



STUDIECENTRUM VOOR ECONOMISCH EN SOCIAAL ONDERZOEK

VAKGROEP PUBLIEKE ECONOMIE

**The Effect of Unions on Employment Behaviour  
in the U.K.: Evidence from  
Firm Level Panel Data**

Jozef KONINGS

Report 94/297  
January 1994\*

\* *Earlier versions of this paper appeared under Working Paper 400, Centre for Economic Performance, London School of Economics. I would like to thank Stefan Késenne, Reinout Koopmans, Steve Machin, Alan Manning, Neil Millward, Andrew Oswald, Chris Pissarides and Jonathan Wadsworth for useful discussions and comments. This paper was presented at the LSE and UFSIA. All errors are mine.*

Universitaire Faculteiten St.-Ignatius  
Prinsstraat 13 - B 2000 Antwerpen  
D/1994/1169/03

## Abstract

This paper investigates the effect trade unions have on employment behaviour in the U.K. during the 1980's. Using a panel of large U.K. firms we find that unionised firms have lower employment *growth* rates, although this effect is not robust over time and is weaker if firms face many competitors. Moreover, this effect is only present in the manufacturing sector. We also find that firms which de-recognised unions have on average lower growth rates than firms which did not de-recognise unions, suggesting that unions affect employment *levels* positively.

JEL classification: J23, J50

## I. Introduction

Over the past decade or so there have been considerable changes in trade union organisation and trade union recognition in the U.K.. The purpose of this paper is to investigate empirically how unions affect employment behaviour and in particular how union de-recognition affected employment in U.K. firms.

Trade union activity clearly plays a major role in economic decisions firms make. Labour Economics has been marked by an increasing literature on the effect trade unions have on various aspects of company performance, such as firm profitability and productivity (e.g. Freeman and Medoff 1984, Clark 1984, Voos and Mishel 1986, Nickel et al. 1992, Gregg et al. 1993). There are however only a few papers investigating the effect of unions on firm-level employment behaviour<sup>2</sup>. The literature mainly uses longitudinal data and focuses predominantly on the manufacturing sector. In contrast, this paper uses a unique *panel* data set of large U.K. manufacturing *and* non-manufacturing firms to analyse the effect trade unions have on both employment *growth* and employment *levels* at the firm. This is important since an common critique to cross-sectional analysis of economic problems is the potential bias emerging in cross-section regressions due to unobservable fixed effects which are correlated with one of the regressors. Since we use panel data we are able to control for these unobservable fixed effects.

We will report evidence that unionised firms have lower growth rates than non-unionised

---

<sup>2</sup>In the U.K. there are only two, Blanchflower, Millward and Oswald (1991) and Machin and Wadhvani (1991). In the U.S., Leonard (1992) and recently Bronars and Deere (1993) and in Canada a recent paper by Long (1993) investigates the issue.

firms over the sample period. However, this union effect is not robust with respect to the time period, a finding already suggested by Machin and Wadhvani (1991). The effect unions have are strongest when firms face only a few rivals, suggesting that spillovers from the product market to the labour market and vice versa might be important<sup>3</sup>. Finally, we find that unionised firms have lower employment growth only within the manufacturing sector. Within the non-manufacturing sector, we find no evidence that unionised firms have significantly different growth rates than non-unionised firms. We also find that firms which de-recognised unions have on average lower growth rates than firms which did not de-recognise unions. This suggests that unions have a positive effect on employment *levels*.

The plan of the paper is as follows. In section two we give a theoretical and empirical background of the problem under investigation. The third section describes the dataset used. In the fourth section we discuss the results. We conclude in section five.

## **II. Theoretical and Empirical Background**

The two main classes of models of union behaviour are the *right to manage* model viz. the *efficient contract* model. The former assumes that management retains the right to set employment levels, given the wage which is either the result of bargaining or is set unilaterally by the 'monopoly' union. In this kind of models employment-wage combinations will be located on the labour demand curve. Given that the wage will be higher than in a competitive labour market, employment will be reduced. Since the union-wage effect makes

---

<sup>3</sup>Spillovers from the product market to the labour market and vice versa have been analysed theoretically and empirically by Bughin (1991a,b), Dowrick (1989), Konings and Walsh (1994), amongst others.

employees more costly for union firms than for nonunion firms, union firms will substitute labour for capital and hence have less employment growth. In the latter class of models, the alternative wage or outside option of union members is taken into account while bargaining and the outcome will lie, in general, off the labour demand curve. In this case, bargaining is over both employment and wages and employment-wage combinations will lie on a contract curve, reflecting Pareto efficient outcomes (McDonald and Solow, 1981). In the efficient contract models, unions increase employment, provided unions put more weighing on employment than on wages. Wage-Employment combinations will then lie on an upward sloping contract curve. However, Layard and Nickell (1990) show that employment will be the same as in the case where there is bargaining over wages only, given a Cobb-Douglas production technology. Moreover, they show that compared to the competitive labour market, employment falls. Similarly, if union's indifference curves are flat in wage-employment space, efficient contracts will lie on the labour demand curve as shown by Oswald (1993). Thus there is no clear-cut prediction as to unions increase or decrease employment levels and growth.

Empirically, there is not much of a consensus either. Blanchflower, Millward and Oswald (1991), using a large cross-section of U.K. establishments, find that employment grows around three percentage points slower in the typical British union establishment. Machin and Wadhvani (1991) dispute this, using the same dataset, and argue that unionism exerts a negative effect on employment growth only in plants which reformed working practices. In other words, those plants which underwent organisational change had lower employment growth, but it were also the ones which were unionised.

