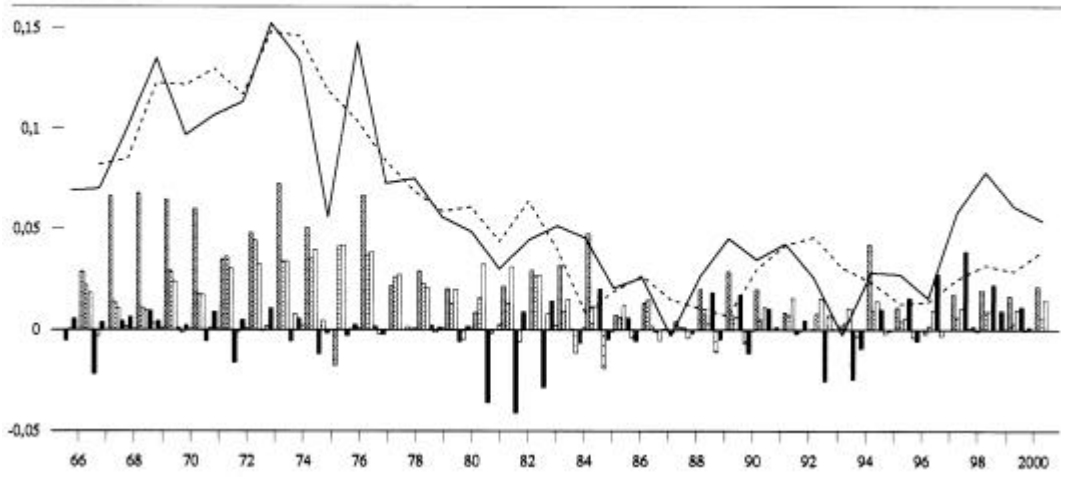
Equation (10) shows that in a particular year, the wage rise can be quantitatively decomposed into its constituent parts. However, it needs to be stressed that the sum of the determinants' parts in a particular year represents the cumulative present and future effects on the wage rate according to the changes of the determinants in that particular year. The observed realisation of the wage increase in a particular year incorporates on the other hand the effects of present and past effects of determinants' alterations.

[4] Note that $\partial \log W \Big/ \partial \log P = \dfrac{\partial W / W}{\partial P / P} := \in_{WP}$

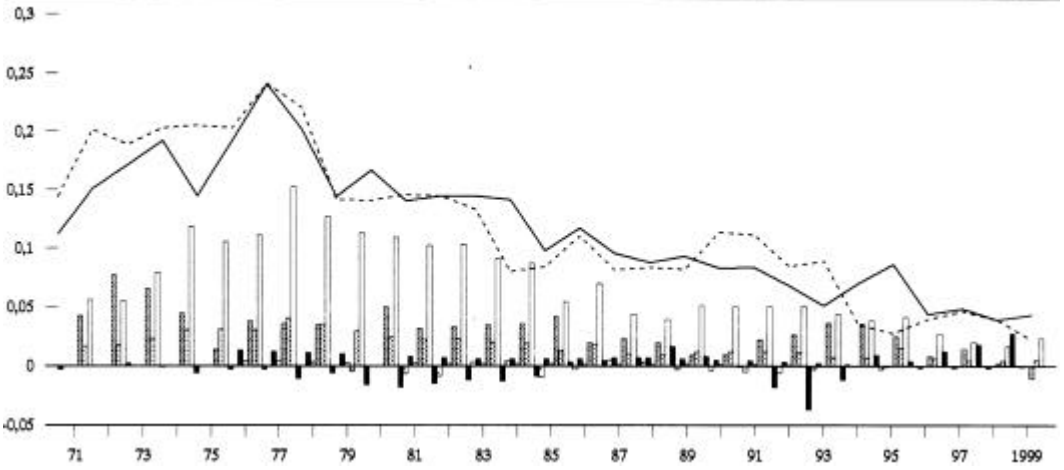
and moreover: $d\log W = \log W - \log W_{-1} = \log \dfrac{W}{W_{-1}} = \log \dfrac{(1+\Delta)W_{-1}}{W_{-1}} = \log(1+\Delta) \approx \Delta$

Chart 4 Observed wage rise, model based wage rise and the constituing determinants' parts

