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Central Bank Independence, Sectoral Interest, and the Wage Bargain

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Abstract

Much recent research in the fields of political science and economics has been devoted to the subjects of coordination in wage bargaining (CWB) and central bank independence (CBI). In this paper, I analyze the employment effects of central bank independence in a model of the open economy with varying degrees of coordinated wage bargaining. Contrary to much recent literature, I find that CBI, even if perfectly credible, has employment effects the sign and size of which depend upon the coordination of wage bargaining and upon the sectoral (traded, non-traded private, and public) composition of employment in the economy. That is, the effects of CBI, CWB, and sectoral composition on unemployment are *interactive*. I derive these hypotheses from a simple open-economy Keynesian model and test them on decade-frequency data from twenty OECD countries. The results are favorable.

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†Note: this version updates CES Working Paper No. 56 (12/94), correcting errors in statistical estimation due to an error in the statistical software, E-Views. Versiosn prior to 1.1c produce incorrect standard statistical errors for coefficients in models with both a weighting series and White's Heteroskedasticity-Consistent-Standard-Errors. I have notified the company (QMS) and their corrections appear in version 1.1c and later. Correction of the previous errors produced no major changes in substantive conclusions; in fact, it strengthened most of them. I have also taken the opportunity to update data on government employment using Lane *et al.* (1991), which increased the number of usable observations to fifty-two. Both changes are reflected in the results now presented. Also, gratitude is now owed additionally to the Mellon Foundation for financial assistance during the time of these corrections.

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I. Introduction

Literature on institutional political economy in the eighties and early nineties developed a convincing argument that central bank independence (CBI) can achieve low inflation (Kydland and Prescott 1977; Bade and Parkin 1982; Barro and Gordon 1983a, 1983b; Rogoff 1985; Alesina and Tabellini 1987; Alesina 1988; Grilli, Masciandaro, and Tabellini 1991; Cukierman 1992; and Alesina and Summers 1993). Due to a credibility advantage such central banks enjoy over elected governments, these authors argued that this inflation benefit comes without employment costs. The evidence amassed has been impressively favorable (see especially Alesina and Summers 1993). Accordingly, the question of whether to increase the autonomy of central banks has risen on the policy agenda in recent years; some countries (most notably New Zealand and Italy) have already made moves in this direction and the proposed European Central Bank is being designed with these considerations in mind.

Similarly, more or less simultaneously, a largely unconnected literature developed which demonstrated that encompassing (Olson 1965) wage-bargaining (corporatism[1]) could achieve wage restraint and thereby had beneficial inflation and employment effects (Headey 1970; Schmitter 1981; Lehmbruch and Schmitter 1982; Cameron 1984; Lange 1984; Scharpf 1984, 1987, 1991; Crouch 1985; Lange and Garrett 1985; Garrett and Lange 1986; Bruno and Sachs 1987; Calmfors and Driffill 1988; Calmfors 1990, 1993a; and Alvarez, Garrett, and Lange 1991). An equally impressive amount of evidence has been amassed to support these arguments (see especially Cameron 1984 and Bruno and Sachs 1987). Therefore, as with CBI a bit later, the issue of economy-wide coordination in bargaining made its way onto a few economic-policy agendas, and some countries (*e.g.*, the United

Kingdom, Italy (Regini 1984)) scrambled for a time (unsuccessfully for the most part) to institute such bargaining in their economies.

Perhaps because the CBI literature originated in economics departments while the corporatist literature originated in political science departments, the two have generally not heretofore broached the question of how CBI interacts with CWB.[2] My goal here is not to repudiate either literature; in fact, I find both to have been thoroughly accurate as far as they have gone. Central banks do, in all likelihood, possess a credibility advantage over elected governments which *ceteris paribus* makes them a more effective source of anti-inflationary monetary-policy than elected governments. Likewise, coordination across wage-bargaining units facilitates internalization of externalities in the wage- and price-setting process which would render more fragmented wage-bargaining more costly in terms of employment and profitability. What I will argue here is not merely that these two arguments are correct and therefore that both CBI and CWB matter independently, but rather that, taken together, the arguments imply that CWB and CBI *interact* to produce predictably beneficial employment outcomes. This is the first of two arguments I wish to press here; the bare bones of the argument are simple enough to sketch verbally.

CWB is argued to be beneficial because the encompassing wage-bargaining units facilitate internalization of the costs associated with excessive (*i.e.*, beyond productivity growth plus acceptable inflation) wage-increases. An isolated worker and employer negotiating a wage will rightly consider aggregate price-levels to be exogenous to their settlement. That is, a particular wage-bargaining unit ignores the cost to others in the economy of its own higher wages and prices. An economy-wide employer and labor organization would, on the other hand, consider the price-level endogenous and

internalize the effect of their settlement on it. Thus, CWB induces wage restraint.[3]

Now consider adding to this political economy a monetary authority expected to react to aggregate-price-level increases (which occur when nominal-wage gains exceed productivity gains) with restrictive policy. We would particularly expect such a reaction where CBI is high. Isolated bargainers would rightly consider this monetary-policy response to be exogenous to their settlement. As the aggregate price-level is exogenous to their wage- and price-setting decisions, any monetary response to the price level is likewise exogenous. Coordinated wage-bargainers, contrarily, can internalize all aggregate-price effects of their settlements, including any monetary-policy response. The point is that even perfectly credible monetary-policy authorities require wage- and price-setters to be responsive to their "threat" to fight inflation if such threats are to be costlessly effective. It follows, therefore, that CBI should be less costly the greater is CWB. Conversely, wage restraint by coordinated bargainers can be enforced and therefore made more effective by CBI.

The second argument I put forward here is that monetary contraction does not affect all sectors of the economy equally and therefore that CBI is more effective in economies with particular sectoral structures of employment. Specifically, monetary contraction involves higher interest-rates and thereby an appreciated exchange rate. Higher interest rates hinder investment and thus hurt all sectors dependent on domestic demand, *i.e.* the private sectors. Exchange appreciation hinders export demand which, being part of total demand, likewise, hurts all private sectors. Exchange appreciation, though, hurts the traded sector more than the sheltered sector as it causes not only a decrease in total demand for domestic product but also a shift in the composition of demand from tradeables to non-tradeables. The public sector is relatively unaffected by domestic demand and, if

anything, benefits from the compositional shift and real-wage effects of exchange appreciation; thus, public-sector workers are at least immune to the central bank threat. Therefore, I conclude that the traded sector should be most responsive to monetary contraction, followed by the sheltered sector, and lastly the public sector. It follows that CBI should be least (most) costly where traded (public) sector employment is large. It also follows that the ability of coordinated bargaining to achieve wage restraint can be weakened by a sectoral structure of the economy that is not conducive to such restraint.

The rest of the paper is structured to make these arguments as follows. First, we need a model which highlights wage bargaining and monetary policy and allows for a distinction between traded and non-traded goods. Accordingly, in the next section I construct a simple, open-economy, neo-Keynesian model of output with bargaining-determined prices. I then demonstrate how independent central banks can maintain low inflation by threatening (and acting upon that threat as necessary) to refuse to accommodate excessive wage increases. The model reveals that, aside from its credibility, the effectiveness and costliness of the central bank threat depends upon the degree of economy-wide coordination in bargaining and upon the sectoral composition of employment in the economy.

Next I turn to the historical record to provide some evidence which might support or contradict these hypotheses. The arguments imply a relationship between excessive wage-increases on the one hand and CBI, coordinated bargaining, sectoral composition, and the interaction of the first with the last two on the other. Given the disputability of what is an *excessive* wage increase, I consider a retreat to a less disputable consequence of such increases, unemployment, as a reduced-

form dependent variable to be prudent. The expected effects on unemployment, moreover, are theorized to occur sporadically (only when the threats must be enacted) and to have only temporary effect on output; thus unemployment, which is much stickier than output, measured in relatively long (decade) averages recommends itself even more. Therefore, a convincing way to assess the model will be to regress decade average unemployment on measures of CBI, coordinated wage-bargaining, sectoral composition and interactions of the first with the last two. Section III details the data and empirical methodology to be employed in this estimation, and Section IV presents and discusses the results along with some exploration into their robustness. In Section V, I conclude by discussing the general implications of the argument and evidence and the specific implications for two issues of current policy and academic debate: the proposed European Central Bank and the collapse of corporatism.

II. The Model

A. A Model of the Open Macroeconomy

As noted above, we need a model of the economy which emphasizes wage bargaining and monetary policy and which allows for separate treatment of the traded and sheltered sectors. Carlin and Soskice (1990) and Layard, Nickell, and Jackman (1991) (henceforth LNJ) offer such a model which I, with minor adjustments, follow here. The main features of the model are demand-determined output[4], bargaining-determined wages with mark-up pricing, and the usual small-open-economy set-up. In log-linear form, the initial equations are given below.

$$(1)\quad Y = \sigma_c Y + G - \sigma_i\left(i - \frac{dP^d}{dt}\right) + \sigma_e(E + P^* - P^d) + \sigma_x Y^* - \sigma_m Y$$

$$(2)\quad M - P^d = \lambda_y Y - \lambda_i i$$

$$(3)\quad E = e_i(i^* - i)$$

$$(4)\quad P^c = (1-b)P^d + b(E + P^*)$$

$$(5)\quad P^d = \sum_1^j a_j \mu W_j$$

Note that the equations have been written so that all coefficient parameters are positive and that, given that all variables are in logs, first differences are rates of growth (*e.g.*, dP^d/dt is domestic-price inflation). Starred variables refer to foreign quantities. The first equation shows total demand[5] (Y) to be consumption ($\sigma_c Y$), plus real government-expenditure (G), plus investment which is a decreasing function of real interest rates[6] ($-\sigma_i(i-dP^d)$), plus net exports which are an increasing function of real-exchange-rate competitiveness ($\sigma_e(E+P^*-P^d)$), and of export demand ($\sigma_x Y^*$), and a decreasing function of import demand ($-\sigma_m Y$). The second equation shows demand for real money-balances ($M-P^d$) to be an increasing function of income and a decreasing function of nominal interest-rates. These two equations are standard in any open-economy Keynesian framework. The third equation shows the exchange rate (E) to be an increasing function of the difference between foreign and domestic interest-rates[7] ($e_i(i^*-i)$). The fourth equation defines the consumption-price index (P^c) which is a weighted average of domestic (P^d) and world prices in domestic-currency terms ($E+P^*$). The weight (b) is the share of imports in the consumption bundle covered by the price index. The final equation determines domestic prices which are a weighted average of a mark-up[8] (μ) on wages (W_j) negotiated in each of j bargains in the economy.

The weight (a_j) associated with each bargain is an extremely important parameter in the model representing the proportion of the economy covered by the j^{th} bargain. At one extreme $a_j=1$ and

$j=\{1\}$, implying that every wage in the economy is set in one national bargain. At the other extreme, $a_j=\epsilon$ and $j=\{1,2,3...N\}$ where ϵ is a small fraction and N is large, implying a large number of very small bargaining units.[9] a_j thus serves as our index of CWB, varying from complete coordination ($a_j=1$) to atomistic bargaining ($a_j=\epsilon$).

Now, for analytic clarity, I will make two simplifying assumptions. First, I will assume, relatively innocuously, zero productivity growth. Allowing exogenous productivity growth would merely require us to carry around an extra parameter reflecting it and speak in terms of wage increases greater than that growth, thereby complicating the exposition without adding any insight.[10] Second, employing the small-open-economy assumption also greatly simplifies matters by making i^*, P^*, and Y^* exogenous; given their exogeneity, I can, without loss of generality, fix them each to zero. After a fair amount of relatively simple but quite tedious substitution, rearrangement, and simplification, the system can be written so that only the choice variables (G, M, and W) of the political-economic actors (the fiscal authority, the monetary authority, and the wage bargainers, respectively) are on the right hand side. The resulting equations (1a-4a and 5) are given above.[11] The equations are again written so that all coefficient parameters are positive. (Refer to Appendix I for

$$(1a) \quad Y = \theta_g G + \theta_i(M - \sum_{j=1}^{n} a_j \mu W_j) + \theta_{xi}(M - \sum_{j=1}^{n} a_j \mu W_j) - \theta_{xj} \sum_{j=1}^{n} a_j \mu W_j$$

$$(2a) \quad i = \phi_g G - \phi_m M + \phi_p \sum_{j=1}^{n} a_j \mu W_j$$

$$(3a) \quad E = -\epsilon_g G + \epsilon_m M - \epsilon_p \sum_{j=1}^{n} a_j \mu W_j$$

$$(4a) \quad P^c = \psi_w \sum_{j=1}^{n} a_j \mu W_j - \psi_g G + \psi_m M$$

$$(5) \quad P^d = \sum_{j=1}^{n} a_j \mu W_j$$

definitions of these parameters.) It will be useful for later purposes to trace the effects of wages and the money supply on the dependent variables of interest: output, consumer prices, and the exchange rate.

As can be seen from equation 5, wage increases achieved by bargainers have only one direct effect: increasing domestic prices. This, of course, implies that they increase the consumption price index as well, though less than proportionately. Indirectly, higher domestic-prices imply real appreciation (the last term in equation 3a) which lowers net exports and thereby output (the last term in equation 1a). The higher price-level also raises nominal money-demand (the last term in equation 2a) which tends to increase interest rates and trigger exchange appreciation both of which further dampen output (the second and third terms of equation 1a). The lower output then feeds back through the income elasticity of money demand to secondary effects on all the variables. The net effects are negative on output and exchange rates, and positive on interest rates and prices. Thus, wage-bargainers perceive an output cost to allowing wages to rise, and this output cost is particular steep for the traded sector.

An increase in the money supply has the direct effect of decreasing interest rates (equation

2a, second term). Indirectly, this raises investment (equation 1a, second term) and causes exchange depreciation (equation 3a, second term). Both these latter effects serve to increase output, and the secondary effects on prices and the exchange rate feed from there through money demand *via* the income elasticity of money demand as above. The net effects are positive on output, consumer prices, and the exchange rate, and negative on the interest rate. Monetary contraction, therefore, lowers prices at the cost of output; again, the traded sector is most severely affected as the exchange-rate appreciates.

B. The Interests (Value Functions) of the Actors

Having worked through the more mechanical parts of the model and reduced it to three policy variables on the right-hand side, I turn now to identification of the policy makers and modeling of their interests and the rules of the game in which they interact. Identification of the relevant actors in the model is straightforward. Fiscal authorities are invariably the government. Monetary authorities I take to be central banks with varying ability to combat inflation credibly; I will expand on this below. The wage bargainers are employers and labor in the traded, sheltered, and public sectors (the employer in the last is the government). The wage-bargaining units act with varying degrees of coordination, modeled, as indicated above, by $a_j \in (0..1]$ where 1 is complete unity in bargaining.[12] Thus, the relevant actors are the government, the central bank, and j employer and labor bargaining-units; what are their interests (*i.e.* their value functions)?