A recent paper by Long (1993) finds for Canada, that unionised firms grew 3.7% slower than non-unionised firms within the manufacturing sector, while within the non-manufacturing sector this was 3.9%.

Bronars and Deere (1993) analyse the effect of union elections on employment growth in the U.S.. They find that in the manufacturing sector firms with a "union win" have lower employment growth than firms without a "union win", looking at the raw correlations only. For the non-manufacturing sector there is no difference in average growth rates. When, however, a proper vector autoregressive analysis is performed this effect turns out to be statistically insignificant in both the manufacturing and non-manufacturing sector.

In order to analyse the issue empirically we need to have a testable model of employment behaviour. The literature on unions and productivity recognises that unions may have effects on both the *level* and the *growth* of productivity. These effects need not be the same (see Addison and Hirsch, 1989). We will specify an employment equation which also allows these two effects to come through or

$$(1) \quad l_{it} = \text{fix}_i + \alpha_0 q_{it} + \alpha_1 w_{it} + \alpha_2 \text{UNION}_{it} + \alpha_3 \text{UNION}_i \times \text{TIME} + \eta_{it},$$

where  $l_{it}$  denotes the log of employment in firm  $i$  at time  $t$ ,  $\text{fix}_i$  represents unobserved firm-specific fixed effects (or firm heterogeneity),  $w_{it}$  denotes the log of the real wage paid in firm  $i$  at time  $t$ ,  $\text{UNION}_{it}$  is a dummy equal to 1 if there is at least one union recognised in the firm at time  $t$ ,  $\text{UNION}_i$  takes the value 1 if the firm is unionised,  $\text{TIME}$  is a time trend and

$\eta_{it}$  is a white noise error term<sup>4</sup>. By modelling the union effect in this way, we are able to investigate the difference between unionised firms viz. non-unionised firms, which can be thought of as predetermined or a long term issue. This is captured by the time invariant union dummy,  $UNION_i$ . By also modelling a time varying union term,  $UNION_{it}$ , we are able to investigate the short term "impact" effects of changes in union recognition. This term reflects the effect of unionised firms which experience some change in unionisation, in our data which experience some union de-recognition. An economic intuition for modelling the union effects in this way is that if unions affect the *level* of employment in the firm, the firm moves away from its optimal employment level in the absence of unions. If a firm is no longer at its most efficient employment level, this could affect future *growth*. Note also that by modelling the union effect as in (1), we investigate the effect of unions over and above the effect of the union-wage effect. Thus we allow the union to have a separate effect on firm performance which does not come through the wage.

The fixed effect in (1) is unobservable and potentially correlated with the other explanatory variables. We therefore estimate (1) in first difference form, which cancels the fixed effect or

$$(1') \quad \Delta l_{it} = \alpha_0 \Delta q_{it} + \alpha_1 \Delta w_{it} + \alpha_2 \Delta U_{it} + \alpha_3 U_i + \Delta \eta_{it}$$

In (1'),  $\alpha_2$  gives an indication of how unions affect the *level* of employment, while  $\alpha_3$  reflects the effect of unions on employment *growth*. Alternatively, the former reflects the impact or

---

<sup>4</sup>The choice of the production function in (1) is completely arbitrary. There is no a priori theoretical reason to prefer one specification over the other. All we need is a functional form which allows us to arrive at a testable employment function.

short term effects, while the latter reflects the long term effects.

### **III. Data Description**

The basic data source at our disposal is the EXSTAT company accounts dataset. The data on union presence and changes in unionism are from a survey carried out in the summer of 1990 (for more details of this survey see Gregg and Yates (1991), Gregg and Machin (1992), Gregg et. al. (1993)). In terms of employment, sales and industry affiliation the respondents formed a representative sub-sample of the EXSTAT population. The survey drew usable responses from 558 companies across all industrial sectors. A number of firms did not have company accounts reported in EXSTAT for each year or there were missing observations on variables of interest in particular years. We therefore required that companies had at least 4 continuous data observations between the years 1982 and 1989. Hence we are left with an unbalanced panel of 361 companies. We did not include companies, prior to 1982, since in 1982 there was a definitial change in the reporting of employees (due to the Companies Act in 1982). In order to have a consistent employment series we therefore started in 1982. Table 1 gives an overview of the structure of the panel. It gives the number of companies which have respectively 4,5,6,7 and 8 continuous time observations available.

The two main variables of interest are union recognition and changes in union status. The survey asked managers whether their company recognises trade unions for the purposes of bargaining over wages and conditions in any of the establishments<sup>5</sup>. Over the sample period

---

<sup>5</sup>The questions asked were formulated as follows: 'Does your company recognize trade unions for the purposes of bargaining over wages and conditions in any of your establishments?' Over the years 1980-4(1985-9), was there a net change in the number of



around 42% of firms did not recognise unions while around 58% did recognise trade unions in one or more of their establishments. The change in unionism is captured by a trade union de-recognition variable. This is a dummy equal to 1 if there are less unions recognised or if there was a net decrease in closed shop arrangements over the period 1980-84 and 1985-89. However, the estimation technique used, implies that the sample over which estimation takes place is from 1985 onwards (see below), hence the union de-recognition variable refers to the period 1985-9. Moreover, it was only in the period 1985-89 that there were 'substantial' changes in unionism. Ideally, one would like to have information on year to year changes in unionism. So the 'union change' variable is merely a rough proxy for changed unionism. Table 2 gives an overview by year of firms which de-recognised unions. Around 15% of firms which recognised unions did also de-recognise unions in one or more of their establishments during the sample period.