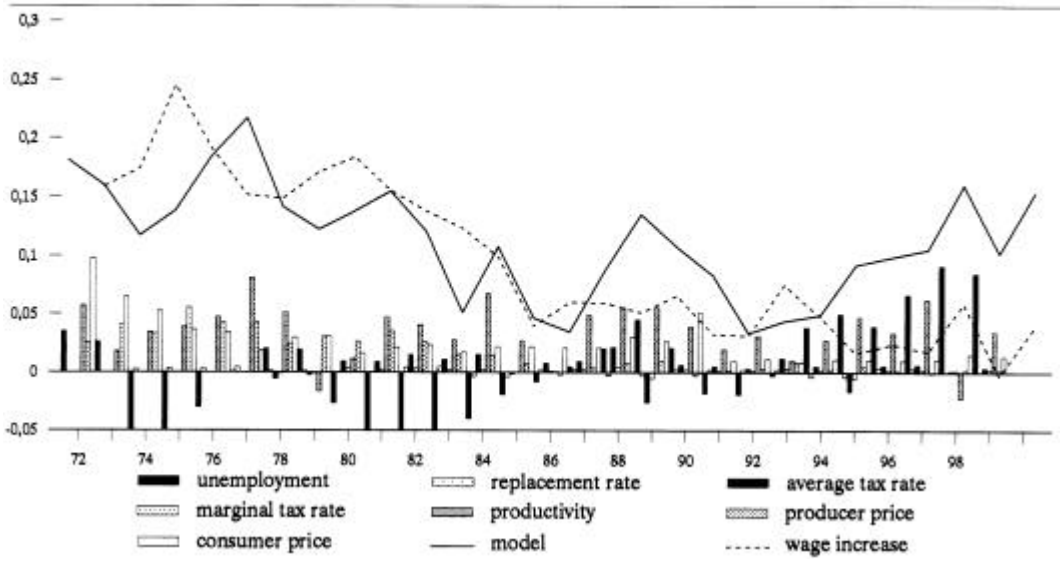
Netherlands



Spain



Ireland



The decomposition of the wage increase into the determinants´ contributions, the total wage increase according to the model and the observed wage increase over the past three decades are graphed in Chart 4 for respectively the Netherlands, Spain and Ireland[5]. The dotted line is the actual wage increase and the solid line the calculated wage rise according to the model, that is the ΔW term on the left hand side of equation (10). The seven bars display the determinants' parts for every year, that is the right hand side of equation (10). Note that some determinants have a negative impact on the wage formation, for instance the unemployment increases, productivity declines during recession periods, etceteras. Interesting is the changes in dominance of the determinants during the decades. The coming paragraphs will elaborate more on characterising these decades.

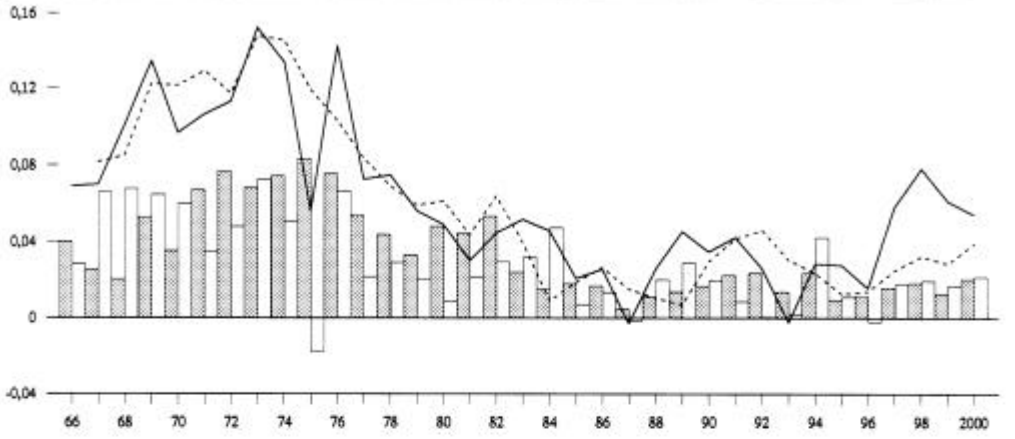
During the seventies and early eighties all three countries show both high wage increases and high price components indeed, reflecting the transmission of prices spiralling into wages. Since the early eighties the price spikes show a huge decrease with spikes only half or one third as high. The total wage increase according to the model corrected for by the price determinant has been remarkably constant in Spain, seems to have increased in Ireland and decreased in the Netherlands. This gap is mainly filled by the productivity determinant. Prices and productivity are in quantitative terms the most dominant determinants over the whole sample for all three countries.

While inflation rates have been more controlled, the eighties are characterised by huge unemployment rates and accompanying government policy to deal with these problems. In terms of our model this is reflected in the replacement rate. In the eighties the policy activities of especially the Netherlands and Spain can be seen in the wage determination. This follows from Chart 4 but even more clearly from Chart 5a showing the individual components. However, changes in the replacement rate do not seem to exert much influence on the wage determination. The same pattern holds for the tax rate, although it exerts slightly more influence than the replacement rate changes.