Governments care about output, unemployment, and/or inflation; after all, evidence is surfeit that governments everywhere in the OECD are evaluated by the governed largely on the basis of their management of the economy (see for example, Eulau and Lewis-Beck 1985; Lewis-Beck 1990;

Norpoth, Lewis-Beck, and LaFay 1991, Powell and Whitten 1993). I will assume that the government cares only about output and unemployment. While governments might also care about inflation, the question of why governments might wish to create a quasi-autonomous, monetary-policy authority more inflation-averse than itself is well-developed in Rogoff (1985) and would need little adjustment to apply here. For the results derived below, all we need is that the government cares more about output and unemployment relative to inflation than does the central bank. Therefore, to focus on the key issue here, I take the extreme case where the government cares not at all about inflation. I will also assume for simplicity that unemployment is a monotonic, negative function of output[13] so that the government's value function may be represented by equation 6.

$$(6) \qquad V^G = V^G(Y)$$

The monetary-policy authority, whatever its ability to combat inflation credibly, surely cares relatively more about inflation than does the government. Again this relatively heavier weight on inflation is all we need for the results obtained below; but, for reasons symmetric to those just given for the government, I will assume the bank cares only about inflation with it's bliss point being zero

$$(7) \qquad V^B = -V^B\left(\frac{dP^d}{dt}\right)^2$$

inflation. Such a value function may be represented as in equation 7 above. Of course, central banks are not equally able to pursue this goal of zero inflation. I will discuss below how variations in the ability of the central bank credibly to pursue this goal will be modeled and how such variations affect

the dependent variables.

The wage bargainers are composed of j laborers or groups of laborers and their corresponding employers or employer groups. Henceforth, I will refer to labor bargaining-units (from 1 to all laborers) as *unions* and their employer counterparts (from 1 to all employers) as *firms*. Logically, the j unions care about (*i.e.* have utility functions defined in terms of) the purchasing power of their wages and about their employment prospects. Consumption real-wages reflect that purchasing power and are given by $W\text{-}P^c$. The employment prospects of the typical worker are most closely tied to the fortunes of the sector in which she works. Thus, given our assumption that employment in a sector is monotonic in output there, unions in the traded, sheltered, or public sector care relatively more about output in their sector than about total output. Again solely for illustrative clarity, I will take the extreme case where unions care only about their own sector's employment/output. For the private sectors (traded and sheltered), sectoral output is a function of aggregate demand and of the relative price of that sector's output. For the public sector, employment is a function of, if anything, real government-spending. The j firms, of course, care about profits, which, for given productivity,[14] are decreasing in product real-wages and increasing in demand for their sector's output (aggregate demand and relative prices). Additively separable versions of the value functions implied by these statements are given below.[15]

$$(8)\quad V_j^{uT} = V_\omega^u(W_j - P^c) + V_{Y1}^u Y + V_{Y2}^u(E - P^d)$$
$$(9)\quad V_j^{fT} = v_\omega^f(E - W_j) + V_{Y1}^f Y + V_{Y2}^f(E - P^d)$$
$$(10)\quad V_j^{uS} = V_\omega^u(W_j - P^c) + V_{Y1}^u Y + V_{Y2}^u(P^d - E)$$
$$(11)\quad V_j^{fS} = V_\omega^f(P^d - W_j) + V_{Y1}^f Y + V_{Y2}^f(P^d - E)$$
$$(12)\quad V_k^{uP} = V_\omega^u(W_k - P^c) + V_G G$$

The superscript u (f) refers to unions (firms), and T (S, P) refers to the traded (sheltered, public) sector. The subscripts ω, Y1, Y2, and G refer to real wages, aggregate-demand effects on output and employment in the sector, relative-price effects on output and employment in the sector, and (real) government spending respectively. The small-open-economy assumption has already been employed.

Notice that product real-wages are different for the traded and sheltered sectors (the first term in equations 9 and 11). Whereas the relevant price for the traded sector is the world price ($E+P^*$), it is the domestic price (P^d) for the sheltered sector. The relative-price effect on demand in the traded and sheltered sectors is also different--opposite in fact--as reflected in the real-exchange-rate term (the last term in equations 8-11). Real appreciation not only diminishes demand in general (equation 1) but also causes a shift in the composition of demand from the traded sector to the sheltered sector. As shall be shown below, the differences in these relative price-effects and, to a lesser degree, in the product-real-wage effects are critical to the differing propensities of the traded and sheltered sector to exercise wage restraint and to their differing responsiveness to the central bank.

Notice further that public-sector unions and wages are subscripted *k* rather than *j*. This is because public-sector wages do not directly impact the price level. Nonetheless the public sector affects prices indirectly in at least four ways not modeled explicitly here. First, public-sector (nominal) demands on output must be made reconcilable with private-sector demands. Thus, higher public-sector wages imply a smaller pie over which the private sector may bargain. One way or another (*e.g.*, higher public-sector prices, direct taxes, allowance of higher seignorage), this will eventually be felt in inflation (see LNJ or Carlin and Soskice 1990). Second, wage gains in the public

sector may also fuel private-sector wage-demands through jealousy effects. Third, increases in public-sector employment generate a structure of the economy which is not conducive to wage restraint (see below). Fourth, real government-spending increases output and lowers unemployment thereby strengthening labor, which is obviously less disposed toward wage restraint than employers. For these reasons, the central bank will want to constrain the public sector in wage bargaining and perhaps in its spending more generally, and I will explore below how it may do so.

C. Solving the Model

Now we have a model in which the policy instruments have been isolated, and the policy-makers and their value functions have been identified. It is time, then, to let the actors interact, *i.e.* to determine the rules of the game and to solve the model. In fact, though, it happens that carrying the model through to its final equilibrium solution is unnecessary. All of the results I wish to emphasize are clear merely from examining the first-order conditions of the bargainers. I turn now to analyzing the wage bargain.

It is extremely useful and not too unrealistic to assume that each union-firm pair is in a Cournot game with the others so that the optimal choice for each actor is contingent only upon the strategy of it's negotiation partner and the structure of the model. The idea that unions and firms might coordinate their action with other unions and firms is critically important, but as already noted such coordination is captured in the relevant a_j, treating the coordinating bargainers as one unit. Thus a group of unions and/or firms acting in a coordinated fashion are modeled as bargaining for a single wage (or at least for wage increases linked one-for-one within the group). This makes matters considerably simpler while maintaining the substance of what coordination in bargaining means.

$$(13)\quad \frac{dV_j^{uT}}{dW_j} = V_\omega^u\left(1-\frac{dP^c}{dW_j}\right) + V_{T1}^u\frac{dT}{dW_j} + V_{T2}^u\left(\frac{dE}{dW_j}-\frac{dP^d}{dW_j}\right)$$

$$(14)\quad \frac{dV_j^{fT}}{dW_j} = V_\omega^f\left(\frac{dE}{dW_j}-1\right) + V_{T1}^f\frac{dT}{dW_j} + V_{T2}^f\left(\frac{dE}{dW_j}-\frac{dP^d}{dW_j}\right)$$

$$(15)\quad \frac{dV_j^{uS}}{dW_j} = V_\omega^u\left(1-\frac{dP^c}{dW_j}\right) + V_{T1}^u\frac{dT}{dW_j} + V_{T2}^u\left(\frac{dP^d}{dW_j}-\frac{dE}{dW_j}\right)$$

$$(16)\quad \frac{dV_j^{fS}}{dW_j} = V_\omega^f\left(\frac{dP^d}{dW_j}-1\right) + V_{T1}^f\frac{dT}{dW_j} + V_{T2}^f\left(\frac{dP^d}{dW_j}-\frac{dE}{dW_j}\right)$$

$$(17)\quad \frac{dV_k^{uP}}{dW_k} = V_\omega^u$$

$$(18)\quad \frac{dV^G}{dW_k} = 0$$

The next step, then is to determine the marginal benefit to each type of bargainer of getting/ceding a wage increase. This is done by differentiating equations 8-11 with respect to W_j and equations 6 and 12 with respect to W_k. The resulting equations (13-18) are shown above. If an individual union or firm had no resistance to setting wages as it liked, either would set its derivative as given in equations 13-18 equal to zero.[16] Of course, the main source of such resistance is found on the other side of the bargaining table.

What then can be said of the expected settlement? If the bargaining between unions and firms takes Nash form[17], it can be shown (see Appendix II) that the resulting wage is (approximately) given by a weighted average of the union's and the firm's first-order conditions where the weights are the usual Nash bargaining-power indices. Critical to the wage outcome, then, is the unions' propensity to offer wage restraint relative to the firms' persistence in demanding it. The larger the derivatives given in equations 13-18, therefore, the less wage restraint will be achieved. Thus, if an economy can be described in terms of its CWB and its sectoral composition of employment, discussion of equations 13-18 will suffice to characterize the expected outcome of wage bargains in that economy.

From equations 13 and 15, private-sector unions are seen to balance the real-wage benefits

($V_w^u(1-dP^c/dW_j)$) of nominal-wage increases against the employment (output) costs (the next two terms in each equation). It is also apparent, since dE/dW_j is negative and dP^d/dW_j is positive, that these costs are larger for the traded than for the sheltered sector. It follows that traded-sector unions are more disposed to offer wage restraint than sheltered-sector unions. Similarly on the firm side, it is seen from the first term of equations 14 and 16, that the product-real-wage costs are larger for the traded than the sheltered sector. The difference in output costs described just now for unions holds for the firms as well. Thus, both sides of the traded-sector wage-bargain are more disposed to wage restraint than their counterparts in the sheltered sector.

Equations 17 and 18, alarmingly, reveal that the public sector perceives no costs from demanding/allowing excessive wage-gains. Admittedly, this is a bit overstated since, as noted above, the indirect effects of the public sector on the economy are not modeled explicitly and as the government has been taken to be completely unconcerned about inflation. Nonetheless, the main point, that the public sector is the least disposed to wage restraint, is abundantly clear.[18] Thus, we have our first result:

> **Proposition 1:** Traded-sector unions (firms) are most disposed to offer (demand) wage restraint, followed by the sheltered sector, and lastly the public sector.

$$(19)\quad \frac{dT}{dW_j} = a_j\mu\theta_T(\frac{dM}{dP^d}-1) + a_j\mu\theta_{XT}(\frac{dM}{dP^d}-1) - \theta_{XZ}a_j\mu$$

$$(20)\quad \frac{dE}{dW_j} = \epsilon_m a_j\mu(\frac{dM}{dP^d}-1) + \epsilon_w a_j\mu$$

$$(21)\quad \frac{dP^c}{dW_j} = (1-b+b\epsilon_w)a_j\mu$$

$$(22)\quad \frac{dP^d}{dW_j} = a_j\mu$$

To take the discussion further, I will need to specify the derivatives on the right hand side of equations 13-16. These derivatives are shown above as equations 19-22. Notice that I have taken

(real) government spending to be exogenous to wage movements (*i.e.*, the derivatives dG/dW_j and dG/dW_k are zero), but that monetary policy is allowed to react to (domestic[19]) price increases (*i.e.*, the derivative dM/dP^d may differ from zero). This follows directly from the previous assumptions (made for exactly this expositional simplicity) that governments care not at all and central banks only about inflation.

The derivative dM/dP^d is the whole key to the interaction of CBI (and monetary policy more generally) on the one hand and CWB and sectoral composition on the other. It appears on the right-hand side of both equations 19 and 20 and thus enters the utility function of all private-sector bargainers. It has larger negative impact on those utilities the larger is a_j, *i.e.* the more coordinated is bargaining. It also has a larger negative impact on traded-sector than on sheltered-sector bargainers by virtue of the different impact exchange appreciation has on those sectors.

In effect, then, the central bank announces a threat to keep the money supply from rising in line with prices; that is, it announces a schedule dM/dP^d which determines how monetary policy will react to wage *cum* price movements. Full accommodation of wage increases would be $dM/dP^d=1$. Anything less than that would amount to a contraction of the real money supply. The size of the derivative dM/dP^d is inversely related to the severity of the threat and can be seen as an inverse indicator of the degree of CBI in the economy. As the government cares not at all about inflation, dM/dP^d will be at least fully accommodating when it has full control of monetary policy. The more independent the central bank, however, the closer will monetary policy be to that necessary to obtain zero inflation (the central bank's bliss point), and the smaller this derivative will be, perhaps becoming negative. To remove credibility as an issue, I will simply allow whatever policy/threat, dM/dP^d, that

is announced to be perfectly credible. Thus, the terms involving dM/dP^d which also indexes CBI enter the unions' and firms' value-functions without expectation operators.

So, as seen in equation 20, the smaller dM/dP^d (*i.e.*, the more severe the monetary threat or equivalently for our purposes the more independent the central bank), the greater the output costs unions and firms will associate with nominal-wage increases. Although this cost is somewhat offset for unions by the induced appreciation holding down consumption prices and therefore magnifying real-wage gains (equation 21), the net effect should typically be to dispose both unions and firms more toward wage restraint. In fact, if the central bank is willing and independent enough to be able to bear the costs of the economic slump its policies produce, the bank can achieve any inflation rate it likes simply by announcing a sufficiently small (perhaps negative) dM/dP^d. If the threat is credible *and there are no uncertainties or information advantages in the economy*, it may perhaps never be enacted and, as previous literature has noted, the central bank might be able to achieve low inflation without output costs. However, in an environment of uncertainty and/or incomplete information--which is surely a more accurate description of any real-world economy, it is well known that threats must periodically be enacted and output will be affected at least temporarily. Similarly, any relaxation of the perfect credibility conferred on CBI in this analysis would require occasional enforcement of the threat. Given the stickiness of unemployment, the real effects of the sporadic monetary contractions (enforced threats) should be particular apparent and durable thereupon. More to the point, it is precisely because central banks can and periodically do hinder output (see Friedman and Schwartz 1963, and Romer and Romer 1989 for empirical confirmation) that the unions and firms respond to its threats at all. If there were no output costs expected from monetary actions by the

central bank, wage bargainers could safely ignore the central bank's intended policies. What then can be said about where these employment costs of monetary conservatism on the part of the bank will be larger or smaller?

I will discuss the case where the central bank seeks to achieve zero inflation and succeeds; *i.e.*, it sets dM/dP^d such that a weighted average of union and firm first-order conditions are zero.[20] Equation 22 shows that the degree to which unions perceive consumption prices to rise in line with their wages is an increasing function of a_j (*n.b.*, ϵ_w is less than 1). Thus, more coordinated unions internalize more of the price effects of their wage gains.[21] Similarly, the output effects the unions and firms associate with wage gains are also positively related to a_j, again reflecting internalization. Notice that these output effects include the monetary-policy reaction dM/dP^d. Therefore, I conclude -- not only that coordinated and traded-sector bargainers are most disposed to wage restraint autonomously, but that they are the most responsive to the central bank threat, *i.e.* they interact most favorably with CBI. This gives us our next three propositions.

