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Abstract

In Europe in recent times, bargaining between a leading nationally-based industrial union and a representative group of employers over the issues of employment, wages and working time has proved to be influential in a much wider industrial context. Adopting a generalized Nash bargaining approach, this paper considers the possible effects on such "key" bargains of several prominent labor market events and policies experienced since the middle 1970s. These include the impacts of OPEC supply shocks, changes in union power, greater emphasis on payroll taxes as well as growing government economic orthodoxy as expressed through the goal of a balanced budget.

**EFFICIENT BARGAINS IN THE CONTEXT OF RECENT
LABOR MARKET EXPERIENCE AND POLICY**

1.   Introduction

        Labor market policy interest in the relationships among employment, working time and wages has centered on studying the demand and supply side reactions of these variables to exogenously imposed changes in standard hours, payroll taxes, job security legislation and legislation and unemployment benefits. The subject area has been variously examined from the viewpoints of employment-at-will, monopoly union and efficient contract models.[1] This paper examines these issues from a somewhat different perspective. Essentially, it is motivated by the observation that the catalytic events that have given rise to government, union, employer and media discussion in this policy domain have often involved attempts to achieve pay improvements and/or to reduce working time by a single, dominant and nationally-based union key industry. Bargaining has largely taken place between that union in a key industry. Bargaining has largely taken place between that union and a group of employers representing the industry. A notable example of such a union on the European scene is that of the Metal workers Union (IG METALL) in West Germany. Not only has it dominated recent annual wage rounds, with wage decisions in other industries largely predicted on its own bargaining outcome, but also - following an important working time dispute in 1984 - it has helped to stimulate a broad debate in Germany and elsewhere into the labor market implications of cuts in the work week.

        We identify four broad categories of political, social and economic events that, a priori, would be deemed important over the past two decades in forming unions' and employers' attitudes towards pay, employment and hours. First, unanticipated changes in relative prices, like those following the OPEC supply shocks, have undoubtedly given rise to pressures on both parties to reconsider existing contractual arrangements. Secondly, fundamental changes in the political and economic climate, especially in the late 1970s/early 1980s, have helped to alter significantly the relative bargaining power of unions and employers in countries like the UK. In due course, this would be expected to be translated into a new set of bargaining outcomes. Thirdly, government fiscal policy may have served to alter the attitudes of employers towards both their workforce sizes and the mix of workers and hours within total labor services. On the union side, fiscal changes may have stimulated members to reappraise their attitudes towards the allocations of work and leisure. We examine the roles of income and payroll taxes as well as that of unemployment benefits as examples of the most important fiscal instruments in these directions. Fourthly, a climate of growing conservative economic orthodoxy by governments throughout Europe and elsewhere has led to the imposition of severe controls on welfare expenditures in relation to tax revenues. These fiscal constraints may have served to limit the scope, or to alter the outcomes, of bargaining agreements compared to those that would have prevailed in periods of lesser commitment to balanced budgets.

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[1]A very broad range of this literature is summarized/developed in Hart (1987).

Our approach is to examine the impact of the four sets of factors on employment, hours and wage settlements in an attempt to identify the menu of events that are likely to give rise to the observed decisions in the leading collective bargaining agreements. Of course, no relatively simple model can be expected to capture all the features of bargaining between a national union and a representative group of employers. The generalized Nash bargaining solution concept, covering an efficient bargain between an employer and a single union, serves as a reasonable first approximation, however. A group of employers acting on behalf of an national industry can be thought to act as a unified coalition, representing "the" view on the demand side of the labor market. The national union has a virtual monopoly on the supply side position if it controls the bulk of workers who possess an important set of skills associated with the industry. Further, given a match between the union members' general human capital and the main industrial activity, the employers might well feel that there is a rent to be earned if a successful bargain can be struck.

We deal with two main types of bargain. First, we consider a relatively simple bargaining agenda in which hours of work are exogenously fixed. This is not an esoteric case since firms and unions often agree to work strictly "standard" or contractual hours per period that are determined at a more aggregate level by national collective bargaining or state mandating. Secondly, we examine a bargain in which hours, workers and wages are all endogenously determined. Further, in both situations, we analyze the bargaining outcomes with and without the constraint that the government imposes a balanced budget in which tax receipts equal benefit outlays. In order to avoid excessive complexity, we assume throughout that the union is risk neutral.