#### **IV. Results**

Table 3 gives the average and median one year employment growth rates for the period 1982-89. It shows that unionised firms grew less than non-unionised firms in both the manufacturing and non-manufacturing sector. Of course, these are just raw correlations and could reflect for instance the fact that large firms tend to grow slower and that exactly large firms are the ones which are unionised.

---

your company's establishments that recognized trade unions for the purposes of bargaining over wages and conditions other than as a result of the opening and closure of establishments?(more details can be found in Gregg and Yates (1991) and Gregg and Machin (1991).

Table 4 gives the average and median growth rates (1985-89) for the sub-sample of firms which de-recognised unions viz. did not de-recognise and for those firms de-recognising unions viz. not de-recognising conditional on positive growth. The latter is done to account for the potential endogeneity of union de-recognition and (negative) firm growth. We computed the 4-year growth rate in 1989, thus the growth rate reflects the difference in employment between 1985 and 1989. The reason for this is that the union de-recognition variable refers to this time period. Table 4 shows that firms which de-recognised unions have on average lower growth rates, 0.035, than those which did not de-recognise, 0.18. This remains the case when we compare median growth rates, 0.084 viz. 0.099. When we compare growth rates, conditional on positive growth, firms which de-recognised unions have still lower growth rates on average than those which did not de-recognise (0.19 viz. 0.37). Figure 1a plots the growth rate distribution for firms which de-recognised unions, while figure 1b shows the growth rate distribution for firms which did not de-recognise. Interestingly, figure 1a shows that the majority of firms which de-recognised unions had *positive* growth rates. Thus de-recognition did not occur at shrinking firms only, which then would explain the de-recognition. All this suggests that because union de-recognition is correlated with lower growth rates unions have a positive effect on employment *levels*. Of course we need to test this hypothesis more rigorously in the regression analysis.

We next turn to estimating the employment equation. Estimating (1') by OLS would lead to inconsistent estimators because  $w$  and  $q$  are endogenous. Thus we need to instrument  $w$  and  $q$ . In panel data, valid instruments are the levels of the endogenous variables dated  $t-2$  and before, as shown by Aralleno and Bond (1991). Thus the estimation will take place from 1984 instead of from 1982. We shall use a General Methods of Moments estimator and use

the Dynamic Panel Data package developed by Aralleno and Bond (1988). The advantage of using the GMM estimator over other commonly used estimation techniques in panel data exists in its optimal use of instruments. As the panel progresses more instruments become available. For instance, in 1984 instruments dated 1982 can be used, in 1985, instruments dated 1982 and 1983 can be used, etc.. In order to test the validity of the instruments, a Sargan test of over-identifying restrictions is produced and is asymptotically  $\chi^2$  distributed. First differencing equation (1) generates first order serial correlation, but second order serial correlation should be absent if the error term in the levels is white noise. Therefore, a test of second-order serial correlation is computed and is asymptotically  $N(0,1)$ .

When estimating (1') we shall also control for possible industry effects on employment growth, via the industry wage<sup>6</sup>. We will further include time dummies to control for common aggregate shocks.

Table 5 reports the results of estimating equation (1') using the EXSTAT panel of company accounts. The wage, output and industry wage refer to real variables. The first column simply regresses employment growth on the union variables, without adding any extra controls, except time dummies. Unionised firms have a 6.4% lower *growth* rate than non-unionised firms. The union de-recognition variable has a negative effect of -4.4% and is significant at the 10% critical level. This means that unions have positive effects on employment *levels*. A possible interpretation for this is that the impact effect of unions on employment is positive. In other words, as a firm becomes unionised (de-unionised),

---

<sup>6</sup>The industry wage can also be thought of an outside option variable. A significant effect would support the efficient contract model.

increased (reduced) employment will result. But because the firm moves away from its optimal level of employment (or scale), it will subsequently grow less.

The de-recognition effect becomes insignificant when the full model is estimated in column 2, although the point estimate is still negative. Of course, the union de-recognition variable does not capture perfectly the year to year changes in unionism, it is merely a dummy indicating whether there was de-recognition or abolishment of closed shop arrangements in the period 1984-89. We therefore experimented with regressing the difference between employment in 1989 and 1985 on the union de-recognition variable, referring to union de-recognition between 1985 and 1989. This would capture in a more exact way the union de-recognition effect. We only did a similar regression as in column 1, using OLS with heteroscedastic consistent standard errors. The union de-recognition effect is estimated to be -14% and significant at the 10% critical level, while the union recognition effect is estimated to be equal to -17% and is also significant at the 5% critical level<sup>7</sup>. When the sample is restricted to firms which experienced only positive growth the union de-recognition effect is -17% and is significant at the 5% critical level, the union recognition effect is -19%. Thus, although we cannot find statistically significant evidence of a union de-recognition effect in column 2 of table 5, we clearly cannot reject the hypothesis of no union de-recognition effect on employment growth. If any, there is likely going to be a negative union de-recognition effect, indicating a positive impact effect of unions on employment levels.

Column 2 of table 5 also shows that unionised firms grow by 2.3% less than non-unionised

---

<sup>7</sup>It should be noted that the union recognition effect should be divided by 4 to obtain the one-year effect of union recognition.

firms. Related studies have found similar results. For the U.S., Leonard (1991) concludes that employment in unionised plants grows 2 to 4% lower than in non-unionised plants. For the U.K., Blanchflower et.al.(1991) have estimated a union growth differential of 2.5 to 4%.