> **Proposition 2:** Encompassingly coordinated bargainers are more disposed to offer (demand) wage restraint than fragmented bargainers.
>
> **Proposition 3:** Encompassingly coordinated bargainers are more responsive to the threat of monetary reaction to their settlements than are fragmented bargainers. It follows that CBI is less costly where bargaining is coordinated than where it is fragmented and conversely that CWB is more effective where CBI is high.
>
> **Proposition 4:** Traded-sector bargainers are more responsive to the threat of monetary reaction to their settlements than are sheltered-sector bargainers. It follows that CBI is less (more) costly where traded-sector (sheltered-sector) employment is large.

It remains to be seen, then, what if anything the central bank can do about the public sector. First of all, it is clear that a second threat is necessary as $dM/dP^d<1$ is a response to neither the

government nor its employees as their control variables are G and W_k respectively. To control public-sector workers directly, a central bank would actually need to threaten to further spur inflation in response to wage increases there (*i.e.*, the threat would have to be of the form $dM/dW_k>1$). To restrain workers in this way, though, dM/dW_k would need to be large enough for the induced depreciation to offset the workers' real-wage gains from nominal-wage increases. Attempting to do so would work against restraining government, the employer in this sector. Furthermore, given that private- and public-sector wages will tend to move in the same direction, this would run counter to what the bank needs to do control wages and prices elsewhere not to mention that depreciation itself is contradictory to the central bank's goal of low inflation. It follows, therefore, that to affect the public sector, the central bank must address its threats to the other side of the bargaining table--to the government.

The government, as was discussed above and noted in equation 6, cares about output. It, therefore, is very sensitive to any central bank threat to constrict the money supply in response to its actions. As equation 18 shows, raising public-sector wages does not affect real output, and raising (real) government spending increases output. Thus, absent any move by the central bank in response to public-sector wages or government spending, the government feels little negative impact from allowing either to grow.[22] If the central bank can employ monetary policy as a threat against the government, however, the latter can be strengthened in its dealings with public-sector workers and may even be restrained in its own fiscal policy.

In particular, suppose the central bank seeks to prevent nominal government-spending from growing. The threat would be to answer nominal-spending increases with less than accommodating

money supply. The result would be higher interest rates and an appreciated currency, both of which would hinder output which of course would considerably displease the government. In this way, it is possible for the central bank to have some control over public-sector spending and wages. Of course, the bank must be careful not to make it worth the government's effort to alter the bank's independent status, and this certainly limits its ability in this regard (on the politics of this dynamic see Goodman 1992, for an economic model capturing this aspect of the relationship see Lohmann 1992). Explicitly analyzing this interaction would take us too far afield, so let us simply suppose the bank is not completely powerless to enact such a threat. Suppose further, for illustrative purposes, that the central bank in fact succeeds in restraining the government to zero nominal-spending growth. Then, any wage gains made by public-sector workers would have to answered by decreased spending elsewhere in the budget or by decreased public-sector employment. In this way, the central bank could gain some leverage on public-sector wage- and spending-decisions.

The costs entailed in implementing such a threat, though, are likely to be quite large. As already noted, any tendency for the (real) money supply to contract in response to public-sector wage-gains will cause exchange appreciation and therefore increases the real-wage gains public-sector workers will associate with nominal-wage increases. Thus the derivative in equation 17 becomes larger as the new threat is introduced. Moreover, whereas the derivatives in equations 16 and 14, which represent the marginal benefit to private-sector firms of allowing wage gains, were originally negative, that in equation 18, which represents the government's marginal benefit, is originally zero. The Nash-bargaining solution for the private sectors, a weighted average of equations 13 and 14 or of 15 and 16, therefore involve a negative and an ambiguous term both of which become smaller as

the central bank's threat becomes greater (*i.e.*, dM/dP^d becomes smaller). The Nash-bargaining solution for the public sector, on the other hand, involves a positive and a zero term only one of which becomes smaller as the threat increases. Clearly, then, the threat necessary to restrain the public sector is greater than that necessary to restrain the private sectors. Given that, precisely as before, the threats will be periodically enforced, it follows that the output costs are likewise greater. We now have our last proposition.

> **Proposition 5:** The public sector is least disposed to offer (demand) wage restraint and is likewise the most costly to restrain using monetary policy. It follows that CBI and large public-sector employment is an even more costly combination than CBI and large sheltered-sector employment.

In summary, then, the model predicts that CWB is conducive to wage restraint and minimizes the cost of CBI by allowing bargainers to internalize monetary-policy responses to their wage- and price-setting decisions. The converse of this is that CWB is more effective in maintaining wage restraint where CBI is high. The model also predicts that the traded sector is most conducive to wage restraint and most responsive to CBI, followed by the sheltered sector, and lastly the public sector. This is true because monetary contraction and therefore the central bank's threat are disproportionately painful (painless) to the traded (public) sector. The economy as whole, then, must suffer more (less) if the public (traded) sector need be restrained by threats of monetary contraction.

III. The Empirical Model, the Data, and Econometric Methods

A. The Empirical Model

Using a simple yet defensible neo-Keynesian model of the open economy with wage bargaining, I have derived several testable propositions. Now, we must turn to the historical record to evaluate these hypotheses. The first step is to identify the appropriate dependent variable for the

empirical analysis.

Strictly speaking the theory relates excessive wage-increases to CBI, CWB, the sectoral composition of employment and their interactions. Moreover, excessiveness occurs only periodically as the central bank's threat fails to deter bargainers. A direct test would then require that we first define and estimate excessive wage gains; then support for the theory would be to find their frequency and severity to be related to certain institutional and sectoral concurrences as hypothesized. Alternatively, we might side-step the thorny issue of what exactly is *excessive* and seek some other more observable consequence of excessive wage-increases, such as unemployment, to serve as the dependent variable in a reduced form regression. Next, we need to identify an appropriate temporal unit of analysis.

Wage negotiations in the OECD typically occur every 1-3 years, and in some countries bargains across the economy are staggered over time whereas in others they occur simultaneously. Thus, if we take a period of some length, say a decade, we know that all bargainers will have reached a settlement between three and ten times during that period. In a period of a decade, then, we could reasonably expect that enough bargains have occurred in each economy to distinguish (with some random error of course) those with higher expected unemployment due to the necessary enactment of central bank threats from those with lower. Therefore, the decade average of unemployment recommends itself as a dependent variable. More precisely, as it is logical to consider that wage restraint is proportionately easier to achieve when unemployment is high (see Carlin and Soskice 1990 and LNJ), we will want the empirical model to allow proportionately larger effects for the independent variables when unemployment is high. Logging unemployment incorporates this

proportionality proposition, and therefore the decade average of the (natural) log of unemployment will be our dependent variable.

$$(22)\ UE_{i,t} = \beta_0' X_{i,t} + \beta_{COV} COV_i + \beta_{CWB} CWB_i + \beta_{TR} TR_{i,t} + \beta_G GOV_{i,t} + \beta_{CBI} CBI_{i,t} + \beta_{CC} CBI(CWB)_{i,t} + \beta_{CT} CBI(TR)_{i,t} + \beta_{CG} CBI(GOV)_{i,t} + \varepsilon_{i,t}$$

Accordingly, using generalized least squares, I propose to estimate equation 22 below, where β_0 is a vector of coefficients and X is a matrix of control variables. The subscripts *i* and *t* index countries and decades respectively. The dependent variable, UE, is the decade average of log unemployment. COV is some index of the extent of wage bargaining as opposed to its coordination which is indexed by CWB. In terms of the theory, COV corresponds to N, the number of independent bargaining units, and CWB corresponds to a_j, the proportion of the economy covered by the typical wage bargain (*i.e.*, the degree of coordination). TR is traded-sector and GOV is public-sector share in total employment. Since traded- plus sheltered- plus public-sector employment equals total employment, the equation is fully specified with the inclusion of any two of these. Ease of exposition suggests that we use the sheltered sector as the baseline and interpret the coefficients on TR and GOV as the effect of a shift in employment composition from the sheltered sector to that sector. Finally, CBI is an index of central-bank independence.

Before describing in detail the data and sources, let us pause here to set down the predictions of the theory for the signs of the coefficients to be estimated. Beginning with COV, it is obvious that increasing the number of bargaining units without increasing (*i.e.* controlling for) the coordination of bargaining lends greater power to wage earners without forcing them to internalize the costs of

their wage increases to others in the economy.[23] Therefore, the model predicts that $\beta_{COV}>0$. Controlling for the extent of bargaining in estimating the effects of coordination in bargaining also serves to capture the essence of the hump-shaped hypothesis offered by Calmfors and Driffill (1988) (see endnote 3). The other coefficients warrant a bit more discussion.

The theory predicts that coordination in wage bargaining facilitates internalization of wage-bargaining externalities and that this benefit is magnified when the monetary-policy authority can credibly enforce such wage restraint (*i.e.*, when CBI is high). In parallel, the employment cost of CBI is lower where wage bargainers coordinate to internalize wage-setting externalities and thereby more effectively respond to its threats. Thus, we expect that the effect of CWB on unemployment is negative and becomes more negative as CBI increases. Strictly, this implies that $\beta_{CWB}<0$ and $\beta_{CC}<0$, but this may be too strict because β_{CWB} is the effect of CWB when CBI is zero which never occurs in the sample. We may not want to push the linearity assumption of regression analysis from the sample maximum of CBI down to zero.[24] A weaker form of the hypothesis, then, would be that, over the sample range of CBI, $\beta_{CWB}+\beta_{CC}CBI<0$ and $\beta_{CC}<0$. With some abuse of notation, I will write this more simply as $\beta_{CWB}\leq 0$ and $\beta_{CC}<0$.

Similarly, the theory predicts that traded-sector bargainers are more disposed to wage restraint than sheltered-sector bargainers and that this greater disposition is magnified as CBI increases. In terms our expectations for the coefficients to be estimated this is exactly analogous to the effect of CWB. In particular, the strong hypothesis is that $\beta_{TR}<0$ and $\beta_{CT}<0$, and the weaker version is that $\beta_{TR}+\beta_{CT}CBI<0$ and $\beta_{CT}<0$ or, abusing notation a bit, $\beta_{TR}\leq 0$ and $\beta_{CT}<0$.

An increase in the proportion of employment in the public sector (GOV) has two effects

according the economic model. First, a shift in employment from the sheltered to the public sector is an increase in real government spending as a share of GDP and therefore should increase output in the usual Keynesian manner. Thus we might expect that $ß_{GOV}<0$. This after all is a large part of why governments hire people in the first place: to cause low unemployment. Second, contrarily, we have argued here that wage restraint is less forthcoming from public than from private sector workers, so we might expect the opposite. The theory is thus ambiguous about the sign of $ß_{GOV}$. However, our theory predicts unambiguously that it is more costly for the monetary authority to combat inflation the larger the proportion of laborers in the public sector, *i.e.* that $ß_{CG}>0$.

Finally, we come to the hypothesized effect of CBI on unemployment controlling for coordination in wage bargaining and the sectoral composition of employment, *i.e.* the effect of CBI in a hypothetical economy with no coordination in bargaining (CWB=0) and all of its employment in the sheltered sector (TR=GOV=0). As modeled and argued above, greater CBI implies both greater credibility and greater willingness to trade higher unemployment for lower inflation. In terms of an expectations-augmented Phillips curve in unemployment-inflation space, then, an increase in CBI is both a shift inward of the curve and a change in the policy-maker's indifference curve such that tangency occurs at a higher unemployment rate. The former effect is beneficial in terms of unemployment while the latter is detrimental (the inflation effect is unambiguously beneficial). Which effect dominates in the hypothetical economy described above is indeterminate in the model. Thus, we have no prediction as regards the sign of $ß_{CBI}$. These hypotheses are summarized in Table I.

[TABLE I about here.]

B. The Data

I return now to detail the data beginning with the dependent variable. I wish to apply the theory to as much of the OECD over as much of the post-war period as possible, gaining both cross-sectional and time-series comparative leverage. LNJ provide uninterrupted and comparable unemployment figures from 1955-90 for 19 countries: the U.S., Japan, Germany, France, Italy, the U.K., Canada, Austria, Belgium, Denmark, Finland, Ireland, the Netherlands, Norway, Spain, Sweden, Switzerland, Australia, and New Zealand. Rather than give up the observations, I incorporate Portugal using the "commonly used definitions" unemployment figures available from OECD sources. For the reasons given above, the annual unemployment figures were (natural) logged[25] and then averaged across approximately (see below) ten-year periods.

Various indices of CBI are available in the literature; five in particular have been widely used: Bade and Parkin (1982); Grilli, Masciandaro, and Tabellini (1991) (2 indices) ; and Cukierman (1992) (2 indices). These five are all attempts to measure the independence of the central bank, defined in very comparable ways. Therefore, I argue that the differences between these indices and between them and the *true*, unobserved, level of CBI can be viewed as random error, implying that a properly scaled average of them is likely a better measure (likely contains measurement error of smaller standard deviation) than any of them individually. Therefore, I have scaled these five indices to zero-one and averaged them.[26] As Cukierman's indices are available at decade frequency, the resulting index of CBI is also of decade frequency. Actually, Cukierman's *decades* are 1950-59, 1960-71, 1972-79, and 1980-89. Henceforth, I mean these periods and this periodization when I refer to a decade or decades and all data use this periodization in calculating averages. The original five indices and my composite index, CBI, are presented in Table II.

[TABLE II about here.]

Multiple indices of the coordination of bargaining and/or corporatism more broadly are also available from a number of sources. Bruno and Sachs (1987), Cameron (1984), Schmitter (1981), Calmfors-Driffill (1988), and Tarantelli (1986) each provide an index of corporatism, variously defined; LNJ provides both employer- and labor-organization indices (BO and LO); and Soskice (1990) provides an index "economy-wide" coordination (EWC). Unfortunately, most of these attempt to capture corporatism more broadly defined than the wage-bargaining/price-setting coordination to which I have here restricted myself, and only two of these has included employer coordination as a criterion (BO and EWC). This is especially problematic for the present purposes as the model in section II actually indicates that employer coordination should be more conducive to wage restraint and interact more beneficially with CBI than does labor coordination. Furthermore, the definitions of corporatism are not as comparable across authors as are those of CBI which might invalidate creation of a composite, averaged index as I have done for CBI. These two considerations force me to construct a new index of coordination in wage bargaining. In doing so I drew heavily form the existing literature and indices and, in particular, from Soskice's index of economy-wide coordination in bargaining, EWC, and LNJ's BO and LO indices. I emphasize especially Soskice's index because his definition of coordination exactly parallels the one employed here. My index, CWB, and some previous indices are given in Table III along with the correlation between those others and CWB. Note that CWB is correlated with each of the other indices and especially highly correlated with EWC. In fact, I intend CWB to be little more than an extension of Soskice's index to 10 more countries.[27] Also given in Table III are the values for the broadest (in terms of the number

of countries) index of which I am aware of the coverage (COV) of wage bargaining; that index is taken from LNJ and will be used here without amendment.