Section 2 deals with bargains in which hours are fixed while Section 3 examines the consequences of introducing variable hours. We assess the results in Section 4.

2   Efficient Bargains wit Fixed Hours

In the bargains outlined in this section, per-period working hours are determined by an "outside" agency, such as the government. Without losing essential generality, we treat the capital stock as a fixed factor of production.

2.1   Bargaining with no government budget constraint

The firm's profit function is given by

$$\pi(n,w) = pf(n) - w(1 + t_f)n \tag{1}$$

where p is a productivity shifter, n is the number of workers, w is the wage rate, and t_f is the firm's payroll tax rate for contributions to statutory social welfare.

The firm hires from a single union in a closed shop arrangement whereby it employs only members of the union. There are n workers who are hired at random from a fixed membership m and it is assumed that n< m. All members not hired are unemployed and receive unemployment benefit, b. The union's objective function is given by

$$V= nu(w(1-t_y)(1-t_u)-d)+ (m-n)u(b)$$

where t_y is income tax, t_u is the union's tax rate for contributions to social security and d is the fixed disutility of work. If the parties fail to strike a bargain, the union utility at the threat point is given by

$$V-\bar{U}= n(w(1-t_y)(1-t_u)-d-b). \tag{2}$$

The generalized Nash bargain is the solution to the problem

$$\max_{n,\omega} J^*\pi(n,w)^{1-\alpha}(v-\bar{U})^\alpha \tag{3}$$

where a represents relative union strength, with $a\epsilon\{0,1\}$.

From the first-order conditions to (3)[2] we obtain

$$pf_n= (d+ b)\tau \tag{4}$$

where
$$\tau= (1+ t_p)/((1-t_y)(1-t_u)).$$

After adjusting for taxes, optimum employment is achieved by equating marginal value product to worker's opportunity cost of work.

Also, we obtain an expression for rent sharing, given by

$$\eta^*(\omega^*(1+ t_p)-(d+ b)\tau)= (\alpha/(1-\alpha))\pi^*. \tag{5}$$

If the union has no power ($\alpha= 0$) it receives zero rent while, at the other extreme, the firm receives zero profit if it has no power ($\alpha= 1$)

From the total differentiation of the first-order conditions, we obtain comparative static effects on n and w resulting from changes in the exogenous variables. These are presented in Table 1.

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[2]It is readily verified that the second-order conditions necessary to obtain a maximum are satisfied.

Table 1.   Employment and Wage Rate Effects of Changes in Exogenous Variables
             (No Government Budget Constraint)

Comparative static effects of n with respect to:	Sign	Comparative static effects of w with respect to:	Sign
price shock(p)	positive	price shock(p)	?
union power (α)	zero	union power (α)	positive
unemployment benefit (b)	negative	unemployment benefit (b)	positive
income tax (t_y)	negative	income tax (t_y)	positive
firm's payroll tax (t_f)	negative	firm's payroll tax (t_f)	?
union's payroll tax (t_u)	negative	union's payroll tax (t_u)	positive

An unfavorable price shock induces the parties to agree unequivocally to an employment reduction but may or may not lead to an accompanying cut in the wage rate. By contrast in this latter respect, a reduction in relative union power is predicted to lead unambiguously to a wage reduction.[3] On the employment side, the firm's stronger bargaining position is reflected in a larger share of the rent - represented by a transfer of wages to profits at the margin - and there is no incentive for it to alter its production input requirements, ceteris paribus. Increases in income and payroll taxes are all predicted to lead to reduced employment. The payroll tax results support a claim frequently made by employers and unions alike that statutory contributions constitute a "tax on jobs". With the exception of the firm's payroll tax which has an ambiguous outcome, the tax increases are further predicted to stimulate offsetting higher wages for those who retain their jobs. On the benefit side, a fall in unemployment benefit induces the union to seek more employment and this is accommodated by an agreed reduction in the wage rate.