We shall investigate the robustness of the estimated union effects by testing several hypothesis. First, the union effect could be correlated with the business cycle as suggested by Second, the effect of unions might be different when firms face a lot of competitors viz. a few competitors. Third, the union effect might be different in the manufacturing sector than in the non-manufacturing sector.

#### **a. business cycle effect**

Column 3 investigates whether unions have different effects in 'slump' years than in 'boom' years. Of course, the time dimension we work with is relatively small, so that the conclusions we draw from this are rather suggestive. Both the union recognition variable and the union de-recognition variable are interacted with a dummy for the period is between 1984-87, the 'slump' years and a dummy for the period between 1988-89, the 'boom' years. These time periods are generally viewed as slump viz. boom years in the U.K. (see Layard, Nickell and Jackman, 1990, p9). It is only in the 'boom' years that unionised firms have significant lower growth rates than non-unionised firms. In the 'slump' years the union effect is not statistically significant and the point estimate is also lower. Of course, this could also reflect changes in managerial behaviour during these years, rather than a reflection of the business cycle, given that we only observe one 'slump' and one 'boom'. The key finding of

this is that the union effect on employment is not the same over time. This finding is consistent with Machin and Wadhvani (1991) and Gregg, Machin and Metcalf (1993). The latter paper investigates the effect of unions on productivity growth. Using the same dataset, they find a positive union effect on productivity growth for the boom years. They argue "if unionised companies were able to respond more quickly to any aggregate stimulus without taking on extra labour, then they could have experienced a boost to productivity (viz. non-union companies)." This thus implies that unionised firms have less employment growth in the boom years.

This business cycle effect is also consistent with an 'insider-outsider' interpretation (Lindbeck and Snower, 1989). When an adverse shock hits the firm some of the incumbent workers will lose their insider status because they are laid off. New employment is now at a lower level. If the economy picks up again, then the remaining insiders will bargain for higher wages, without taking into account the outsiders. Thus employment will stay at the lower level. Assuming two different types of firms, unionised viz. non-unionized, the unionised firm will have lower growth in booms than the non-unionised firm, because the non-unionised firm will simply hire extra workers if the economy picks up again.

#### **b. competition effects**

Stewart (1990) investigates the effect of product markets on union wage differentials and finds evidence that there exists only a union wage differential in establishments with some degree of product market power, as measured by the number of rivals a firm faces. The economic intuition for this is that union wage differentials are created by the capturing of

rents. In a perfectly competitive market, there are no rents to capture, hence there will exist no union wage differential. A similar argument is developed in a general-bargaining-oligopoly model in Konings and Walsh (1994). It is shown that the spillover from the labour market due to union bargaining to market share determination in the product market becomes weaker as the degree of price competition increases. As an illustration, we derive in the appendix a simple Cournot model with an isoelastic demand function and incorporate it with a right to manage bargaining model. The union effect on employment reduces as the number of competitors increases.

We test this hypothesis in column 4 of table 5. We have interacted the union variables with a dummy (comp) equal to 1 if the firm faces less than or equal to 5 competitors<sup>8</sup>. We also interacted the union variables with (1-comp) to capture those firms facing many rivals. Obviously we need to include comp separately to control for spurious correlation in the interaction terms. As expected, we find a stronger union effect when firms face only a few rivals. Unionised firms grow 4.1% slower in 'non-competitive' markets, while only 1.9% in 'competitive' markets. Moreover, the union de-recognition effect becomes now significant at the 10% critical level for those firms facing a few competitors and is -2.1%. It is -0.5% and insignificant for those firms facing many competitors. Thus when firms have some market power, as measured by the number of rivals they face, unions do have stronger effects: Unions decrease employment *growth* more and increase employment *levels*.

---

<sup>8</sup>The managers were asked whether they were the dominant firm in the market, whether they faced less than or equal to 5 competitors or whether they faced more than 5 competitors.

### **c. manufacturing viz. non-manufacturing**

The above results refer to both the manufacturing and non-manufacturing sector. Some authors suggest however that there could well be different union effects in the manufacturing sector than in the non-manufacturing sector. Bronars and Deere (1993) report an average employment growth rate for firms with a successful union election of 0.81% and of 2.21% for firms without a union win in the manufacturing sector, in the non-manufacturing sector, however, the employment growth rate is approximately the same for both type of firms, 3.42% viz. 3.04%.

We therefore split up the sample and estimate (1') on the subsample including only manufacturing firms and on the subsample including only non-manufacturing firms. This is another way to test for the robustness of the negative union effect on employment growth as found in column 2 of table 5. Table 6 reports the results. Column (1) shows that unionised manufacturing firms grow 3.3% slower than non-unionised manufacturing firms. Column (2) reports the same regression for the non-manufacturing sector. There is no significant difference in growth rates between unionised and non-unionised firms. Note further that in the non-manufacturing subsample the only significant explanatory variable is the output of the firm. The wage does not attract a significant coefficient. This suggests that in the non-manufacturing sector labour market variables are not that important in employment determination.



## V. Summary and Conclusions

In this paper we addressed the question of what unions do to employment behaviour. Do unions affect the *level* of employment and do unions affect the *growth* of employment? We have used a unique panel data set of large U.K. manufacturing and non-manufacturing firms to investigate this question. This is important to control for unobservable fixed effects. Moreover it allows to exploit both the cross-section and time-series dimension and hence to test the robustness of the estimated union effects on employment behaviour at the firm level.