[TABLE III about here.]

Ideally, we would like these measures to vary over time as true CWB and COV no doubt do, but such time-varying indices are not yet[28] available in the literature and are beyond my historical knowledge to construct. In recognition of these limitations and the inevitable subjectivity of creating an index, some explorations into the robustness of the results to the use of other CWB indices will be discussed in Section IV. In particular, the coordination of wage-bargaining in Japan and Switzerland is especially controversial (see Calmfors-Driffill 1988 and Soskice 1990 for this debate). Addressing the controversy, I will also discuss the sensitivity of the results to the omission of individual countries, particularly Japan and Switzerland, from the sample.

In terms of the sectoral composition of the economy, it would be optimal to have measures of the percentage of employment in any two of the traded, sheltered, and public sectors. Data on government employment[29] (GOV) are in fact available from the OECD Historical Statistics and Lane *et al.* (1991). These figures are spottily available and are the "limiting reagent" on the sample size: 52 observations[30], two or three decades for each country. Traded-sector employment, on the other hand, is simply not available, partly because there is no agreement on what products count as tradeable. OECD Labor Force Statistics provide us with several potential proxies: the industrial sector, the manufacturing sector, or manufacturing plus mining and quarrying, or some combination. As it happens, the qualitative results do not depend much on our choice here, but I believe manufacturing, mining, and quarrying to be the most clearly traded sectors and those in which wage

bargaining is most prevalent. I therefore use the sum of employment shares in those sectors as my measure of traded-sector employment. As with the alternative indices of CWB, I will offer some examination of the robustness of the results to alternative operationalizations of traded-sector employment in Section IV.

Finally, I wish to control for oil dependency as the oil crises of the seventies were the main supply-shocks in the post-war period. Accordingly, I constructed a variable equal to net imports of oil as a percentage of total inland supply in the 1970s and zero elsewhere using data available from OECD Oil Statistics. This variable and its lag was significant in the expected direction in all models, and so is included. To conserve space and maintain the focus, however, the coefficients are not given in Table IV.[31] All data are available upon request.[32]

C. Econometric Methods

First, though of decade-frequency, the data are nonetheless time-series and therefore almost certainly exhibit serial correlation. In fact, since the *decades* have different numbers of years and the dependent variable is an average over those years, it follows that even if the year-to-year correlation is the same for every pair of adjacent years, the *decade*-to-*decade* correlation will not be. Therefore, I have not only included a lag of the dependent variable as an independent variable, but I have also allowed the coefficient on that lag to vary across decades. Wald, F, t, and Likelihood-ratio[33] tests all overwhelmingly rejected constraining the coefficient on the lag to be the same across decades. I also include decade dummy variables to capture any trends in or decade-specific shocks to the dependent variable. Once again the null hypotheses of zero coefficients on any (t-tests) or all (F- and Wald tests) of these dummies were overwhelmingly rejected. Controlling for this time-varying-

coefficient lag and the decade dummies, LaGrange multiplier tests fail to reject the null of no serial correlation in the residuals, so we need do nothing more to correct for serial correlation.

Next, as already noted the dependent variable is an average over differing numbers of years. Weighted least squares is therefore appropriate as the variance of the dependent variable will be inversely proportional to the number of years in the average. However, especially given the partly cross-sectional nature of the data, I am far from confident that this is the only source of heteroskedasticity in the data. Therefore, I use weighted-least-squares estimation (using the square root of the number of years as the weight) in combination with White's robust standard errors.[34]

Third, as is probably already clear, I am asking quite a bit of the data for 52 observations to sort out coefficients on up to 16 independent variables some of which are fairly correlated (*e.g.*, the interaction terms). To deal with this difficulty, I will rely heavily on joint hypothesis tests to examine the significance of complexes of variables (*e.g.* CWB and CBI(CWB), all the terms involving CBI, *etc.*) and to guide reductions in the number of parameters to be estimated. These joint hypothesis tests, though, are more than merely a statistical necessity imposed by limited degrees of freedom and multicolinearity; as I shall make clear as the test results are reported, they in fact correspond to tests of sets of hypotheses which emerge naturally from the theory.[35]

IV. Econometric Results and their Robustness

A. The Results

Table IV, then, gives the results of four equations estimated, each of which use decade dummies, a time-variant-coefficient lag, and oil-dependency 1970s and its lag as controls and weighted-least-squares estimation with White's robust standard errors. Coefficients on the controls

are not at issue here and, so, are suppressed in the table.[36]

[TABLE IV about here.]

I will defer thorough discussion of the substantive size of the estimated coefficients until after we have determined a preferred model. Let us examine first, then, the most general model, Model II. At first glance, we see unambiguous support for our hypothesis that increased coverage of wage bargaining, as opposed to coordination, results in higher unemployment (the coefficient on COV is positive and significant at below the .0001 level). Model II also gives strong support to proposition five as regards the interaction of CBI and public-sector employment; that is, the coefficient on CBI(GOV) is significantly positive at below the .0001 level. This result implies that the effect of public-sector employment on unemployment becomes more detrimental with increases in CBI and, symmetrically, that the unemployment cost of CBI increases with the proportion of employment in the public sector, exactly as predicted by Proposition 5. The estimated coefficient on GOV, on the other hand, is negative, large, and significant in all models except Model I. These results indicate that increases in public-sector employment-shares lower unemployment only where CBI is low; where CBI is high, they in fact have the opposite effect.

The results in Model II are slightly less clear as regards Propositions 1-4. There is strong support for Proposition 3 that CWB interacts favorably with CBI in that the coefficient on CBI(CWB) is negative, large, and significant at below the .0001 level. The coefficient on TR, which along with the interaction term CBI(TR) represents Proposition 1 that traded-sector employers and labor are more disposed to produce wage restraint, is also negative and significant ($p<.01$) as argued. However, the coefficient on CBI(TR), which represents the rest of Proposition 1 and Proposition 4

that the traded sector interacts more favorably with CBI, does not quite meet the usual significance levels (p is only slightly less than .2). Moreover, the coefficient on CWB alone, which along with the interaction term CBI(CWB) represents Proposition 2 that coordinated bargainers are more disposed to offer wage restraint, is even significantly ($p<.0005$) of the wrong sign. Recall, however, the empirical forms of our hypotheses: that we expect the estimated effect of CWB and TR to be negative over the sample range of CBI. Clearly this holds as regards TR since both it and its interaction term have negative coefficients (Figure 5 reveals that this is significantly ($p<.05$) so). At CBI=.15, *i.e.* in New Zealand, the sample minimum, the estimated effect of CWB is however still positive though only marginally significantly so (note in Figure 3 that the 95% confidence only barely excludes zero even at the sample minimum). As CBI increases, though, the effects of both CWB and TR become more negative and do attain significance; most critically, nearly all of the statistically significant range and all of the substantively significant range of the CWB effect is negative (see Figure 3 below). Thus, at least the weaker form of our hypotheses are supported in Model II. Next, I conduct a series of joint-hypotheses tests both to examine specific predictions of the theory and to determine how best to proceed to obtain more precise estimates of the interaction effects of CBI, CWB, and traded-sector employment-shares.

[TABLE V ABOUT HERE]

Consider the most central and broadest claim of this paper: that CBI has unemployment effects the size and size of which depends upon coordination in wage bargaining and the sectoral composition of employment. If we can reject the joint null-hypothesis that the coefficients on CBI(CWB), CBI(TR), and CBI(GOV) are all zero, the we can say that CBI has unemployment

effects, the sign and size of which depend upon CWB, traded-sector employment-shares, *and/or* public-sector employment shares. As shown in the second row of Table V, this null is indeed easily rejected. This test also serves as an F-test of the non-interactive model (Model I) as a restriction on the full model (Model II); rejection here implies that we should prefer the interactive model this paper proposes. Even including CBI in the group of variables one considers omitting from Model II (row one), rejection is clear-cut. In short, then, our central claim is overwhelmingly supported by the data.

Next, I test whether the data supports the inclusion of coordination in bargaining or sectoral composition, either singly or interacting with CBI, in the model. Not surprisingly, given that the coefficients on GOV and CBI(GOV) were each significant individually (by the t-tests reported in Table IV), we find strong support that GOV and/or CBI(GOV) belong in the equation. Wald-tests nearly as strongly argue against omitting both CWB and CBI(CWB) from the equation. The conclusion is the same, again at very low significance levels, as regards TR and CBI(TR). Furthermore, as the next line shows, we should overwhelmingly reject omission of CBI(CWB) and CBI(TR), which serves as a test rejecting Model IV (to be introduced below) in favor of Model II.

Let us look more closely at the estimated coefficient on CBI in Model II. Clearly, it is insignificantly different from zero; however, there are, in fact, three ways a coefficient can insignificantly differ from zero. First, the estimated coefficient can be far from zero substantively while the standard error is large. Second, the coefficient can be substantively near zero and the standard error large; and third, the coefficient can be very near zero and the standard error small. In the last two instances, somewhere between which this particular insignificantly estimated coefficient belongs, it is safe to omit the variable even if, in some strict epistemological sense, it *belongs* in the

regression. We can safely omit a variable in such cases because, even if it theoretically belongs in the regression, we introduce very little bias by omitting it. As will be seen below, cross-validation provides further support for the omission of CBI in this case. Thus, we have little to lose by omitting CBI from the regression, and much to gain in the preciseness of our remaining coefficient estimates.

Omitting CBI from the regression, we obtain Model III. In it, the coefficients are more precisely estimated, and every one of our propositions receives strong confirmation from the data. Before accepting this model as our preferred, though, we should consider further the three other alternatives to Model II. Model I omits all the interaction terms and therefore represents the standard (non-interactive) model of CBI and CWB effects. Model IV omits CBI(CWB) and CBI(TR) and therefore augments Model I only with Proposition 5 which received unambiguous support in Model II. In addition to the joint-hypothesis tests reported above (which point toward Model II or III over Model IV), I present three statistics commonly used to measure nested models of this sort against each other: adjusted R^2, the standard error of the regression, and the Akaike information criterion. All three are based upon the standard deviation of residuals and in some sense measure how well the model fits the data, controlling in some way for degrees of freedom.[37] I also give the cross-validation standard-error of prediction criterion, *s*, suggested by Beck and Katz (1993). The *s*-criterion is particularly useful when one does not want model choice to be overly sensitive to the inclusion or exclusion of any individual country in the sample. Moreover, the *s*-criterion is based on *out-of-sample* predictive power which alone should argue for its use. (*s* is calculated by repeating a regression several times, omitting a different country each time from the sample. The coefficients from each regression are then used to *predict* the omitted country and the errors are saved. The

standard deviation of these errors is the statistic, *s*.) All four statistics are clear in their support for our choice of Model III as the preferred. Notice particularly that, although Model IV obtains impressive significance for all of its coefficients, even Model II is preferred to it by all criteria while Model III in turn is likewise preferred by all criteria to both Models IV and II. Nor is the magnitude by which Model III dominates Model IV small: out-of-sample prediction-error is a bit more than 31% smaller in our preferred model (even Model II beats Model IV by 24%)!. The more commonly reported within-sample standard-error-of-the-regression is similarly around 30% smaller in Model III than Model IV. Finally, our preferred model has out-of-sample prediction error nearly 10% smaller than the full model. Without a doubt, then, Model III emerges as the preferred; I turn, therefore, to a discussion of the results from that model.

First, we note that, as hypothesized, increased coverage of bargaining, controlling for... coordination in it, raises unemployment. Statistically, the coefficient on COV is clearly significantly positive ($p<.0001$). Substantively, the effect is equally clearly large; *ceteris paribus* a shift in the level of coverage from that of the U.S., one, to that of Canada, two, results in about a 70% increase in the unemployment rate. Recall that the dependent variable is in logs so that the absolute size of the effect depends on the original level of unemployment. The coefficient of .7 thus implies that at an initial level of 1% unemployment a shift in coverage from one to two increases unemployment to approximately 1.7% while at an initial level of 4% unemployment the same shift would increase unemployment to approximately (1.7x4)% or 6.8%. For ease of exposition, subsequently I will discuss the effects given a hypothetical original unemployment rate of 1%.

The coefficients on GOV and CBI(GOV) are also quite significant ($p<.0001$) and

substantively large. The *direction* of public-sector employment-share's impact on unemployment, however, depends on the level of CBI. When CBI is below about .5 (which happens to be approximately the sample median), the net effect of increases in public-sector employment-share on unemployment is negative while above that level of CBI the net effect is positive. In either case, the effect can be quite large substantively. At one extreme, a hypothetical situation with zero CBI and 1% initial unemployment, a 5% increase in public-sector employment-share[38] results in about a .66% decrease in the unemployment rate. At the other extreme, the same initial unemployment with CBI of one, a 5% increase in public-sector employment-share would cause about a .67% increase in the unemployment rate. A clear way to present these results is to plot the estimated effect of, say, a 5% increase in GOV as a function of the level of CBI--with a confidence interval (95% is chosen) around it of course. This is done in Figure 1 using the estimates from Model II and in Figure 2 using the estimates from Model III. Notice that near the sample median of CBI, the net effect is statistically indistinguishable from zero, but that for considerable ranges on either side of that the effects are substantively and statistically significantly non-zero.

[Figures 1 and 2 about here]

The effect of coordination in wage bargaining is likewise dependent upon the level of CBI, statistically significant, and substantively quite large. As noted above, at the sample minimum of CBI, the effect is marginally significantly positive, but the effect is decreasing in CBI as argued and for the large majority of the sample significantly negative. For example, at CBI of .5 (about the level of Denmark or Finland, the median), a .5 increase in CWB (the gap from, *e.g.*, New Zealand to Denmark or Belgium to Switzerland) would more than halve the unemployment rate (about a 62% reduction

in the rate). Again, this is most clear in a graph of the estimated effect of, say, a .1 increase in CWB as a function of the level of CBI. Figure 3 is such a graph using Model II's estimates; Figure 4 uses Model III's. Notice in particular, that the effect is (significantly) negative and increasingly so over nearly the entire sample range of CBI. This is graphical revelation of the strong support for both Propositions 2 and 3 already noted in the hypotheses tests.

[Figures 3 and 4 About Here]

Next we have the estimated unemployment effect of traded-sector employment-share. Again the effect is dependent upon the level of CBI, statistically significant, and substantively large. For example, at the median level of CBI, .5, and 1% initial unemployment, a 5% increase in the traded-sector employment share would cause the unemployment rate to fall about 18% (from 1% to .82% in our example). Notice, moreover, that in Model III it is now clear not only that traded-sector bargainers have beneficial unemployment effect, but that this effect is greater the more independent is the central bank. This supports our Propositions 1 and 4. Again, the dependence of the magnitude of this effect upon the level of CBI is best seen graphically as in Figure 5 and 6, using Model II's and Model III's results respectively.