2.2   Bargaining subject to a government balanced budget constraint

We now impose the condition that the government wishes to equate tax revenues and welfare spending. We assume further that the firm and the union under analysis are 'representative' of the whole economy in that the value of the tax revenues collected from the firm and its workers equals the value of benefits paid out to the unemployed members of the union. Thus, we introduce the constraint that the government revenue is equal to government spending, or

$$\omega\eta((1-t_u)t_y + t_u = t_f) = (m-\eta)b. \qquad (6)$$

In the new problem, (3) is maximized subject to (6). Our adopted approach to the solution is as follows. We enquire into the effects of changes in t_y, t_u and b and allow t_1 to adjust endogenously so as to keep the government's budget in balance at all times. From the first-order conditions to

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[3]The joint event of an unfavorable price shock and a decline in union power - often associated with the OPEC supply crisis - has an ambiguous effect on the wage.

this conditional optimization, we obtain a particularly simple expression for optimal employment given by

$$pf_\eta = d \qquad\qquad (7)$$

or employment is set at the point where the marginal value product of employment is equal to the disutility of work. It follows that employment under the government budget constraint is affected only by changes in product price. The wage, however, is influenced by all of the exogenous variables.[4] The complete set of results are summarized in Table 2.

Table 2.   Employment and Wage Rate Effects of Changes in Exogenous Variables
             (With a Balanced Government Budget)

Comparative static effects of n with respect to:	Sign	Comparative static effects of w with respect to:	Sign
price shock(p)	positive	price shock(p)	?
union power (α)	zero	union power (α)	positive
unemployment benefit (b)	zero	unemployment benefit (b)	?
income tax (t_y)	zero	income tax (t_y)	positive
union's payroll tax (t_u)	zero	union's payroll tax (t_u)	positive

On the wage side, the introduction of a balanced budget constraint leaves the equivalent unconstrained results, shown in Table 1, almost intact. The exception is that a change in unemployment benefit no longer has an unambiguous effect on employment.[5] On the employment side, the results turn out to be significantly different. The budget constraint effectively removes the possibility of government taxation and benefit intervention as a means of tackling unemployment since, as indicated in Table 2, changes in payroll and income taxes and in unemployment benefit have no effect on bargaining with respect to employment. The positive effect of a price shock remains as the one non-zero influence on the employment decision.

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[4]The share equation, equivalent to (5) is given by

$$\eta \left((\omega((1-t_y)(1-t_u))/(1-\alpha)) - d - b \right) = (\alpha/(1-\alpha))(pf(\eta) - (m-\eta)b)$$

which when totally differentiated along with (7) provides the complete set of partials with respect to w.

[5]Although we do obtain $\partial w/\partial b > 0$ if the union share parameter α is less than the employment rate, n/m.

3.   Efficient Bargains with Flexible Hours

We now add one more endogenous variable, hours of work, to the bargains set out in the previous section. The inclusion of hours more realistically represents the bargaining agenda between many firms and unions (see Ulph and Ulph, 1990).

3.1   Bargaining with no government budget constraint

The firm's profit is given by

$$\pi(\eta,h,\omega)= pf(\eta,h)-y(1+ t_f)\eta \tag{8}$$

where, in addition to the previously noted variables, h is average hours worked and $y =$ wh is wage income.

Again, assuming risk neutrality, the union's rent - derived equivalently to (2) - is given by

$$V\text{-}\overline{U}= \eta(y(1\text{-}t_y)(1\text{-}t_u)\text{-}g(h)\text{-}b) \quad g_h> 0, g_{hh}> 0 \tag{9}$$

where g(h) is the disutility of hours worked.

Note that the total payroll tax is given by

$$T= (t_j+ t_u(1\text{-}t_y))y\eta \tag{10}$$

and so we assume that all union members receive wage income that lies between wage floors and wage ceilings below and above which, respectively, payroll taxes are zero-rated. This is almost universally the case on the European scene.[6]

The new generalized Nash bargaining problem is given by

$$\max_{\eta,h,w} J= \eta,h,\omega)^{1\text{-}\alpha}(V\text{-}\overline{U})^{\alpha.} \tag{11}$$

From the first-order conditions we obtain[7]

$$pf_{\eta}/\hat{\eta}= g_h\tau \tag{12}$$

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[7]As in the simpler problems, it is found that the second-order necessary conditions are satisfied.

or the average marginal product of hours is equal to the cost of employing an extra hour. This cost is equal to the tax adjusted marginal disutility of hours worked. Further, we obtain

$$pf_\eta = g(\overset{.}{h}) + b\tau \tag{13}$$

which corresponds closely to (4). The new rent sharing condition, equivalent to (6), is given by

$$\hat{\eta}(\hat{y}(1 + t_f) - g(\overset{.}{h}) + b)\tau) = (\alpha/(1-\alpha))\overset{.}{\pi}. \tag{14}$$

Adding hours of work to the bargain considerable complicates issues when attempting to derive unambiguous responses of labor inputs and wages to changes in the exogenous variables. A useful simplification is to adopt a specific form of technical production process and, in line with much related theoretical and empirical work, we chose the Cobb Douglas production function.