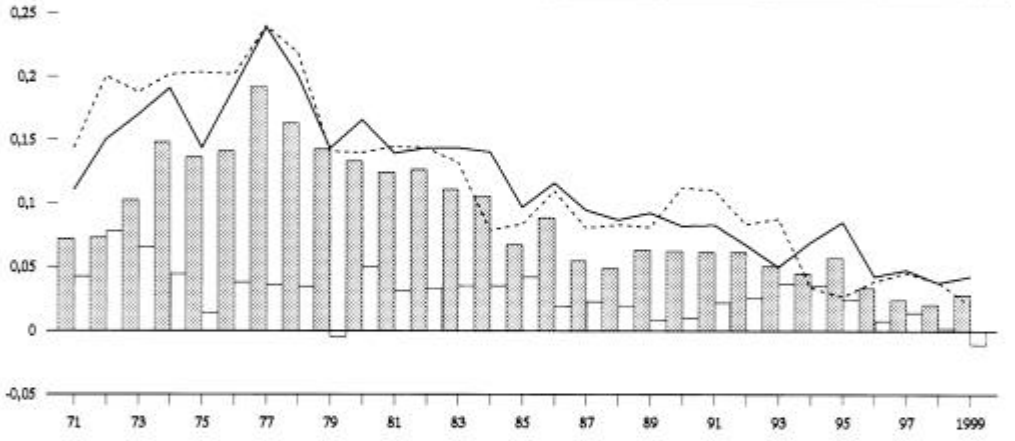
[5] The Irish figures should be viewed cautiously because the Irish parameters are calibrated on the parameter estimates of the Dutch equivalents.

Chart 5a Contributions of the total price and productivity

Netherlands



Spain



Ireland

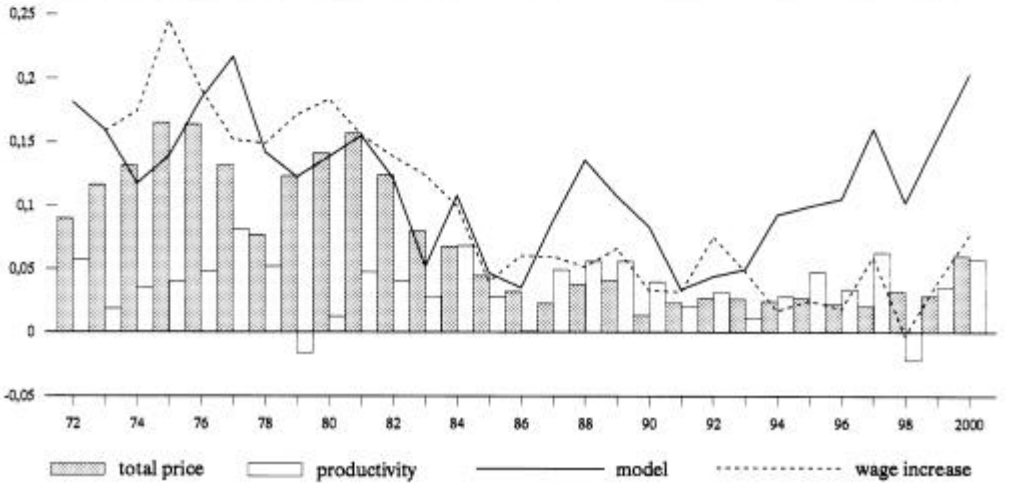
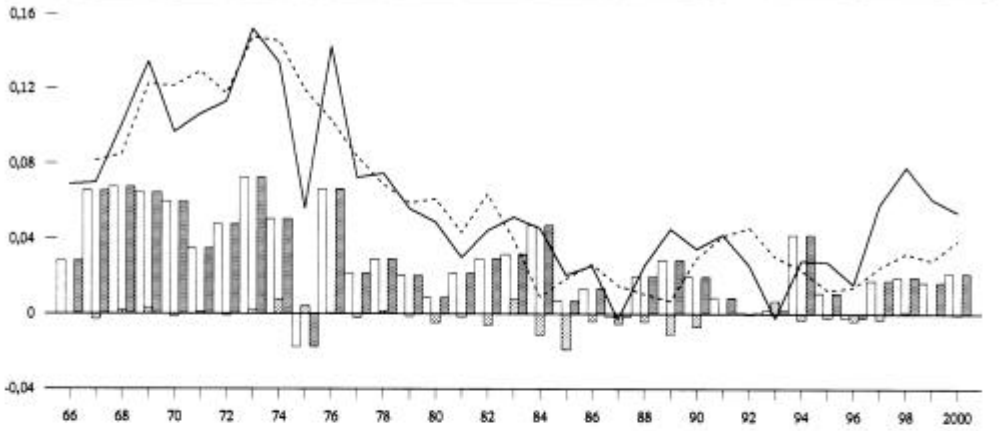
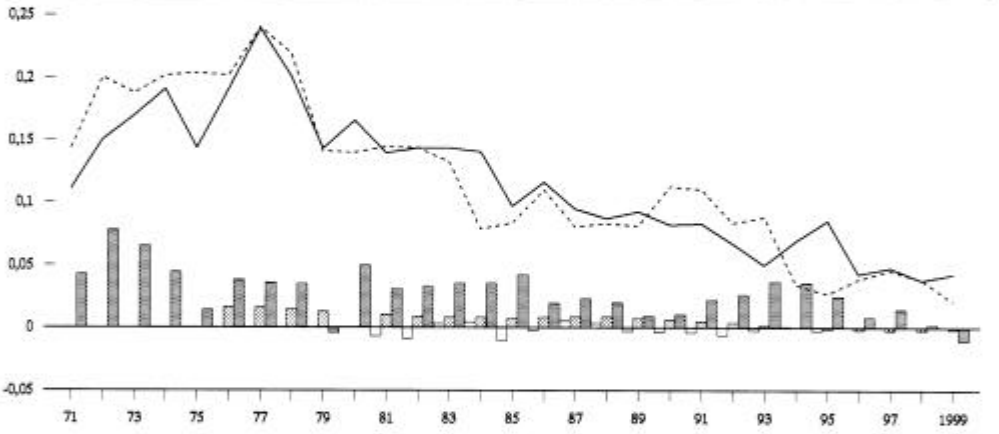