[Figures 5 and 6 About Here]

Finally, we have the estimated unemployment effect of an increase in CBI, which is found to depend upon coordination in wage bargaining and the sectoral composition of employment. This can be seen most clearly by differentiating the regression equation with respect to CBI:

$$\frac{\partial \ln(UE)}{\partial CBI} = -4.6762^{**}\,CWB \; -.0264^{*}\,TR \; +.2674^{**}\,GOV$$

An asterisk indicates a coefficient significant at at least the .05 level, two asterisks at the .0001 level. As the derivative clarifies, the unemployment cost of CBI may be positive or negative and is increasing (decreasing) in public-sector (traded-sector) employment-share and decreasing in the coordination of bargaining. To get a feel for the substantive size of these effects graphically as we have done in Figures 1-6 above, we would need four dimensions. Instead, in Figure 7, I give the estimated effect of a .1 increase in CBI (about the gap from Ireland to the Netherlands, Belgium to Denmark, or the U.S. to Switzerland) at the actually observed levels of CWB, TR, and GOV for each country-decade available.

[Figure 7 About Here]

Several features of the evidence presented in Figure 7 deserve emphasis here. First, notice that the unemployment cost of increasing CBI may be positive or negative; it has been negative in Japan and Switzerland throughout the postwar period, positive throughout for some including the U.S. and U.K., and shifted from negative to positive in others including the Netherlands and Sweden. Thus, it is understandable that previous, non-interactive regressions of unemployment on CBI have failed to notice any relationship. Second, notice that the effect of even a .1 increase in CBI on unemployment can be quite large, varying from about a 32% reduction in Switzerland in the fifties to about a 54% increase in Australia in the eighties. Third and last, notice that the effect has been stable in some countries (the U.S., Japan, and Canada notably) and increased in most others (most dramatically in Sweden). I will return to this in the conclusion. I turn now to a brief exploration of the robustness of these results to alternative operationalizations of CWB and traded-sector employment-share and to the omission of particular countries.

B. Robustness of the Results

First, I consider the sensitivity of the results to the omission of particular countries. Recall from Table IV that the cross-validation standard-errors suggest Model III as the preferred model. This implies that Model III is no more dependent upon any particular country for its results than are Models I-II and IV. This was our first indication that the results presented were robust to the omission of individual countries. However, we have particular reason to consider more carefully the omission of Japan and Switzerland from the sample.

Something of a controversy in the literature was raised by Soskice 1990 over whether to classify Japan and Switzerland as having a great deal of coordination in wage-bargaining and price-setting or very little. The controversy centers on whether employers can provide coordination in bargaining. As already noted, I side with Soskice (and Swenson 1989, 1991) in believing that the previous literature had focused too exclusively on labor in this regard. Nonetheless, I re-estimated Model III omitting Japan and Switzerland from the sample. The results are substantively the same. Specifically, that estimation returns coefficient estimates of .88 (s.e.≈.24; p≈.0007) for CWB and -3.86 (s.e.≈.65; p≈.0000) for CBI(CWB). All other coefficients were still clearly significant in the same directions (in fact, CBI(TR) is more clearly significant with the omissions). In Model II, excluding Japan and Switzerland does not change our conclusion (nor the reasons for that conclusion) that CBI can safely be omitted. Thus, miscoding of Japan and Switzerland is unlikely to be driving the results presented.

We were also concerned above that manufacturing, mining, and quarrying (MMQ) might not be the best available proxy for the traded sector. I therefore re-estimated Models II and III using just

manufacturing, using industry, and using a third proxy in place of MMQ. The third potential proxy was obtained by factor analysis of the nine sectors for which the OECD provides data. That factor analysis produced two factors, one which broadly corresponded to intuition about traded sectors and another which corresponded more to intuition about sheltered sectors. For every one of these alternatives, the results were substantively similar to those presented above. Specifically, in Model II, the traded-sector term was clearly significant and its interaction was borderline significant.[39] Once Model II was reduced to Model III, as was supported in every case by joint-hypothesis tests and residual statistics analogous to the discussion above, in all three cases the coefficient on CBI(TR) was negative and at least as significant as that reported here. Thus, poor operationalization of the traded-sector is also unlikely to be responsible for the results presented.

Finally, I considered how some other indices of organization in the labor market fared in Model III. First, Soskice's index of economy-wide coordination in bargaining, which is available for only 10 countries (see Table III) and therefore puts a severe strain on degrees of freedom, nonetheless yields results basically identical to those in Table IV. A recoding of LNJ's labor and business organization indices to weight each by the Nash-bargaining-power weight they imply[40], works in Models II and III much like CWB does. In particular, the coefficients on BO and LO alone are both slightly positive, the former a bit larger and borderline significant, and their interactions with CBI are both negative (that on BO larger) and individually significant at the .0163 and .0006 levels. For both the effect of employer and of labor organization, beneficial impacts are significantly increasing in CBI, are negative and significant for most of the sample, and, moreover, the effect of BO is more negative and interacts with CBI better than does LO. Thus, the results accord exactly with our theoretical

predictions even when we ask so much of the data as to sort out these highly correlated effects.

Using the average of some of the more labor-oriented and broader definition indices of corporatism, LO^a in Table III, the results are less commensurate with those reported here. In particular, the data is less able to determine whether to attribute explanatory power to LO^a or its interaction with CBI. I would attribute these difficulties (a) to the discrepancy between the definitions of corporatism used in these indices and the definition of coordinated wage-bargaining used here, (b) to the fact that it was perhaps inadmissible to average these indices in the first place since their definitions of what they measured were so different to begin with, and (c) to the fact that the theory offered here places less weight on labor than on employer organization while these indices are exclusively labor-oriented. Still, even using this index, the results are merely ambiguous, they do not reverse any of our conclusions. Moreover, the importance of the sectoral-structure variables and of their interactions with CBI remain unambiguously supported by the data.

V. Conclusion: Implications of the Argument and Evidence

Summarizing and testing existing theory about CBI, Alesina and Summers (1993) found that CBI was associated with lower inflation but could find no evidence that CBI affected any real variables (*e.g.*, output, employment, real interest-rates). Likewise, few previous studies of corporatism have specifically incorporated the role of the monetary-policy. The present model suggested that theoretically, these previous conclusions rested on isolating for study either credibility problems in monetary policy or coordination problems in wage bargaining. Combining the insights which emerged from these focused studies, and introducing differential sectoral impacts of monetary and wage policy, we were able to derive the propositions that the costliness of CBI was a decreasing

(increasing) function of CWB and traded-sector (public-sector) employment-share and symmetrically that the effectiveness of CWB was an increasing function of CBI. Both these claims are strongly supported by the empirical record.

As examples of what I consider the wide-ranging implications of this theory and evidence, I consider two topics: one a matter of current policy debate and another a matter of current academic dispute. First, I will argue that the unemployment costs of the proposed European Central Bank, contrary to its drafter's expectations, are not likely to be nil; and second, I will suggest a new hypothesis for the cause of the "corporatist decline" observed recently in some countries.

A. An Independent Central Bank for Europe?

With the examples of Germany, Switzerland, and Austria (the Teutonic Three--*pace* French- and Italian-speaking Swiss), and with the support of previous theory, the countries of the European Community apparently intend to endow the proposed European Central Bank with considerable independence[41]. The present theory suggests, however, that the relative success of the Teutonic Three in combining low inflation with low unemployment derived not merely from CBI, but from CBI in the presence of CWB, relatively large traded sectors, and (at least originally) not too large public sectors. As the public sector in these three economies grew, however, the unemployment cost of controlling inflation rose as well. This can be seen in Figure 7 as can the fact that most other European countries would pay much higher costs for increasing their CBI than would the Teutonic Three. What does this tell us about the likely cost of instituting a very independent European Central Bank?

Wage bargaining could hardly be very coordinated across all of Europe. In terms of the

present theory, this would imply that a_j's would be small and numerous (*i.e.*, COV would be high and CWB low) in a Europe-wide economy. This at least leads one to believe that high CBI for Europe as a whole would be somewhat more costly than it has been in the Teutonic Three individually[42]. Trade openness elsewhere in Europe lags somewhat behind these three as well, particularly if one weights the other European countries by their GDP. Finally, public-sector employment is very high and continues to rise in much of Europe, including these three, keeping potential CBI costs rising as well. All of these considerations point toward higher unemployment costs for CBI at the European level than most have predicted.

Does this mean, then, that Europe should abandon the idea of an independent European Central Bank? Not necessarily--nothing in this argument or evidence indicates that independent central banks do not enjoy a credibility advantage over elected monetary-policy-authorities. A choice to establish a more independent central bank produces both an inward shift of the Phillips' Curve (the credibility effect stressed in previous literature) *and* a shift in the optimum trade-off to higher unemployment and lower inflation. The point is merely that the trade-off does exist, and that it is likely to be considerably steeper for a single European economy than most have imagined because institutional and sectoral structures at the European level would interact much less favorably for Europe as a whole than they have for the Teutonic Three. Sacrificing the independence of the bank may not be optimal either as that would only mean allowing more accommodating monetary-policy and therefore higher inflation. A preferable path would be for Europe to continue with its plans for an independent Central Bank but also to work to increase the openness of its economies and decrease the size of its public sectors. Unfortunately, I have little hope that such policies are forthcoming, so

the remaining choice for Europe is the traditional and painful one: lower inflation or lower unemployment. If it chooses lower inflation, it probably remains the case that this would be better pursued by an independent central bank than by a elected officials for exactly the credibility reasons made standard by previous CBI literature.

B. The Collapse of Corporatism

Noting the collapse of corporatist wage-bargaining in Sweden and Denmark, many scholars have begun to talk about the general decline of corporatism. In recent papers, however, Iversen (1993a, 1993b), Lange, Wallerstein, and Golden (1993), and Golden and Wallerstein (1995) have noted that this decline is not as general as was first believed. According to data presented by Golden and Wallerstein, centralization[43] of bargaining has indeed collapsed in Denmark and Sweden. In the former, the collapse began around 1980; in the latter, there were hiccups of low centralization in 1984 and 1988 then the seemingly permanent drop in 1991. In Austria, however, nothing has changed at least since 1970. In Finland and Germany, there was some small drop in the early seventies, but centralization has lost no further ground since. Finally, while Norway experienced considerable turbulence in bargaining centralization during the mid-eighties, it has seemingly stabilized at a high level since 1987.[44]

The usual culprits to which academics have pointed as the reason for corporatist decline have been the rise of new (*post-Fordist*) production techniques and/or the increasing mobility of financial capital.[45] Both of these arguments, however, are simply unsustainable if the collapse has not been general but rather has occurred in some countries, like Sweden and Denmark, and not in others. Certainly financial capital is no less mobile in Austria, Finland, Germany, and Norway not to mention

Japan and Switzerland. Nor is it likely that new production techniques are more predominant in Sweden and Denmark than elsewhere among corporatist countries. However, there is a suggestion in the evidence provided here of a different explanation.

Figure 7 reveals that the rising costs of CBI in Sweden and Denmark since the sixties has outstripped similar rises in these other countries (extrapolating a bit for Denmark). By the eighties, both had costs of CBI among the highest in the sample. Close examination of trends in the sectoral composition of employment reveals that these two were exceptionally extreme in terms of the rise in public-sector employment. Accordingly, the output and unemployment costs of controlling inflation monetarily have risen dramatically there while they have risen less so in other coordinated economies. Perhaps it is not surprising, then, that employers in Sweden and Denmark have rebelled against coordinated bargains in which public-sector unions have considerably risen in importance....

I propose, therefore, that a more likely culprit in the decline of corporatism has been the rise of public-sector workers within the labor bargaining-units (see Lange, Wallerstein, and Golden 1993; Iversen 1993a, 1993b, 1994; Pontusson 1992a, 1992b; Pontusson and Swenson 1993; and Garrett and Way 1995 for more on this point). The evidence here is that the public-sector rise has significantly sapped the ability of labor to produce wage restraint. As CBI was low in Sweden, inflation was not particularly combated monetarily and the rise led to increasingly frequent decisions to devalue/allow the currency to depreciate (see Calmfors 1993b). When, in the late eighties and early nineties, Sweden attempted to fix its exchange-rate to the ERM and stick to that peg more religiously, the output and unemployment costs were felt with a vengeance. In Denmark, where CBI was higher, the costs of controlling inflation were more immediately and directly felt in

unemployment. In both countries, though, the increasing inability of CWB to provide wage restraint surely had a lot to do with employer disillusionment with coordinated bargaining.

An anecdote illustrating how unlikely wage restraint is to come from the public sector illustrates the severity of the problem. Consider, for example, what might be called the *ÖTV debacle* (my account summarizes that of Kennedy 1991). In January 1974, ÖTV, the German public-sector-workers union, led wage negotiations and demanded a 15-20% wage increase which massively outstripped productivity growth in the sector and forecasted inflation. The *Bundesbank* pleaded for the government to resist, but eventually most of the increase was granted. Subsequent wage settlements, as is typical in Germany, followed suit. In response the bank sought and obtained (real) monetary-contraction and appreciation. The results were painful--much more so for the traded than the public sector. Interestingly, this was followed by the one decline in centralization of bargaining in Germany that Lange, Wallerstein, and Golden note. Prior to this and since, IG Metall, the metal-workers (a traded-sector) union, has led labor in wage negotiations, and centralization has been stable. Perhaps the lesson was not lost on Nordic employers; at the least, further research on this hypothesis is warranted.

In conclusion, I have shown that the institutions of coordinated bargaining and of CBI and the sectoral composition of employment interact with each other in their effects on employment. In particular, while CBI can always get low inflation, the costs at which it does so are lower (or even negative) where bargaining is coordinated and where traded sectors are large and are higher where public sectors are large and bargaining is more fragmented. Similarly, coordinated bargaining is more effective where monetary policy can be counted on to police restraint and where traded sectors

dominate public and sheltered sectors. Most generally, it has been shown that an institutional political economy requires careful consideration of how various institutions in the polity and economy interact with each other and with the structural interests of actors to produce outcomes.