As to the question that unions affect the *growth* of employment, we found no *robust* evidence that unionised firms have lower growth rates than non-unionised firms. The evidence we report indicates that there exists a negative effect of unions on employment growth, but this is not systematic over time. Moreover, the effect is weaker as firms face more competitors. Finally, we found a significant negative union effect only in the manufacturing sector, but not in the non-manufacturing sector.

As to the question whether unions affect the *level* of employment, we conclude with a quotation of a recent article in the Financial Times (May 27, 1993), 'Shell is to derecognise unions at refinery...and intends to cut the Haven workforce by 100 posts to 350 by the end of 1994'. The evidence presented here is in line with this quotation. It suggests that unions have a positive impact effect on employment levels. We found that there is a significant effect of union de-recognition on employment growth when firms face only a few competitors. The reason why in the other specifications the union de-recognition effect comes through only weakly and not significant at conventional levels is most likely due to the

construction of the union de-recognition variable and the limited number of observations on this variable.

## Appendix

### The Effect of unions on employment in a Cournot Model

There are  $n$  firms facing an isoelastic demand function,  $P=S/Q$ , where  $P$  is price,  $S$  is size of the market (consumer expenditures) and  $Q=q_1 + q_2 + \dots + q_n$ , is total output produced in the market and  $q_i$  is output produced by firm  $i$ . Let the production function simply be constant returns to scale with respect to employment or  $q_i = L_i$ , where  $L_i$  stands for employment in firm  $i$ . The strategies chosen by the firms is to choose employment, given the employment set in the other firms. They play simultaneously. The profit function of firm  $i$  can be represented as follows:

$$(a1) \quad \pi_i = Pq_i - w_iL_i,$$

where  $w$  is the unit wage cost, determined by bargaining.

The first order conditions with respect to employment are given by

$$(a2) \quad \delta\pi_i/\delta L_i = S/(L_1 + \dots + L_n) - (SL_i)/(L_1 + \dots + L_n)^2 - w_i = 0$$

We are looking for a symmetric Nash Equilibrium in employment. This implies

$$(a3) \quad L^\circ = (S/w)[(n-1)]/n^2$$

$$(a4) \quad \pi^\circ = S/n^2$$

We next turn to wage determination. We assume a simple union utility function of  $U=w-A$ , where  $w$  is the wage and  $A$  is the outside option. Given (a4), the wage is the outcome of a maximising the Nash bargaining product with respect to the wage or

$$(a5) \quad \text{Max } \Omega = (w - A)^\beta (\pi - \pi^*)^{1-\beta},$$

where  $\beta$  stands for relative bargaining power,  $\pi^*$  is the firm's disagreement payoff. We set this equal to zero.

The first-order condition of (a5) is given by,

$$(a6) \quad \Omega_w = 0 \quad \text{or} \quad (w - A)L = [\beta/(1-\beta)]\pi$$

This gives an optimal wage which is equal to the following

$$(a7) \quad w^\circ = \beta S/(n^2 L (1-\beta)) + A$$

Solving (a3) and (a7) simultaneously gives

$$(a8) \quad L^\circ = \{S[(n-1)(1-\beta)-\beta S]/[An^2(1-\beta)]\}$$

The partial derivative of (a8) with respect to  $\beta$ , union bargaining power, is given by

$$(a9) \quad \delta L^\infty / \delta \beta = -SAn^2 / [A(1-\beta)n^2]^2 < 0$$

To see how the effect of union bargaining power depends on the number of firms we take the partial derivative of (a9) with respect to  $n$ ,

$$(a10) \quad \delta^2 L^\infty / \delta \beta \delta n = 2SAn[2An^2(1-\beta) - 1] / [An^2(1-\beta)]^3 > 0$$

This means that as the number of firms increases (a9) becomes less negative. In other words, if firms face only a few rivals the negative effect of unions on employment will be strongest.

Table 1: Structure of the EXSTAT Panel

number of continuous years	number of firms
4	32
5	28
6	53
7	146
8	102

Table 2: Number of unionised firms which de-recognised unions

year	de-recognition:	yes	no
1984		7	178
1985		26	173
1986		26	181
1987		26	181
1988		24	174
1989		17	116

Table 3: Summary statistics on 1-year growth rates

Union		Manufacturing	Non-Manufacturing
Yes	median	0.010	0.019
	mean	0.012	0.027
	std	0.20	0.21
No	median	0.063	0.073
	mean	0.097	0.099
	std	0.23	0.27

Table 4: employment growth rates, 1985-89

	mean	median	std
derecognition=1	0.035	0.084	0.30
derecognition=0	0.18	0.099	0.41
derecognition=1, + growth	0.19	0.23	0.11
derecognition=0, + growth	0.37	0.28	0.34