Chart 5b Wage rise and contributions of productivity, the replacement rate and taxes

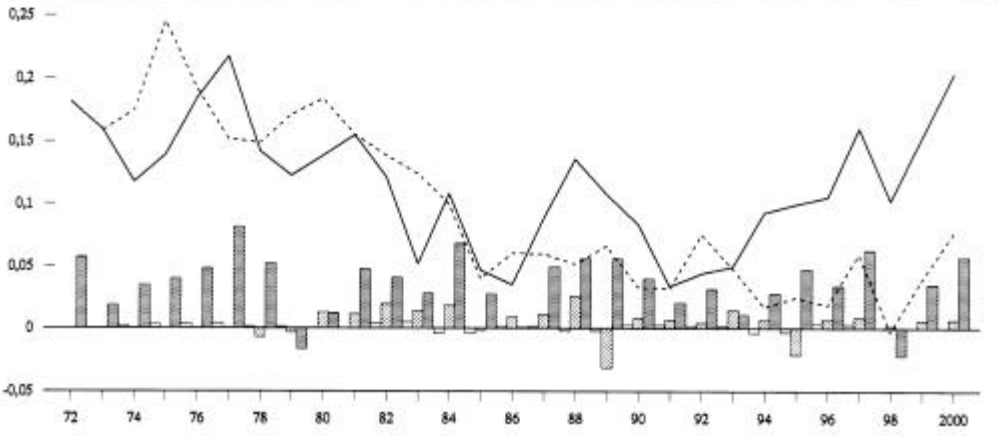
Netherlands



Spain



Ireland

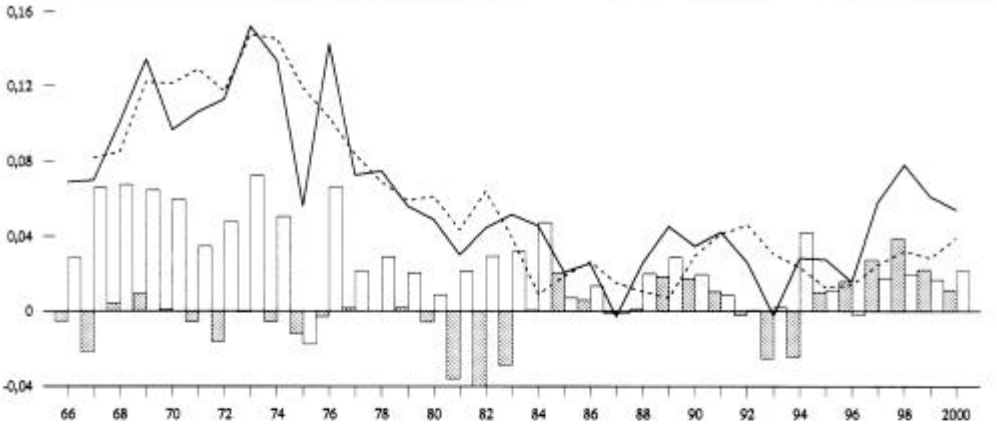


model — wage increase

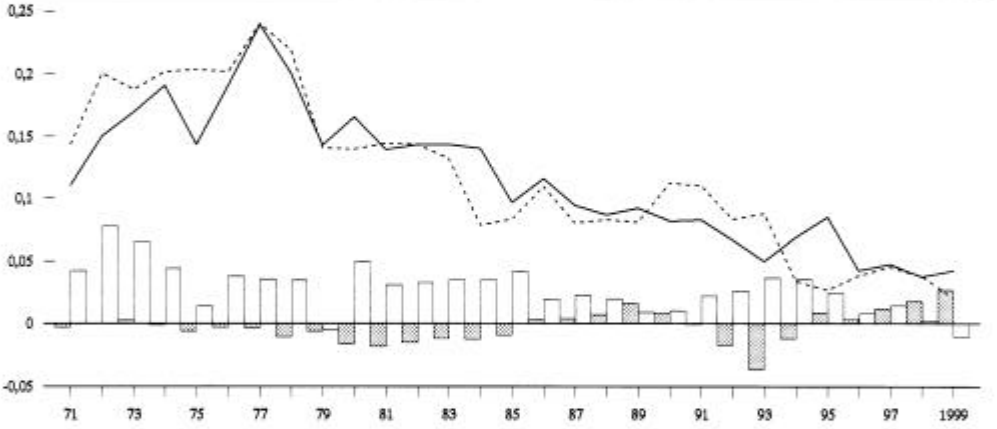
productivity — replacement rate — total tax

Chart 5c Wage rise and contributions of productivity and unemployment

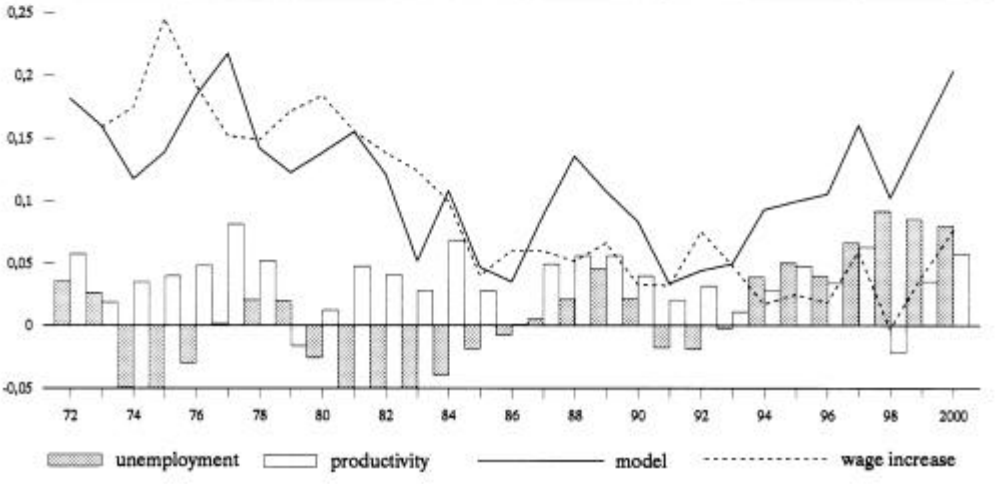
Netherlands



Spain



Ireland



Particularly interesting is the wage moderation policy in the Netherlands, established in the Wassenaar treaty of 1982. Government, employers and employees agreed that productivity increases should be shared in order to create employment. The capital's share of GDP, as a measure of investment activity, increased. Chart 5a shows indeed that productivity's absolute contribution in the eighties and nineties is only half as high as that of the seventies. This feature may reflect both a lower productivity rise and a lower share of this rise showing up in wage increases. So, the eighties and early nineties show a lower wage increase due to a lower price contribution in absence of huge inflation, negative replacement rate contributions resulting from governmental policy actions and, in the Dutch case, due to lower productivity contributions as agreed in the Wassenaar treaty.