Table I: The Hypothesized Coefficients

Coefficient on...	Hypothesized Sign
COV	$\beta_{COV} > 0$
CWB	$\beta_{CWB} \leq 0$
CBI(CWB)	$\beta_{CC} < 0$
TR	$\beta_{TR} \leq 0$
CBI(TR)	$\beta_{CT} < 0$
GOV	Ambiguous
CBI(GOV)	$\beta_{CG} > 0$
CBI	Ambiguous

Table II: Central Bank Independence

CTRY/YR	LVAU*	QVAU*	POL**	ECO**	BP***	CBI
US	.5018		5	7	3	.750443
JA	.1376		1	5	3	.409401
GE	.6572	1.00	6	7	4	.931438
FR 50	.2000					.436667
FR 60	.2313	.65	2	5	2	.442917
FR 70-80	.1131					.419292
IT	.2322	.76	4	1	1.5	.365104
UK 50	.2332					.399973
UK 60	.4763	.60	1	5	2	.448583
UK 70-80	.3088					.415083
CA	.4566		4	7	2	.614141
AU 50-60	.6750		3	6		.669444
AU 70-80	.5806					.637986
BE 50-60	.1763	.53	1	6	2	.407917
BE 70-80	.1888					.410417
DE	.4499	.70	3	5	2	.529979
FI	.2358	.75				.492917
GR 50	.5413					.347100
GR 60	.4988		2	2		.332933
GR 70-80	.5103					.336767
IR	.3379	.51	3	4		.461979
NE	.4228		6	4	2	.564036
NO 50-60	.1158					.224567
NO 70-80	.1366				2	.234948
PO			1	2		.166667
SP 50	.1163					.195742
SP 60-70	.1006		2	3	1	.191823
SP 80	.2069					.218385
SW	.2725		2	2		.302917
SZ 50-70	.5317		5	7	4	.841250
SZ 80	.5729					.851563
AL 60-80	.3055	.73	3	6	1	.473771
NZ 50	.1469		0	3	1	.120058
NZ 60-80	.2686					.150495

* LVAU, derived from data and formula in Cukierman (1992), based on political and economic characteristics of the bank as described in national law. QVAU are the results from a qualitative survey given in the same text.

** POL (ECO) indexes the political (economic) independence of the bank in Grilli, Masciandaro and Tabellini (1991).

*** BP is the index of CBI given in Bade and Parkin (1982).

Table III: Employer and Labor Organization

CTRY	COV	LO[a]	BO	LO[b]	EWC	CWB
US	1	1.12	1	1	0	0
JAPAN	2	1.53	2	2	5	.875
GERMANY	3	2.33	3	2	3.5	.675
FRANCE	3	1.48	2	2	1.5	.375
ITALY	3	1.61	1	2	2	.25
UK	3	1.26	1	1	0	0
CANADA	2	1.07	1	1	NA	0
AUSTRIA	3	3	3	3	5	1
BELGIUM	3	1.92	2	2	NA	.375
DENMARK	3	2.63	3	3	NA	.75
FINLAND	3	2.48	3	3	NA	.75
IRELAND	3	1	1	1	NA	0
NETHERLANDS	3	2.39	2	2	3	.625
NORWAY	3	2.90	3	3	4	1
PORTUGAL	3	2	2	2	NA	.25
SPAIN	3	1.5	1	2	NA	.125
SWEDEN	3	2.87	3	3	4	1
SWITZERLAND	2	1.60	3	1	4	.875
AUSTRALIA	3	1.64	1	2	NA	.25
NEW ZEALAND	2	1.75	1	2	NA	.25
CORR w. CWB	.16	.82	.91	.68	.96	1

COV is LNJ's index of the coverage (as opposed to coordination) of bargaining.

LO[a] is a scaled (1-3) average of labor-based coordination/corporatism indices from LNJ, Cameron, Bruno-Sachs, and Calmfors-Driffill.

BO is LNJ's index of coordination among employer bargaining units.

LO[b] is LNJ's index of coordination among labor bargaining units.

EWC is Soskice's index of economy-wide coordination in wage bargaining.

Table IV: The Unemployment Effects of CBI, Regression Results

Independent Variables	Model I	Model II	Model III	Model IV
COV	**.4208** (.1413) *.0050*	**.7155** (.0488) *.0000*	**.7178** (.0473) *.0000*	**.3856** (.0548) *.0000*
CWB	**-1.0159** (.2104) *.0000*	**1.0935** (.2798) *.0004*	**1.0931** (.2757) *.0003*	**-.8111** (.0731) *.0000*
TR	**-.0680** (.0216) *.0032*	**-.0242** (.0088) *.0096*	**-.0227** (.0052) *.0001*	**-.0491** (.0076) *.0000*
GOV	**.0040** (.0073) *.5881*	**-.1337** (.0092) *.0000*	**-.1325** (.0084) *.0000*	**-.1148** (.0172) *.0000*
CBI	**.4578** (.2066) *.0326*	**-.1320** (.5210) *.8014*	---	**-3.6829** (.6345) *.0000*
CBI(CWB)	---	**-4.6729** (.7646) *.0000*	**-4.6762** (.7550) *.0000*	---
CBI(TR)	---	**-.0236** (.0180) *.1993*	**-.0264** (.0116) *.0292*	---
CBI(GOV)	---	**.2705** (.0163) *.0000*	**.2674** (.0140) *.0000*	**.2780** (.0425) *.0000*
° Free	39	36	37	38
Adj. R^2	0.8602	0.9441	.9457	0.8999
S.E.R.	0.389	0.2459	.2425	0.344
AIC	-1.606	-2.502	-2.541	-1.969
s	0.5426	0.3646	.3315	0.4825

Coefficient in bold, (standard error) in parentheses, *p-level* from two-tailed t-test of the null hypothesis that the coefficient is zero in italics. Models also have decade dummies, a lagged dependent variable with decade-variant coefficients, and 1970s oil-dependency and its lag as controls (not reported). The estimation is Weighted least squares (square root of number of years in "decade" is weight) with White's robust standard errors. AIC is the Akaike information criterion; s is cross-validated standard error (see text).

Table V: Joint-Hypotheses Tests on Model II

Variables to Omit...	*p*-levels of rejection
CBI and All Interaction Terms	**F** = 113.0 ==> p = .0000 X^2 = 452.3 ==> p = .0000
All Interaction Terms	**F** = 146.9 ==> p = .0000 X^2 = 440.8 ==> p = .0000
GOV,CBI(GOV)	**F** = 146.6 ==> p = .0000 X^2 = 293.3 ==> p = .0000
CWB,CBI(CWB)	**F** = 92.92 ==> p = .0000 X^2 = 185.8 ==> p = .0000
TR,CBI(TR)	**F** = 44.79 ==> p = .0000 X^2 = 89.58 ==> p = .0000
CBI(CWB), CBI(TR)	**F** = 44.75 ==> p = .0000 X^2 = 89.49 ==> p = .0000
Decade Dummies	**F** = 219.9 ==> p = .0000 X^2 = 439.9 ==> p = .0000
Time-variant Lag-Coefficients	**F** = 95.64 ==> p = .0000 X^2 = 185.8 ==> p = .0000
Oil Dependency and Lag	**F** = 40.08 ==> p = .0000 X^2 = 80.15 ==> p = .0000

p-levels are from Wald tests of null hypothesis that the "Variables to Omit" all have coefficients of zero (simultaneously). Wald tests are preferable to the usual F-tests because the former take into account the information in the robust variance-covariance matrix of coefficient estimates while the latter do not.

Appendix I

In going from equations 1-4 to 1a-4a, a number of expressions involving coefficient parameters were simplified. The redefinitions are given here.

$$\theta_g = (1-\sigma_c+\frac{\sigma_i\lambda_\gamma}{\lambda_i}+\frac{\sigma_e\lambda_I}{\lambda_i}+\sigma_m)^{-1}$$

$$\theta_i = \theta_g\frac{\sigma_i}{\lambda_i}$$

$$\theta_{x1} = \theta_g\frac{\sigma_e\rho_I}{\lambda_i}$$

$$\theta_{x2} = \theta_g\sigma_e$$

$$\phi_g = \frac{\lambda_\gamma}{\lambda_i}\theta_g$$

$$\phi_m = \frac{1}{\lambda_i}-\frac{\lambda_\gamma}{\lambda_i}\theta_i-\frac{\lambda_\gamma}{\lambda_i}\theta_{x1}$$

$$\phi_p = \frac{1}{\lambda_i}-\frac{\lambda_\gamma}{\lambda_i}\theta_i-\frac{\lambda_\gamma}{\lambda_i}\theta_{x1}-\frac{\lambda_\gamma}{\lambda_i}\theta_{x2} = \phi_m-\frac{\lambda_\gamma}{\lambda_i}\theta_{x2} = \phi_m-\phi_w$$

$$\epsilon_g = e_i\phi_g$$

$$\epsilon_m = e_i\phi_m$$

$$\epsilon_p = e_i\phi_p = \epsilon_m-e_i\phi_w = \epsilon_m-\epsilon_w$$

$$\psi_w = 1-b-b\epsilon_p$$

$$\psi_g = b\epsilon_g$$

$$\psi_m = b\epsilon_m$$

Appendix II

The solution to a Nash bargaining problem is obtained by maximizing an exponentially weighted average of the utilities of the bargainers where the exponents are their relative bargaining powers. That this reduces to approximately a weighted average of the first order conditions of the two bargainers is shown below.

$$Max_{W} \quad (V^{u})^{\alpha}(V^{f})^{\beta}$$

where α, β *are the Nash Bargaining strengths*

$$\rightarrow$$

$$\alpha(V^{u})^{\alpha-1}(V^{f})^{\beta}\frac{dV^{u}}{dW} + \beta(V^{u})^{\alpha}(V^{f})^{\beta-1}\frac{dV^{f}}{dW} = 0$$

multiplying through by $(V^{u})^{-\alpha}(V^{f})^{-\beta}$ $\rightarrow$

$$\alpha(V^{u})^{-1}\frac{dV^{u}}{dW} + \beta(V^{f})^{-1}\frac{dV^{f}}{dW} = 0$$

The approximation entails the assumption that the initial utility levels of the union and firm are not too disparate.

References

Akerloff, G.A. and J.L. Yellen. 1985. "A Near-Rational Model of the Business Cycle with Wage and Price Inertia," Quarterly Journal of Economics 100, suppl.: 823-38.

Alesina, Alberto. 1988. "Macroeconomics and Politics," NBER Macroeconomics Annual 3:13-61.

Alesina, Alberto and Guido Tabellini. 1987. "Rules and Discretion with Non-Coordinated Monetary and Fiscal Policies." Economic Inquiry 25:619-30.

Alesina, Alberto and Lawrence Summers. 1993. "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence," forthcoming in Journal of Money, Credit and Banking.

Alogoskoufis, G.S. and A. Manning. 1988. "On the Persistence of Unemployment," Economic Policy 7: 427-69.

Alvarez, R. Michael, Geoffrey Garrett, and Peter Lange. 1991. "Government Partisanship, Labor Organization, and Macroeconomic Performance," American Political Science Review: 539-56.

Bade, Robin and Michael Parkin. 1982. "Central Bank Laws and Monetary Policy," Typescript, Department of Economics, University of Western Ontario.

Barro, Robert and Robert Gordon. 1983a. "Rules, Discretion, and Reputation in a Model of Monetary Policy," Journal of Monetary Economics 12:101-22.

Barro, Robert and Robert Gordon. 1983b. "A Positive Theory of Monetary Policy in a Natural Rate Model," Journal of Political Economy 91:589-610.

Beck, Nathaniel and Jonathan Katz. 1993. "Model Assessment and Choice *via* Cross-Validation," Typescript, UCSD.

Beck, Nathaniel and Jonathan Katz. 1995. "What To Do (and Not to Do) with Time-Series-Cross-Section Data in Comparative Politics," American Political Science Review 89(3): 634-47.

Berger, Suzanne (ed.). 1981. Organizing Interests in Western Europe. Cambridge: Cambridge University Press.

Bernanke, Ben and Alan Blinder. 1992. "The Federal Funds Rate and the Channels of Monetary Transmission," The American Economic Review.

Blanchard, Olivier Jean. 1989. "A Traditional Interpretation of Macroeconomic Fluctuations," The American Economic Review 79,5: 1146-64.

Blanchard, Olivier Jean and Mark Watson, "Are Business Cycles All Alike?" In Robert Gordon (ed.), The American Business Cycle: Continuity and Change. Boston and Chicago: NBER and University of Chicago Press.

Bruno, Michael and Jeffrey Sachs. 1987. The Economics of Worldwide Stagflation. Cambridge: Harvard University Press.

Calmfors, Lars (ed.). 1990. Wage Formation and Macroeconomic Policy in the Nordic Countries. Uppsala: SNS Forlag.

Calmfors, Lars. 1993a. Centralization of Wage Bargaining and Macroeconomic Performance--A Survey. Seminar Paper No. 536. Stockholm: Institute for International Economic Studies.

Calmfors, Lars. 1993b. "Lessons from the Macroeconomic Experience of Sweden," European Journal of Political Economy, 9: 25-72.

Calmfors, Lars and John Driffill. 1988. "Centralisation of Wage Bargaining and Macroeconomic Performance," Economic Policy 6: 13-61.

Cameron, David. 1984. "Social Democracy, Corporatism, Labor Quiescence, and the Representation of Economic Interest in Advanced Capitalist Society." In John H. Goldthorpe (ed.), Order and Conflict in Contemporary Capitalism. New York: Oxford University Press.

Carlin, Wendy and David Soskice. 1990. Macroeconomics and the Wage Bargain. A Modern Approach to Employment, Inflation and the Exchange Rate. Oxford: Oxford University Press.

Crouch, Colin. 1985. "Conditions for Trade Union Wage Restraint," in Leon Lindberg and Charles Mair, ed., The Politics of Inflation and Economic Stagnation. Washington, D.C.: The Brookings Institution.

Cukierman, Alex. 1992. Central Bank Strategy, Credibility, and Independence: Theory and Evidence. Cambridge: MIT Press.

Dornbusch, Rudiger. 1976. "Expectations and Exchange-Rate Dynamics," Journal of Political Economy 84: 1161-1176.

Eulau, Heinz and Michael S. Lewis-Beck (eds.). 1985. Economic Conditions and Electoral Outcomes: The US and Western Europe. New York: Agathon Press.

Fair, Ray. 1988. "Sources of Economic Fluctuations in the United States," Quarterly Journal of Economics 103: 313-32.

Friedman, Milton and Anna J. Schwartz. 1963. A Monetary History of the United States, 1867-1960. Princeton: Princeton University Press.

Gali, Jordi. 1988. "How Well Does the AD/AS Model Fit Postwar US Data?" Mimeo, MIT.

Garrett, Geoffrey and Peter Lange. 1986. "Performance in a Hostile World: Economic Growth in Capitalist Democracies, 1974-1982," World Politics 38.

Golden, Miriam and Michael Wallerstein. 1995. "Trade Union Organization and Industrial Relations in the Post-War Era in 16 Nations," Paper given at the 1995 MidWest PSA.

Goldthorpe, John H. (ed.). 1984. Order and Conflict in Contemporary Capitalism. New York: Oxford University Press.

Grilli, Vittorio, Donato Masciandaro, and Guido Tabellini. 1991. "Political and Monetary Institutions and Public Financial Policies in the Industrial Countries," Economic Policy 13: 341-92.

Hall, Peter. 1993. "Independence and Inflation: The Missing Variables," Forthcoming in German Politics and Society.

Headey, Bruce. 1970. "Trade Unions and National Wage Policies," Journal of Politics, 32: 407-29.