Table 5: Unions and Employment Growth  
Dependent Variable:  $\Delta$ employment

explanatory variables	(1)	(2)	(3)	(4)
$\Delta$ wage	-	-0.57* (0.29)	-0.56* (0.29)	-0.59* (0.29)
$\Delta$ output	-	0.77* (0.12)	0.77* (0.12)	0.78* (0.12)
$\Delta$ industry wage	-	0.31 (0.47)	0.27 (0.48)	0.32 (0.48)
un derecognition	-0.044** (0.026)	-0.006 (0.014)	-	-
un recognition	-0.064* (0.014)	-0.019* (0.011)	-	-
un derecognition <sub>1984-87</sub>	-	-	-0.01 (0.02)	-
un recognition <sub>1984-87</sub>	-	-	-0.015 (0.015)	-
un derecognition <sub>1988-89</sub>	-	-	-0.005 (0.03)	-
un recognition <sub>1988-89</sub>	-	-	-0.034* (0.012)	-
un recognition $\times$ comp	-	-	-	-0.041** (0.028)
un recognition $\times$ (1-comp)	-	-	-	-0.019** (0.011)
un derecognition $\times$ comp	-	-	-	-0.021** (0.014)
un derecognition $\times$ (1-comp)	-	-	-	-0.005 (0.019)
comp	-	-	-	0.018 (0.028)
Time dummies	Yes	Yes	Yes	Yes
Sargan Test	-	44.43 (33)	41.69 (33)	44.11 (33)
Second Order Serial Correlation N(0,1)	0.978	-0.257	-0.230	-0.185
Number of Firms	361	361	361	361

Notes:(i) Instruments used are all available moment restrictions on wage from t-2 back and on output from t-3 back. (ii) one step robust standard errors in parentheses, except with Sargan test and Wald test, they refer to degrees of freedom.(iii) (\*)/(\*\*) denotes significant at 5%/10% Employment, wage, output and industry wage are in logarithms.

Table 6: Unions and Employment Growth, Manufacturing viz. Non-Manufacturing  
 Dependent Variable:  $\Delta$ employment

explanatory variables	manufacturing	non-manufacturing
$\Delta$ wage	-0.76* (0.31)	-0.19 (0.31)
$\Delta$ output	0.79* (0.10)	0.73* (0.14)
$\Delta$ industry wage	-0.28 (0.42)	0.29 (0.64)
union derecognition	-0.003 (0.019)	-0.01 (0.027)
union recognition	-0.033* (0.011)	-0.004 (0.018)
Time dummies	Yes	Yes
Sargan Test	37.4(38)	47.8(38)
Second Order Serial Correlation N(0,1)	1.8	1.8
Number of Firms	187	174

Notes: As in table 3



Figure 1a: Growth Rate Distribution for firms which de-recognised trade unions

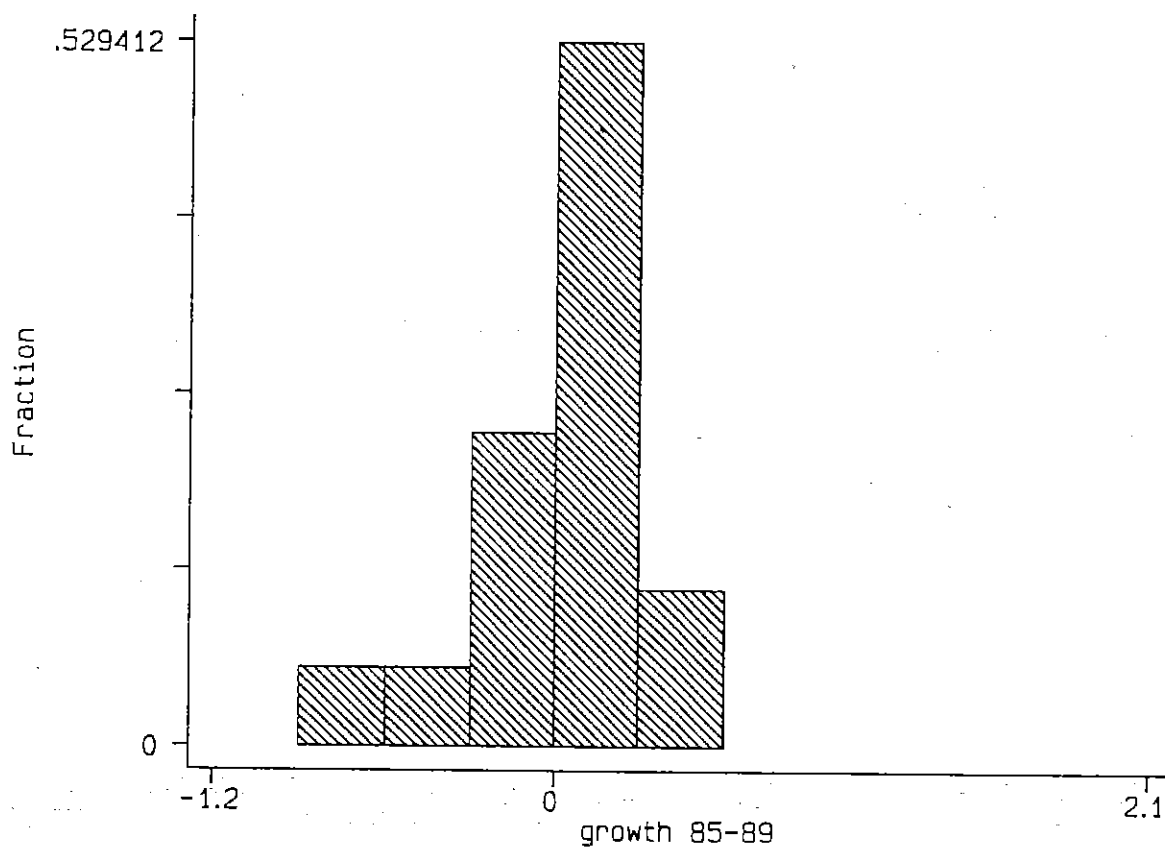
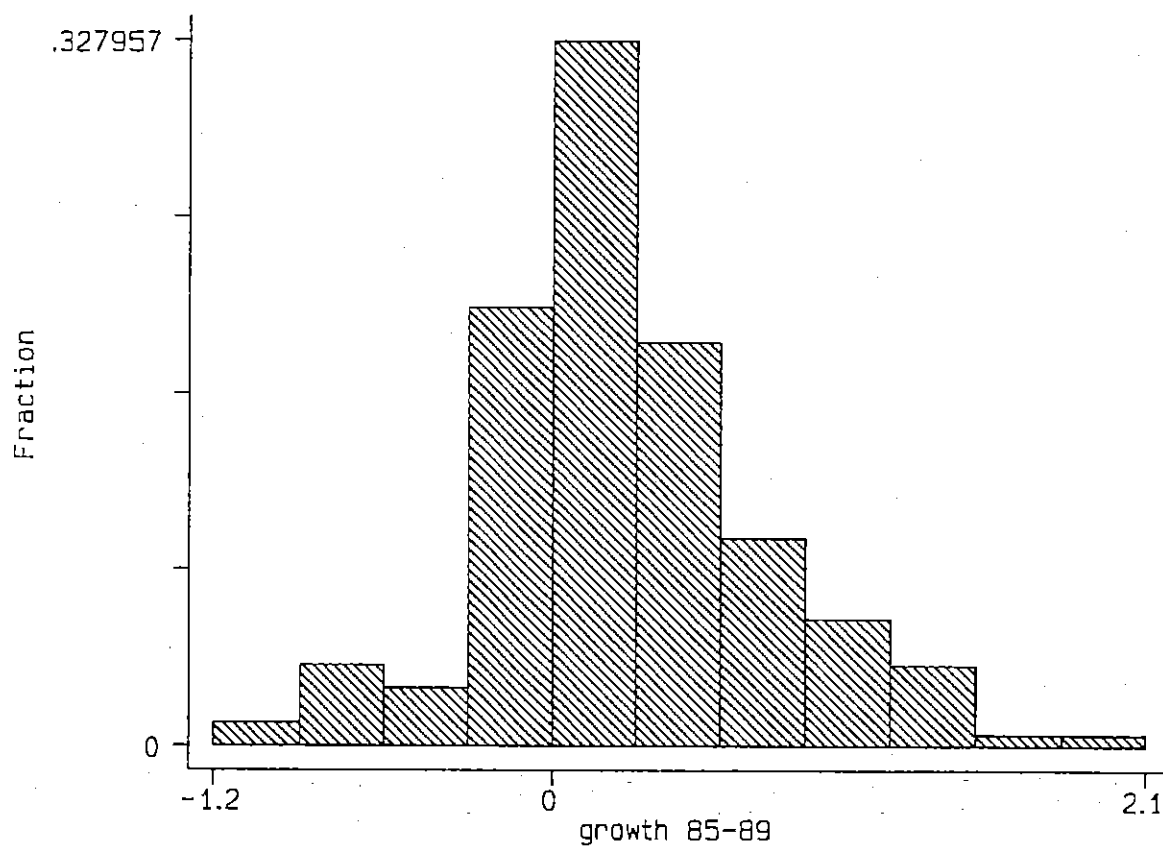