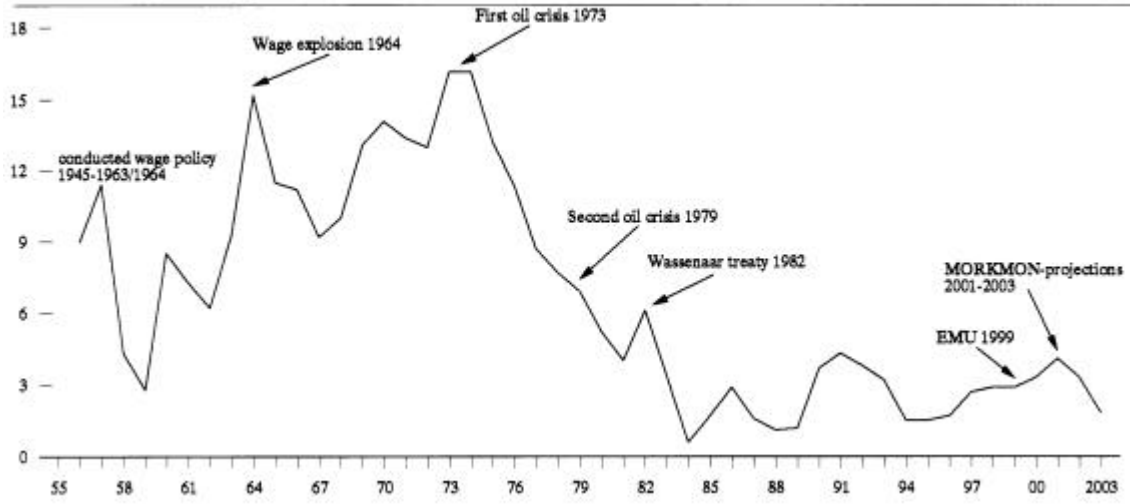
While during the seventies, eighties and first half of the nineties the contributions of price increase and productivity almost fully accounted for the total contribution, in the late nineties a third determinant is becoming more prominent. Charts 4 and 5c show that for the first time in three decades unemployment tends to put upward pressure on the wage rate over a sustained period. The charts show for all three countries moreover a moderating influence on wages of unemployment in the recession periods, i.e. the first oil crisis, the early eighties and the 1993/1994 period. The upward pressure on the wage rate of the unemployment figures in the late nineties is a result of a tightening labour market and, in accordance, rising elasticities (in absolute terms). Spain is however still facing high unemployment rates but has put a lot of effort in liberalising and deregulating it's labour market in the nineties. Small changes in the unemployment rate will eventually show up more pronounced in the wage figures because of increasing semi-elasticities of the unemployment rate with respect to the wage rate. Both the high elasticities and the dominance of the unemployment determinant in the wage increase are novel features over the last thirty year.

7 ON WAGE DEVELOPMENT

This paragraph describes the institutional aspects of the three countries affecting the wage negotiation process. A brief history of the evolution of these structures including the main events that shaped them is presented for each country separately.

In the *Netherlands* [6] after the Second World War a guided wage policy started in order to quickly rebuild the country and recover the economy. This lasted until 1963/64. Wages and prices were not allowed to develop excessively. Wage agreements were approved by the government by the institution of the College van Rijksbemiddelaars. In the beginning of the period, until 1954, the real wage was kept constant. This policy was accompanied by a uniform nominal wage increase in accordance with inflation. Adaptation on the industry level was not allowed. Since 1954 the labour income share, instead of the real wage, was kept constant by equating the nominal wage increase to the price increase plus the labour productivity rise. In 1963/1964 this wage policy was no longer sustainable because of the tightened labour market. Market forces took over guided wage policy and resulted in a wage explosion of 9% in 1963 and 14,9% in 1964. This event together with all post-war events are presented in chart 6.

Chart 6 Dutch wage increases market sector and main events



6 For full details on Dutch wage developments, see for example Van Veen (1996).

Since 1964 collective wage agreements have been settled on industry level during free negotiations that take place every 2 to 3 years. This feature brings the Netherlands at an intermediate position, between totally centralised -by the government- and totally decentralised -on firm level- wage negotiations. The government is allowed to intervene. The most prominent example of government advice has been in 1982, known as the Wassenaar treaty. In this agreement employees agreed on wage moderation in exchange of employment creation. The treaty has been established at the unprecedented peaking time of the unemployment. This phenomenon was the result of the developments of the seventies, with the first oil crisis in 1973, leading to a high inflation and consequently to considerable wage increases, and the second oil crisis in 1979. This settled wage moderation lasted from 1983 until the late nineties. During the take off to EMU, that started in 1999, severe criteria were imposed in accordance with the Maastricht criteria. These concern the public debt, government deficit, exchange rate and inflation. Being one of the candidate members of EMU, the Netherlands experienced the consequences. The development of inflation mitigated. This together with the moderated wage development led to a balanced real wage increase since the mid nineties.