Iversen, Torben. 1993a. "European Monetary Integration and the Politics of Designing Wage Bargaining Institutions: A Comparative Analysis of Germany, Sweden, and Denmark." Paper presented at the on "Production Regimes in an Integrating Europe," July 23-35, at the Wissenschaftszentrum, Berlin.

Iversen, Torben. 1993b. "National Regimes of Collective Wage Bargaining and Macroeconomic Policies: Lessons from Austria, Denmark, Germany and Sweden," Unpublished Manuscript.

Iversen, Torben. 1994. "Wage Bargaining, Monetary Regimes, and Economic Performance in Organized Market Economies: Theory and Evidence," Paper given at the 1994 APSA.

Kennedy, Ellen. 1991. The Bundesbank: Germany's Central Bank in the International Monetary System. London: Pinter.

Kydland, Finn E. and Edward C. Prescott. 1977. "Rules Rather than Discretion: The Inconsistency of Optimal Plans," Journal of Political Economy 85: 473-92.

Lane, Jan-Erik, David McKay, and Kenneth Newton. 1991. Political Data Handbook: OECD Countries. New York: Oxford University Press.

Lange, Peter. 1984. "Unions, Workers, and Wage Regulation: The Rational Bases of Consent." In John H. Goldthorpe (ed.) Order and Conflict in Contemporary Capitalism. New York: Oxford University Press.

Lange, Peter and Geoffrey Garrett. 1985. "The Politics of Growth: Strategic Interaction and Economic Performance in the Advanced Industrial Democracies, 1974-1980." Journal of Politics 47: 792-827.

Lange, Peter, Michael Wallerstein, and Miriam Golden. 1993. "The End of Corporatism? Wage Setting in the Nordic and Germanic Countries," in Sanford Jacoby, ed., Work and Society: Global Perspectives. New York: Oxford University Press, forthcoming.

Layard, Richard, Stephen Nickell, and Richard Jackman. 1991. Unemployment: Macroeconomic Performance and the Labour Market. New York: Oxford University Press.

Lehmbruch, Gerhard and Phillippe Schmitter (eds.). 1982. Patterns of Corporatist Policy-Making. Beverly Hills: Sage.

Lewis-Beck, Michael S. 1990. Economics and Elections: The Major Western Democracies. Ann Arbor: The University of Michigan Press.

Lohmann, Susanne. 1992. "Optimal Commitment in Monetary Policy: Credibility versus Flexibility," American Economic Review 82.

Mankiw, N. Gregory. 1985. "Small Menu Costs and Large Business Cycles: A Macroeconomic Model of Monopoly," Quarterly Journal of Economics 100,2: 529-37..

Norpoth, Helmut, Michael S. Lewis-Beck, and Jean-Dominique LaFay. 1991. Economics and Politics: The Calculus of Support. Ann Arbor: The University of Michigan Press.

Olson, Mancur. 1965, The Logic of Collective Action: Public Goods and the Theory of Groups. Cambridge: Harvard University Press.

Pontusson, Jonas. 1992a. "The Role of Economic-Structural Change in the Decline of European Social Democracy," Paper given at the 1992 APSA.

Pontusson, Jonas. 1992b. "At the End of the Third Road: Swedish Social Democracy in Crisis," Politics and Society, 20: 305-32.

Pontusson, Jonas and Peter Swenson. 1993. "Employers on the Offensive: Wage Bargaining, Pay Practices and New Production Strategies in Sweden," Typescript Cornell University.

Powell, G. Bingham, Jr. and Guy D. Whitten. 1993. "A Cross-national Analysis of Economic Voting: Taking Account of the Political Context, American Journal of Political Science, 37(2): 391-415.

Regini, Marino. 1984. "The Conditions for Political Exchange: How Concertation Emerged and Collapsed in Italy and Great Britain," in John Goldthorpe, ed., Order and Conflict in Contemporary Capitalism. New York: Oxford University Press.

Rogoff, Kenneth. 1985. "The Optimal Degree of Commitment to an Intermediate Monetary Target," Quarterly Journal of Economics 100: 1169-90.

Romer, David and Christina Romer. 1989. "Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz," NBER Macroeconomics Annual 4: 121-70.

Rubinstein, Ariel. 1982. "Perfect Equilibrium in a Bargaining Model," Econometrica 50(1): 97-109.

Scharpf, Fritz. 1984. "Economic and Institutional Constraints of Full-Employment Strategies: Sweden, Austria, and West Germany, 1973-82." In John H. Goldthorpe (ed.) Order and Conflict in Contemporary Capitalism.

Scharpf, Fritz. 1987. "Game-Theoretical Interpretations of Inflation and Unemployment in Western Europe," Journal of Public Policy 7,3: 227-57.

Scharpf, Fritz. 1991. Crisis and Choice in European Social Democracy. Ithaca: Cornell University Press.

Schmitter, Phillippe. 1981. "Interest Intermediation and Regime Governability in Contemporary Western Europe and North America," in Suzanne Berger, ed., Organizing Interests in Western Europe. Cambridge: Cambridge UP.

Sims, Christopher. 1992. "Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy," European Economic Review 26: 975-1011.

Soskice, David. 1990. "Wage Determination: The Changing Role of Institutions in Advanced Industrialized Countries." Oxford Review of Economic Policy, 6: 36-61.

Swenson, Peter. 1989. Fair Shares. Ithaca: Cornell University Press.

Swenson, Peter. 1991. "Bringing Capital Back In, or Social Democracy Reconsidered: Employer Power, Cross-Class Alliances, and Centralization of Industrial Relations in Denmark and Sweden." World Politics: 513-45.

Tarantelli, Ezio. 1986. "The Regulation of Inflation and Unemployment," Industrial Relations: A Journal of Economy and Society, 25:1-15.

Notes

1. Although, by some definitions corporatism extends well beyond mere encompassing wage bargaining, for our purposes we will restrict the term to refer only thereto.

2. Scharpf's work (*op. cit.*) is somewhat of an exception as it does consider, informally at least, the interaction of fiscal, monetary, and wage-setting policy-makers.

3. A recent amendment to this argument (Calmfors and Driffill 1988) notes that perfectly competitive labor markets can also ensure wage restraint *via* market discipline. I do not explore this extension in the theoretical model, but the empirical model does capture that hypothesis by controlling for the coverage of wage-bargaining when estimating the effects of coordination. The results obtained in empirical estimation produce something quite like the hump-shaped relationship between coordination and unemployment hypothesized by Calmfors and Driffill. The difference is that coordination is shown to be more beneficial the greater is CBI.

4. Wage and price bargaining (setting) suffice as justification for the demand-determined output form of the model. We need both nominal and real rigidities to get policy effectiveness on the order required by the theory (Ball and Romer 1990), and wage-bargaining with mark-up pricing provides both. I have no doubt that both are present in all real-world economies and available evidence supports this view. Bernanke and Blinder (1992), Blanchard (1989), Fair (1988), Friedman and Schwartz (1963), Gali (1992), Romer and Romer (1989), Sims (1992)) all provide varying degrees of support for the continuing effectiveness of traditional demand policy (once one controls for supply shocks). The focus on aggregate demand in the theoretical model is for clarity. Empirically, decade dummy-variables and a variable measuring oil imports as a percentage of total inland supply will serve as controls for supply shocks which, for decade-frequency data, were probably dominated by the oil shocks in the seventies

The appropriate time period for the theoretical model is also established by wage bargaining to be the interval between bargains: 1-3 years in OECD economies.

5. In equilibrium in a Keynesian setting, demand equals output equals income. Therefore, where not ambiguous, the terms will be used interchangeably.

6. To keep matters transparent, the domestic-price index is used to adjust nominal interest-rates and nominal money-demand (below) to real. Using the consumption-price index would not alter the substance of our conclusions but would require additional steps in the algebraic simplification.

7. Recall that depreciation (appreciation) is a *rise (fall)* in the exchange rate. To be sure, exchange-rate determination is much more complicated than this; I would need to model expectations, in particular, to be more complete. However, for the present purposes, nailing down the direction of exchange-rate movements is sufficient, and no one doubts that exchange rates generally appreciate when domestic interest-rates exceed foreign. (Even the depreciation that may occur after an exogenous increase in domestic interest-rates in a Dornbusch (1976) over-shooting model follows a discontinuous appreciation which it does not completely erode.)

8. Here I am assuming a fixed mark-up for simplicity, but the assumption may be justified by either "menu-costs" in changing prices (Mankiw 1985) or calculation costs or "near rationality" in price re-optimization (Akerloff and Yellen 1985). Note that this argument would mean that the output and real-wage effects of policy are temporary, lasting only until the next optimization. Unemployment, on the other hand, is well-known to be extremely sticky, implying that such temporary policy effectiveness in terms of output has much longer impact upon unemployment levels. This is part of the argument for testing the model in reduced form with unemployment measured in relatively long intervals as a dependent variable.

9. I have modeled the economy so that all wages are bargained. It is not difficult to allow some wages to be set outside of bargaining if those wages are exogenous to bargained wages. If one assumes that some barrier to entry into the bargaining sectors exists and that labor markets do not clear, the substantive conclusions of the model are unchanged. (These two additional assumptions are required for any model of fragmented labor markets to generate involuntary unemployment.) To see this, simply change equation 5 to $P^{\mu}=\Sigma a_j \mu W^{\mu}_j+(1-\Sigma a_j)\mu W^{n}$ where W^{n} are non-bargained wages. So long as dW^{n}/dW^{μ}_j equals zero, or in fact so long as it is lower than one, the propositions put forward in the text hold.

10. The assumption may mask another potential difficulty facing coordinated wage bargaining. If productivity growth-rates differ across sectors and if corporatist bargaining seeks to decrease wage differentials, then maintaining wage restraint and wage compression become incompatible goals (see Iversen 1995 for an argument which focuses on this at length).

11. I will be restricting my attention to the instructive case where the monetary-policy authority achieves zero inflation, so the term dP^d/dt can be ignored. Including it would again considerably complicate the exposition without adding any insight.

12. Specifically, a coordinated bargain, whether explicit as in Austria or *via* leading settlements as in Germany and Japan (see Soskice *op cit.*), is represented by directly linked wage increases for all labor covered by the bargain. Wages covered in the bargain are assumed to move together perfectly; thus it is as if, in each of the j bargains, a single wage is being bargained for all of the workers covered by the j^{th} bargaining unit.

13. Again, all that we need is a generally negative relationship between output and unemployment, which is not controversial; it is merely simplest to let this relationship be exact and monotonic.

14. Recall that we fixed productivity growth at zero and that allowing for (exogenous) productivity growth would merely force us to carry around an extra term reflecting it. Thus, I reiterate that wages could rise in line with productivity without affecting profits or output, and all the analysis in the text would be unaltered provided I spoke of wage increases relative to productivity growth rather than wage increases *per se*. When I use the phrase *excessive wage increases*, I am referring to increases in excess of productivity (and acceptable inflation).

15. In equations 8 and 9 the appropriate expression for aggregate demand is $Y+Y^*$. As noted below, the small-open-economy assumption is already employed which allows us to ignore Y^*, but I should note that here the assumption is not necessarily completely innocuous. It obscures the possibility that V_{Y1} is not equal in the traded and sheltered sector. Given our empirical results, this does not seem important enough outweigh the effects emphasized in the text.

16. If equations 13-18 are linear, then strictly speaking the derivative may never be zero nor will the weighted sum (see below) necessarily ever be. On the other hand, if V^u_w, V^u_{Y1}, V^u_{Y2}, *etc.* are treated as partial derivatives of a more standard-convex utility function, then marginal utilities from real wages and output are decreasing and solutions exist. In any event, as we shall see the point is that the larger the terms by which these partial derivatives are multiplied, the more excessive wage-settlements will be.

17. Rubinstein (1982) shows that, though Nash bargaining is a cooperative-game-theory solution-concept, it is identically equal to the solution of a non-cooperative game of offers and counter-offers. Wage-bargaining is clearly similar to such a Rubinsteinian game, so it is not valid to criticize the present model on the grounds that the Nash solution is cooperative while wage-bargaining is not.

18. Should empirical confirmation be required that public-sector unions are not apt to offer restraint, consider the ÖTV-led wage-negotiations in Germany in 1974 discussed in section V.

19. Once again, the domestic-price index is used instead of the consumer-price index for simplicity. Having the central bank to react to the consumer-price index would merely complicate the math without adding insight.

20. This is done so the term $d(dP/dt)/dW_j$ can be ignored. The algebra otherwise becomes considerably messier while nothing is added to the insight.

21. This effect actually weakens the resolve of sheltered-sector firms to resist wage demands since as they become more coordinated they become more certain that their competitors prices will rise in line with theirs if wage demands are met. However, I am inclined to believe this effect is swamped by the other considerations mentioned in the text. The empirical evidence presented in the next section supports this inclination.

22. Apart from whatever costs it may incur by raising taxes and/or issuing debt neither of which is considered here. Again the model overstates the case a bit by not directly modeling the process by which public-sector developments indirectly affect the economy.

23. If we allow for some proportion of the economy to have wages determined without bargaining (as suggested in endnote 9), it is even clearer that we need to control for the extent as opposed to the coordination of bargaining. Wages in the bargained sectors would have to exceed this outside wage in order to attract workers to unions, and these union wages would have to be *excessive* and there would have to be barriers to entry into the bargained sector for us to observe involuntary unemployment as we do. Therefore, controlling for the degree of coordination among bargainers, increasing the extent of wage bargaining without increasing its coordination would have to lead to greater excesses in wages and thus greater unemployment.

24. Notice that the effect of an increase in CWB in the empirical model is $\beta_{CWB}+\beta_{CC}CBI$, so the coefficient on CWB is quite like an intercept term when considering the total effect of CWB. We would hardly want to place to much emphasis on an intercept term for precisely the reasons elaborated in the text. The core of the hypothesis is, then, that $\delta UE/\delta CWB<0$ and that $\delta^2 UE/\delta CWB\delta CBI$ is negative, or, in terms of regression coefficients, that $\beta_{CWB}+\beta_{CC}CBI<0$ over the sample range of CBI and that $\beta_{CC}<0$.

25. Occasionally, the annual figure for unemployment was 0, the log of which is negative infinity. The data are carried only to one decimal place, so I treat these (very infrequent) data points as being .05 unemployment, the boundary at which the rate would have been rounded up to .1. Such country-years are far too infrequent to have any significant effect on the results as omitting them from the averages and re-estimating confirms.

26. Since I take the average for each country over the indices available for that country, this procedure has the added benefit of increasing the number of countries for which an index of CBI is available. Recall also that while CBI could in principle be zero, that never obtains in the sample. The sample minimum is about .15 which obtains in New Zealand from the sixties through the eighties.