Figure 1b: Growth Rate Distribution for firms which did not de-recognise trade unions



## References

- Aralleno, Manuel and Bond, Stephen (1988). 'DPD-A user's guide', *Institute for Fiscal Studies*.
- Aralleno, Manuel and Bond, Stephen (1991). 'Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations'. *Review of Economic Studies*, vol. 58, pp.277-98.
- Blanchard, Oliver, J. and Summers, Larry, H. (1986). 'Hysteresis and the European Unemployment Problem', in S.Fischer (ed.), *NBER Macroeconomics Annual 1986*, Cambridge, Mass. MIT press.
- Blanchflower, David G., Millward, Neil and Oswald, Andrew J. (1991). 'Unionism and Employment Behaviour.' *The Economic Journal*, vol.101, pp.815-34.
- Bronars, Stephen G. and Deere, Donald D. (1993). 'Union Organizing Activity, Firm Growth, and the Business Cycle.' *The American Economic Review*, vol. 83, pp.203-220.
- Bughin, J., (1991a). 'Testing Oligopolistic Behaviour Within an Efficient Wage Bargaining Model', *Discussion Paper 9104* IRES, Université Catholique de Louvain.
- \_\_\_\_\_ (1991b). 'Wage Premia, Price-Cost Margins and Bargaining over Employment in Belgian Manufacturing: An Analysis of Distinct Behaviour among Various Skilled Workers", *Discussion Paper 9112*, IRES, Université Catholique de Louvain.
- Clark, Kim B. (1984). 'Unionization and firm performance: The impact on profits, growth and productivity.' *The American Economic Review*, vol. 74, pp.893-919.
- Freeman, R. and Medoff, J.L. (1984). What do unions do?, New York, Basic.
- Gregg, Paul and Machin, Stephen (1991). 'Changes in Union Status, Increased Competition and Wage Growth in the 1980's.' *British Journal of Industrial Relations*, vol.29, pp.603-611.
- Gregg, Paul and Machin, Stephen (1992). 'Unions, the demise of the closed shop and wage growth in the 1980's.' *Oxford Bulletin of Economics and Statistics*, vol. 54, pp.53-72.
- Gregg, Paul, Machin, Stephen and Metcalf, David (1993). 'Signals and cycles? Productivity growth and changes in union status in British companies, 1984-90. *The Economic Journal*, forthcoming.
- Gregg, Paul and Yates, Anthony (1991). 'Changes in trade union and wage setting arrangements in the 1990's.' *British Journal of Industrial Relations*, vol. 29, pp.361-76.
- Hirsch, Barry T. and Addison, John, T. (1989). 'Union effects on productivity, profits and growth: Has the long run arrived?', *Journal of Labor Economics*, vol. 7, pp. 72-105.