This is given by

$$f(\eta,h) = \eta^y h^\delta \quad y > 0, \delta > 0. \tag{15}$$

A noteworthy feature of the Cobb-Douglas function in the context of this model relates to the relative returns to hours and workers. Incorporating (15) into the first-order conditions in (12) and (13), we obtain

$$g_h h = (\delta/y)(g(h) + b)$$

from which it follows, given $g_{hh} > 0$, that δ y. This is an interesting result from both theoretical and empirical perspectives. In labor demand models that include workers and hours, the use of Cobb-Douglas functions frequently imposes the condition that $\delta < y$. This is the reverse of the finding here. While there is empirical support for both directions of inequality, most studies have produced parameter estimates in line with the present Nash bargaining outcome.[8]

Incorporating (15) into the first-order conditions, we can derive the comparative static effects of n, h and w with respect to the exogenous variables. The results are summarized n Table 3.

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[8]See Hart (1987) for more details.

Table 3.   Employment, Hours and Wage Income Effects of Changes in Exogenous Variables (No Government Budget Constraint)

Comparative static effects of n with respect to:	Sign	Comparative static effects of h with respect to:	Sign	Comparative static effects of y with respect to:	Sign
price shock(p)	?	price shock(p)	0	price shock(p)	?
union power (α)	0	union power (α)	0	union power (α)	+
unemployment benefit (b)	?	unemployment benefit (b)	?	unemployment benefit (b)	+
income tax (t_y)	?	income tax (t_y)	0	income tax (t_y)	+
firm's payroll tax (t_f)	?	firm's payroll tax (t_f)	0	firm's payroll tax (t_f)	?
union's payroll tax (t_u)	?	union's payroll tax (t_u)	0	union's payroll tax (t_u)	+

A change in product price now has an ambiguous effect on employment and wages and does not alter hours of work. This latter result is due to the choice of (a homothetic) production function. A change in union power has similar effects to the results of the simpler model outlined in Table 1: the alteration in relative bargaining status is reflected directly through the wage with no effect on labor input, that is on either employment or hours. The changes in payroll and income taxes have ambiguous effects on employment and leave average hours unchanged. The wage effects of tax changes are in line with those of the simpler model.

Only a change in unemployment benefit is predicted to influence hours of work. While we cannot sign this effect, we do obtain the result that

$$sign\left(\frac{\partial \eta}{\partial b}\right) = - \, sign\left(\frac{\partial h}{\partial b}\right)$$

On the assumption that $\partial \eta / \partial b < 0$, in line with the equivalent result in Table 1, a ceteris paribus decrease in unemployment benefit would be predicted to lead the bargaining parties to agree to a cut in working hours. In effect, this is a form of work sharing, since it constitutes an agreement to counter the relative fall in 'outside' income by trading-off more employment against less wage income. Note that, in this latter respect, both h and w are predicted to fall.

3.2   Bargaining subject to a government budget constraint

The equivalent budget constraint to (6) in the extended workers-hours problem is expressed

$$y\eta((1-t_u)t_y + t_u + t_f) = (m-\eta)b. \tag{16}$$

Maximizing (11) subject to (16)[9] produces

$$pf_h = \hat{n}g_h \tag{17}$$

and

$$pf_\eta = g(\hat{h}). \tag{18}$$

In equilibrium, (17) and (18) require that, respectively, the parties equate the marginal product of hours to workers' marginal disutility of work and the marginal product of employment to the per-worker disutility of work. Only changes in p affect the equilibrium values of n and h although the adoption of the Cobb-Douglas function in (15) leaves only n with a non-zero derivative. Further, the choice of Cobb-Douglas again requires that $\delta > y$.[10]

Table 4.   Employment, Hours and Wage Income Effects of Changes in Exogenous Variables (With a Balanced Government Budget)

Comparative static effects of n with respect to:	Sign	Comparative static effects of h with respect to:	Sign	Comparative static effects of y with respect to:	Sign
price shock(p)	?	price shock(p)	0	price shock(p)	?
union power (α)	0	union power (α)	0	union power (α)	+
unemployment benefit (b)	0	unemployment benefit (b)	0	unemployment benefit (b)	?
income tax (t_y)	0	income tax (t_y)	0	income tax (t_y)	+
union's payroll tax (t_u)	0	union's payroll tax (t_u)	0	union's payroll tax (t_u)	+

From the results outlined in Table 4, we find that the imposition of the budget constraint produces the result that only price shocks change employment and that none of the exogenous variables have an effect on hours. With one exception, the wage results remain unaltered from the previous, unconstrained problem.[11]

4   Assessment

Our central purpose in this paper has been to evaluate the impacts of important economic events on employment and wage bargaining decisions between a large national union and a representative

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[9]Again, treating t_j as an endogenous variable.