27. Some regression analysis is revealing.

CWB=	-.3789	+.3372 BO	+.0928 LO[b]	R^2=.85	
	(.105)	(.051)	(.064)	N = 21	
CWB=	-.3882	+.3072 BO	+.1336 LO[a]	R^2=.84	
	(.112)	(.068)	(.097)	N = 21	
CWB=	-.5558	+.1566 BO	+.0496 LO[b]	+.3336 EWC	R^2=.97
	(.078)	(.047)	(.041)	(.060)	N = 11
CWB=	-.5612	+.1384 BO	+.0549 LO[a]	+.3492 EWC	R^2=.97
	(.083)	(.055)	(.055)	(.059)	N = 11

These results reveal first the nearly exact relationship between EWC and CWB within the smaller sample for which Soskice coded his index. This is as intended since EWC employs exactly the definition of coordination used here: coordination in wage bargaining, be it employer- or labor-led and be it by explicit coordination or leading settlements. The coefficients also reveal a heavier weight on BO than on LO in both the full sample and the Soskice sub-sample. That is also as intended because our theory indicates greater wage restraint from employers than labor. Finally, the high R^2 of each regression re-confirms the tight relationship between my and previous indices (implying multiple correlations in excess of .9 in all cases).

28. This is unfortunate as presumably coordination of labor and employers in bargaining is time-variant even though the indices are not. Measures which would aid in the construction of such an index are being compiled by Golden and Wallerstein (1995), but they are currently available for at most sixteen countries and focus on union density and concentration, *i.e.*, on the labor side and not directly on coordination. Unless and until such measures become available, there is nothing to be done about this problem but to acknowledge it.

29. Employees of publicly owned enterprises which sell in private markets are not included in these figures. Such workers would fall somewhere between public-sector workers and private-sector workers as the two are defined in the model. While they do sell in private markets and therefore could be considered private-sector, it is also likely the case that they would expect the government to bail them out of any excessive wage gains through some sort of loan to the firms, which makes them somewhat akin to public-sector workers.

30. Spain 1980 was discovered to be a large outlier (t-statistic on a dummy for that observation was in excess of 26!). Its residual was an order of magnitude larger than any other and so it was deemed wise to omit that observation from all estimations. Its omission lowered all standard errors, of course, by lowering the standard deviation of residuals. However, by and large, particular coefficient standard errors were not affected noticeably more than others, so this observation is more of an outlier than an influential point. Moreover, the broad flavor of the results was not contaminated by the omission. *P*-levels were lowered with the omission, but what is reported as unambiguously significant here was also significant at standard levels with the outlier included.

31. The significance of the oil-dependency control is one change resulting from the correction to the E-Views estimation procedure. It inclusion in the results now reported did not, in turn, cause any major changes in the substantive results.

32. Send a blank, IBM-formatted 3.5" disk along with your request to the author care of the Government Department, Harvard University.

33. Throughout this paper, I will report both Wald F-and Chi-Squared-tests. Wald tests are preferable to the usual F-tests in this set-up because they incorporate the information given by White's heteroskedasticity-consistent variance-covariance matrix while F-tests do not.

34. The data are partly cross-sectional, and it is standard to assume heteroskedasticity in cross-sections. However, White's test for heteroskedasticity, with or without cross-terms, failed to reject the null of homoskedasticity of the weighted residuals. These tests had very few or no degrees of freedom, though, suggesting the caution I employ in reporting White's heteroskedasticity-consistent standard-errors. In general, the results were, if anything, even more favorable to the theory if one does not employ White's robust errors. Note: versions of E-Views prior to 1.1c produce incorrect coefficient standard errors when using both WLS and White's.

35. A pair of notes on the panel-corrected-standard-errors (PCSEs) suggested by Beck and Katz (1995) which are not reported here: first, the present data are overwhelmingly cross-sectional (21 countries, up to 3 decades); therefore, I expect the more usual heteroskedasticity (*i.e.*, non-constant variance) to be a much greater danger to the accuracy of the standard-errors than contemporaneous correlation. Thus White's robust estimators are more appropriate. Second, Beck-Katz PCSEs were nonetheless estimated, and none of the test results reported were different with their application (details available from the author upon request).

36. Coefficients on the decade dummies trend upward in each decade. The coefficients on the lag trend downward. The coefficients on oil-dependency and its lag are positive and higher on the lag. Contact the author for a complete report.

37. For an excellent treatment of model assessment techniques, see Beck and Katz (1993) who suggest the criterion, s, which is discussed below when we explore the robustness of our results.

38. Recall that, since we include traded-sector and public-sector and omit sheltered-sector employment-shares and since the three add to 100% of employment, implicitly the effect is of a shift of 5% of employment from the sheltered to the public sector. Similarly, the estimated effect of traded-sector employment-share is of a shift of employment from the sheltered to that sector.

39. In fact, the factor-analysis variable and manufacturing alone usually outperformed manufacturing, mining, and quarrying by a small (insignificant) margin. One could conjecture as to why this was (*e.g.*, mining and quarrying is heavily protected and may not therefore be fully *tradeable* in our sense; factor analysis actually, fortuitously, produced a better measure than my theoretical conjecture), but the differences were too minor to make that much more of this than that the results are robust.

40. The recodes are $BO^2/(BO+LO)$ and $LO^2/(BO+LO)$ where $BO/(BO+LO)$ and $LO/(BO+LO)$ are taken to be the usual Nash-bargaining-power weights.

41. I make no claims here regarding the likelihood of either a central bank for Europe being instituted nor of its being particularly independent if instituted.

42. See Hall 1993 for an argument along some of these same lines.

43. Centralization is not be quite the same thing as coordination as evidenced by the pattern-setting wage bargains typical of Germany and Japan. However, it is probably close enough for the qualitative discussion of this section, especially as, in contrast to the econometrics of the previous section, I am here comparing only within country over time rather than both across countries and over time.

44. In Japan, Golden and Wallerstein (1995) indicate that coordination of bargaining has in fact been increasing. While data for Switzerland are not yet available, no one to my knowledge has written of employer-led coordination in bargaining declining there. These two countries as well, then, would fit the proposed hypothesis detailed below.

45. Another argument is that political power has shifted from labor to employers in these economies. I, in fact, support this view. The argument, however, requires that one explain why employers have become enemies of coordinated bargaining; they were, for example, instrumental in instituting coordinated bargaining in Sweden (see Pontusson 1992b). My view is that the increasing prominence of public-sector unions in wage bargaining led to a decreased ability for unions to provide wage restraint in national bargains which in turn soured employers on coordinated wage bargaining.

Figure 7: Estimated Impact of CBI in Each Available Country-Decade

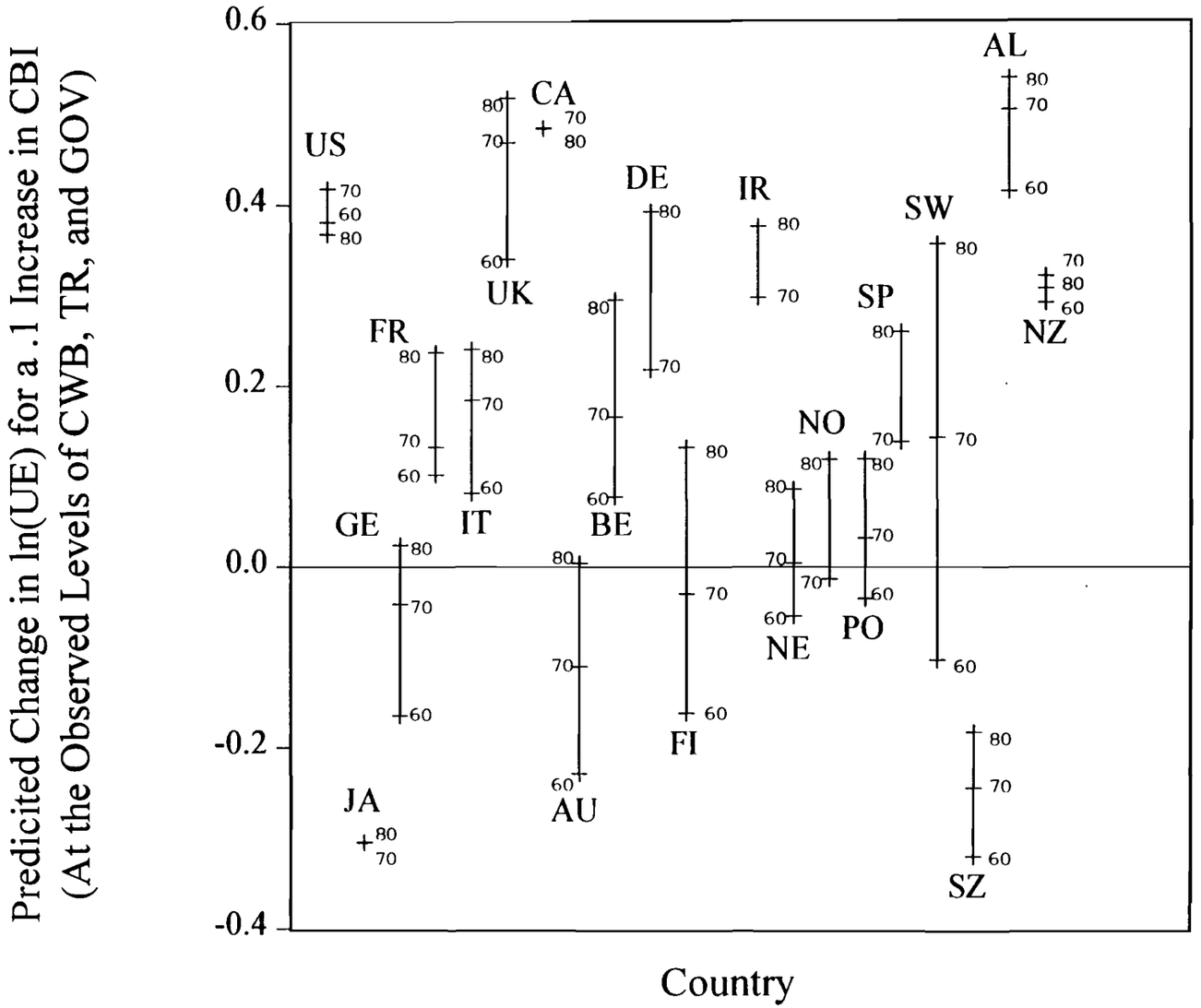


Figure 1: Unemployment Impact of 5% Increase in Government Employment-Share

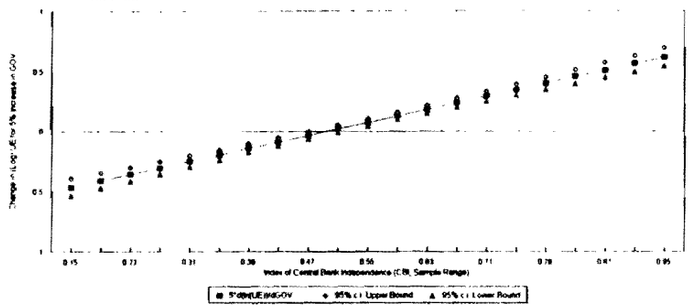


Figure 2: Unemployment Impact of 5% Increase in Government Employment-Share

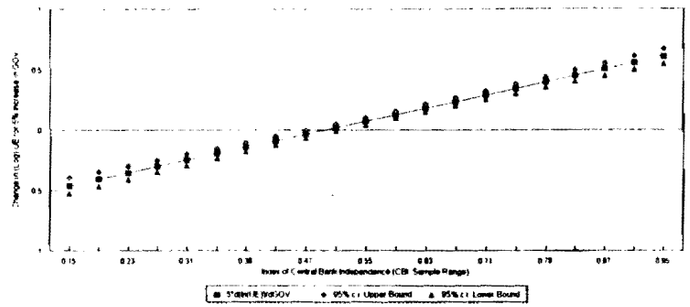


Figure 3: Unemployment Impact of 0.1 Increase in Coordination of Wage Bargaining

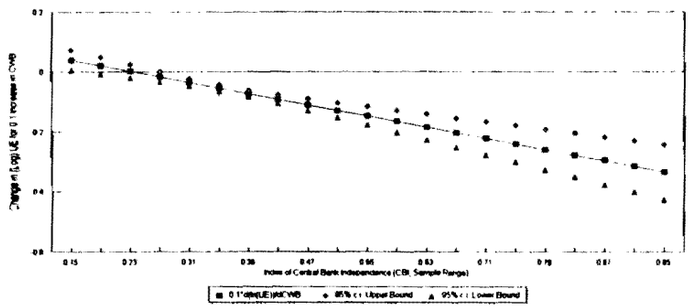


Figure 4: Unemployment Impact of 0.1 Increase in Coordination of Wage Bargaining

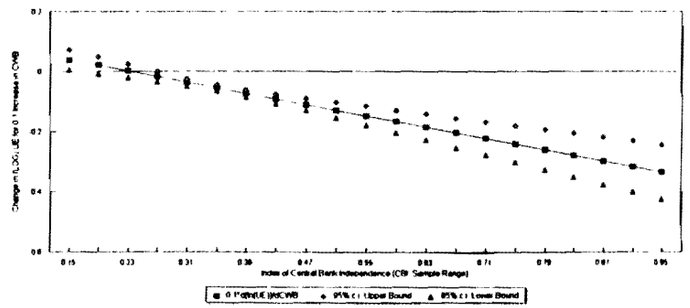


Figure 5: Unemployment Impact of 5% Increase in Traded-Sector Employment-Share

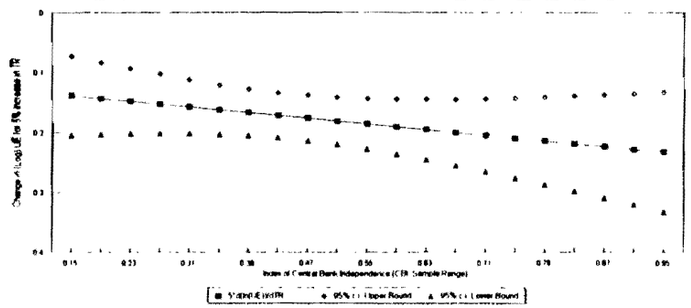
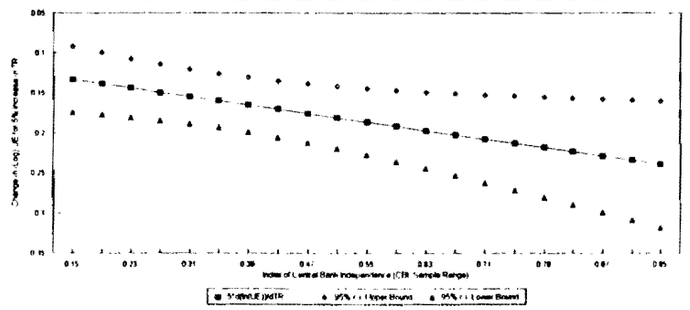


Figure 6: Unemployment Impact of 5% Increase in Traded-Sector Employment-Share



The Minda de Gunzburg Center for European Studies

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