Huber, P.J. (1967). 'The behavior of maximum likelihood estimates under non-standard conditions'. Proceedings of the fifth Berkeley symposium on mathematical statistics and probability. pp. 221-233.

Jovanovic, B. (1982). 'Selection and Evolution of Industry'. *Econometrica*, vol.50, pp.649-670.

Konings, Jozef and Walsh, Patrick (1994). 'Evidence of Efficiency Wage Payments in U.K. Firm Level Panel Data'. *The Economic Journal*, forthcoming.

Layard, Richard and Nickell, Stephen (1990). 'Is Unemployment Lower if Unions Bargain over Employment?' *Quarterly Journal of Economics*, Vol.CV, pp.773-787.

Layard, Richard, Nickell, Stephen and Jackman, Richard (1991). Unemployment. Oxford University Press.

Leonard, J.S. (1991). 'Unions and employment growth.' *Industrial Relations*.

Lindbeck, A. and Snower, D.J.(1989). The Insider-Outsider Theory of Employment and Unemployment, Cambridge, Mass.: MIT press.

Lockwood, B. and Manning, A. (1989). 'Dynamic wage-employment bargaining with employment adjustment costs', *The Economic Journal*, vol. 99, pp. 1143-58.

Long, Richard J. (1993). 'The Effect of Unionization on Employment Growth of Canadian Companies'. *Industrial and Labor Relations Review*, Vol. 46, No.4, pp.81-93.

Machin, Stephen, Manning, Alan and Meghir, Costas (1993). 'Dynamic models of employment based on firm-level panel data', in eds. Pfann,

Machin, Stephen and Wadhvani, Sushil (1991). 'The effects of unions on organisational change and employment.' *The Economic Journal*, vol. 101, pp.835-54.

Manning, Alan (1987). 'An integration of trade union models in a sequential bargaining framework', *The Economic Journal*, vol. 97, pp. 121-39.

McDonald, Ian M. and Solow, Robert, M. (1981). 'Wage Bargaining and Employment'. *The American Economic Review*, vol.71, 5, pp.896-908.

Nickell, Stephen, Wadhvani, Sushil and Wall, Martin (1992). 'Productivity growth in UK companies 1975-86'. *European Economic Review*, vol. 36, pp.1055-85.

Oswald, A. (1985). 'The economic theory of trade unions: an introductory survey', *Scandinavian Journal of Economics*, vol. 87, pp. 160-93.

Oswald, A. (1993). 'Efficient contracts are on the labour demand curve: theory and facts,

*Labour Economics*, Vol. 1.

Voos, Paula B. and Mishel, Lawrence R. (1986). 'The union impact on profits: Evidence from industry price-cost margin data'. *Journal of Labor Economics*, pp.105-33.

White, H. (1980). 'A heteroskedastic-consistent covariance matrix estimator and a direct test for heteroskedasticity'. *Econometrica*, vol.48, pp. 817-830.

## LIJST VAN RECENTE SESO-RAPPORTEN

COPPIETERS P., DE BORGER B. & A. HUFKENS, Productivity growth measurement in the Belgian banking sector 1985-1989, December 1992, 26 blz. (92/282)

VAN GOMPEL J., Stabilization with wage indexation and exchange rate flexibility -a survey of the literature-, January 1993, 47 blz. (93/283)

NONNEMAN W., De kosten van instellingen van hoger onderwijs buiten de universiteit, januari 1993, 33 blz. (93/284)

HEYLEN F., VAN POECK A. & J. VAN GOMPEL, Real versus nominal convergence - national labour markets and the European integration process, April 1993, 42 blz. (93/285)

KESENNE S., The unemployment impact of a basic income, May 1993, 25 blz. (93/286)

CORTENS I. en W. NONNEMAN, Is het onderwijs meer dan een filter ?, juni 1993, 31 blz. (93/287)

VAN TRIER W., James Meade and his "social dividends" - An intriguing chapter in the history of an idea, July 1993, 34 blz. (93/288)

HEYLEN F., The theory and evidence of unemployment persistence - A review of the literature, August 1993, 41 blz. (93/289)

YZEWYN D., Input-outputanalyse en toeristische impactmeting - een verkennende toepassing voor Vlaanderen, augustus 1993, 70 blz. (93/290)

HEYLEN F. en A. VAN POECK, Government preferences and equilibrium inflation - a simple test of the Barro-Gordon Model, August 1993, 24 blz. (93/291)

VAN POECK A., Belgian banks under stress - the effects of deregulation and financial innovation on the performance of the Belgian credit institutions, September 1993, 32 blz. (93/292)

VAN GOMPEL J., Unemployment and monetary integration - on the relevance of wage formation characteristics in a target zone regime versus an irrevocably-fixed exchange rate regime, November 1993, 22 blz. (93/293)

BORGHERS E., Automatic ARMA identification for a large number of time series, December 1993, 42 blz. (93/294)

KONINGS J., Labour economics or industrial economics ? Analysing gross job creation and destruction in the theory of oligopoly, January 1994, 18 blz. (94/295)

DE BORGER B. en K. KERSTENS, Cost efficiency of Belgian local governments : a comparative analysis of FDH, DEA and econometric approaches, January 1994, 26 blz. (94/296)