[10]The sharing condition for this problem is given by
$$\eta(y(1-t_y)(1-t_u)-b-g(h)) = \alpha(pf(n,h)-mb-g(h))\eta).$$

[11]The derivative $\partial y/\partial b$ is now ambiguous although we obtain
$$\partial y/\partial b > 0 \text{ if } -\eta + am < 0.$$

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group of employers. The principal motivation for this approach is the view that the outcomes of such bargaining agreements can be influential in a much wider industrial context since they set the patterns of employment and wage settlements elsewhere. In Section 2, we identified four major areas that would be expected to influence collective bargaining decisions on jobs, hours and pay; these are price shocks, relative union power, government fiscal intervention and government budgetary policy. In this section, we assess our findings with respect to the first three of these items in the absence of government budget control and then we discuss the overall implications of introducing a budget constraint.

(i)   Price shocks

The OPEC supply shocks in the middle and late 1970s and the associated recessions have generally been regarded as resulting in a significant departure the type of employment and wage collective bargaining settlements that dominated the 1960s and early 1970s. The aftermath of the shocks has witnessed falls in industrial employment accompanied by varying trends in wages. Some countries, like West Germany, have succeeded in tempering wage growth while others, like the UK, have experienced significant rises in unit labor costs, including wages. In so far as these reactions have been influenced by the 'leadership effect' of key bargains, our results are not inconsistent with these patterns of events. In the simple model with fixed hours, we find that an adverse price shock would be expected to reduce the numbers of union members in employment and lead to wage changes that could go in either direction. Allowing hours to vary renders both employment and wage outcome to be uncertain while leaving average hours unchanged.

(ii)   Union power

It is also a commonly held view that the recent recessionary periods have been associated with a decline in union power. In the UK, this trend has been exacerbated by government legislation designed to reduce the degrees of freedom previously enjoyed by unions in industrial disputes. To the extent that such a relative decline has taken place, our analyses indicate that this would have served, ceteris paribus, to dampen wage settlements, leaving employment and hours unchanged. In other words, the monopoly union would opt, and the employer would comply, with a policy of preserving jobs at the expense of a lower standard of living for employed members.

(iii)   Fiscal intervention

We noted earlier, in relation to Table 3, that we find that only one form of fiscal initiative- to change the level of unemployment benefit-is predicted to influence worksharing in those bargains where hours are free to vary. While we cannot unambiguously sign the employment/hours changes, there are reasonable grounds for expecting that a fall in benefit will lead the parties' to agree to trade-off more employment for fewer hours per worker. These results are of interest within a broader labor market context because they support earlier work on

efficient wage contracts that have emphasized the role of unemployment benefit (Feldstein, 1976; Burdett and Wright, 1989) in worksharing and employment decisions.

On the taxation side, there has been a tendency among governments to switch emphasis away from income and towards payroll taxes. In the unconstrained model with fixed hours, reduced income tax is predicted to result in the mix most desirable to policy makers, that is reduced wages and increased employment. Unfortunately, increased payroll taxes would generally serve to reverse these bargaining outcomes leaving net outcomes to be uncertain. Similar wage effects are found in the extended model with employment repercussions now uncertain.

(iv)   A budget constraint

A growing conservative orthodoxy in the late 1970s/1980s in several leading industrial countries has been characterized by the dual goals - perhaps not always realized in practice - of a balanced budget approach to fiscal expenditure and less government intervention in the regulation of labor markets. Our most important finding stemming from the imposition of a balanced budget is that these two objectives are mutually consistent in the sense that the former severely reduces the ability of the government of establish some control on labor input decisions. A balanced budget constraint renders impotent the use of tax and benefit changes to influence the level of employment. The fiscal effects on wages, however, are in the same direction as the unconstrained results and so there may still be deemed to be political and economic returns to fiscal intervention.

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