Wage formation in Spain is essentially performed by collective bargaining. There are two main labour unions in Spain that are organised both over economic sectors and regional lines. Sectoral agreements are generally applicable on provincial level, being part of a whole region. Agreements can be applied to a whole region, more than one region or even the whole country. The agreements determine wage developments of different professional groups. The conditions are legally binding for all employees in the concerning economic and geographical domain and profession, independent of labour union membership. Labour union power does not express itself in high membership rates of the unions but in the total amount of employees subjected to the collective agreements. Employer's organisations are organised along similar lines as the unions and are represented by a national umbrella.

The collective bargaining process is legally settled already in the Franco regime in 1958 known as 'Ordenanzas laborales'. The sectoral structure of the unions, originating from the dictatorial episode, had undergone remarkably little alterations since the democracy take off in 1977. The call for more equality after the dictatorship fall down might be the cause of the reduction in wage inequality. The resulting wage equalisation is characteristic for the mid seventies in Spain. During the first half of the eighties the Spanish unemployment rate rose dramatically, from 11% in 1980 to over 20% in 1985. A couple of developments can be mentioned that potentially have influenced the wage formation. Contrary to the declining union power in the Anglo-Saxon countries in the Spanish case this power magnified. Wage bargaining institutions were more forcefully legitimised by law with the ratification of the so called

employee constitution. The main consequence was the creation of law concerning employee protection resulting for the employer in excessive employee dismissal costs.

The rigid labour market institutions started to show an increasingly worse fit in structural adjustments caused by the opening of the economy. The openness of the Spanish economy increased considerably when Spain joined the European Union in 1986. The decline of the agricultural share in the Spanish economy coincided with the restructuring process of the industrial sector in the aftermath of the oil shock in 1979. In the mid eighties both factors caused turbulence at the labour market, declining employment and correspondingly high unemployment figures. After 1986 the employment recovered because of EU membership, the cyclical state of the European economy and a series of reforms. Since 1984 unemployment figures have not been lower than 15%. This caused ongoing attempts to reform.

A short overview is as follows.

· *1984*: abandoning the restrictions on temporary labour contracts. Companies were enabled to hire people without being confronted with the extensive labour protection and accompanying excessive dismissal costs.

· *1994*: broadening of the scope of legitimate massive dismissals and encompassing of organisational and production related motives.

· *1997*: reaching stable employment and improving the collective bargaining process. Temporary labour contracts harm the long term relationship between the employer and employee and consequently the accumulation of firm specific human capital. Stable employment is encouraged by the introduction of permanent contracts with reduced protection. The negotiation process was intended to be improved by bargaining on a more decentralised level (regional or firm specific) as the resulting wages better reflect the specific labour market conditions.

Partly because of the latest reforms and the moderated wage development over 1 million jobs have been created in 1998 and 1999. The creation shows up in the unemployment rate reduction from 19.6% to 15.5% in the end of 1999.

In *Ireland* unemployment steadily declined to a level of 4.2% in 2000, coming from the most recent peak of 15.7% in 1993. The long term unemployment -more than a year- has moreover substantially fallen to a level of 1.4% in the end of 2000. The percentage long term unemployed of 0.5 in 1997 remains far beyond the OECD-average of 0.33 but is however approaching the EU average. With such low unemployment figures labour force shortages increasingly become the bottleneck of continuing economic growth.

As a consequence of the strong economic growth and resilient expectations employment has risen by 4% yearly from 1994 until 1997 and by almost 7% in 1998. This rise is mainly accounted for by the construction sector (23.5%) and the private services sector (14.6%), while a sluggish but significant growth is observed in the industrial sector. Employment in the public sector has remained constant, apart from a modest jump in the fall of 1998. The strong demand for labour reduced unemployment, while also attracting newcomers on the labour market. About three quarters of the employment creation between 1995 en 1998 was fulfilled by an increase in the working population and the remaining quarter by unemployment reduction. Growth of the labour force accelerated form a annual 2% during the period 1993-1995 to a 3% ever since. Domestic demographic factors explain a stable 1.25%. The other source is the rising labour participation mainly of women, explaining roughly 1%. The women participation fraction approaches with 0.47 the EU average, but stays far below the 0.65 of the UK. A second source is net immigration becoming positive in 1996 and rising to 0.6 percentage point in 1998. The elasticity of labour supply is indeed very high which is a special privilege of Ireland.

With respect to issues like exclusion and poverty the government has introduced a minimum wage. The OECD (1999) expresses however doubts on the instrumental value of the minimum wage for these specific targets. Income distribution affairs are best dealt with by fiscal, social and tax policies, while the labour market´s only goal is the efficiently assigning of jobs and individuals. Given the introduction of the minimum wage the effects on poverty fighting depends on the level of this wage. The introduction of a minimum of two thirds of the median wage of a full time employee resulted in the highest relative minimum wage in the OECD.

Since 1987 a social consensus model has been the basis of the wage formation. The core of the model is to combine moderate gross wage increases with tax wage decreases resulting in substantial higher after tax net wages. This model was implemented against a background of high unemployment and gradually deteriorating public finances. The desirability of this strategy is being discussed in the current situation of a severe shortage in the labour force. Ireland could for instance reduce the excessive competitive capacity by a real appreciation of the currency, that can only be achieved in a monetary union by price and wage increases higher than the competitors ones. The government warned however against an overshooting of prices and wages potentially leading to an Irish hard landing scenario.

The resulting and currently existent agreement of the social partners is the ‘Programme for Prosperity and Fairness’ (PPF) and covers the period 2000-2002 and consists agreements over a broad range of subjects: social activation, promotion of a dynamical economy, full employment, the information society, balanced

and sustained development and modernisation of the public sector. The agreement moreover emphasises the vital importance of the international competitiveness as a precondition for ongoing economic and social progress. The agreement is however not legally binding for the employers and employees in the private sector. It is expected to put forward a standard.

Extreme tight labour market conditions and the higher than expected inflation caused additional wage increases on top of the settled ones resulting from the PPF. In 2000 a wage increase of 5.5% was agreed under these conditions, while the realisation reached levels of 7.5% for the industrial sector and 7.6% for the services sector.

In the nineties the wage agreements of the social partners contributed considerably to the economic performance but their functioning under the condition of full employment and as an instrument to control inflation remains uncertain. In 2000 wages in the private sector already increased faster than agreed in the PPF and surveys show this trend to continue. Moreover the public sector exerts pressure for wage equalisation compared to the private sector. A decrease in the wage taxes results, even if wages will develop as agreed, to an increase in total demand that, *ceteris paribus*, results consequently even in a small open economy with inflationary pressure.

8 SUMMARY AND CONCLUSIONS

A non-linear wage equation is derived from a theoretical framework describing the wage bargaining process between employers and employees. The wage rate is determined by labour productivity, the value added price and the consumer price, the marginal and average tax rates and further, interrelatedly, the unemployment and replacement rates. This wage equation is estimated using annual and quarterly time series of the last three decades of the Netherlands, Spain and Ireland. In comparison with the study of Graafland and Huizinga (1999), who developed this wage bargaining model and estimated the wage equation for the Netherlands up to 1993, main attention is paid here to the end nineties where unemployment sharply dropped. Additionally, the contributions of the wage determinants are computed and assessed during the full sample period.

The nice feature of the model concerns the wage determinants´elasticities that are allowed to differ over time. The wage semi-elasticity with respect to unemployment, for instance, depends on the unemployment rate, the replacement rate, the tax rates and the estimated structural parameters. Higher (lower) unemployment leads, *ceteris paribus*, to a lower (higher) wage rate. Moreover, our model provides a tool to measure the reactivity of the wages due to unemployment over time. Empirical results show that low unemployment figures match with high semi-elasticities (in absolute values), that is highly reactive wage developments. Our calculations show an upward tendency and downward rigidity of wage development in case of respectively low and high unemployment.

Main empirical results are the following. In the Netherlands a shift in the bargaining power of the employers to the employees is found. This is captured in the wage equation by allowing for a parameter shift, which according to tests, takes place in 1995. Then unemployment elasticties (in absolute terms) are highest in Ireland and lowest in Spain. The Netherlands take an intermediate position in this case. Over the whole sample period, labour markets in Ireland and the Netherlands were more reactive to unemployment in comparison with Spain. Relatively higher reactivity of wages to labour demand and supply conditions reflects a better functioning labour market. During the three decades the unemployment elasticities are (in absolute terms) at the highest at the end of the nineties in all three countries. The corresponding upward pressure on wages is caused by the decline in unemployment and seems to be a result of strongly improved job market position of employees.

Furthermore the contributions of each of the individual wage determinants to the wage developments are computed over the three decades. It follows that in the Netherlands, Spain and Ireland prices exerted much

upward pressure on wages in the seventies. In the eighties governmental regulatory activities affecting the labour market show up as pushing the wage increase downward. In comparison with the seventies and eighties, the nineties are very different. During the beginning or mid nineties considerable changes took place in labour markets entailing lower unemployment rates and therefore a more dominant upward impact of unemployment on wage development. This unparalleled turning point in the Netherlands, Spain and Ireland was probably due to the favourable combination of the labour market policy conducted in the eighties and the bright economic climate starting in the beginning or mid nineties.

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Appendix A Semi-elasticities of prices and the tax rate