

Institutional and structural interactions in monetary policy and wage/price-bargaining

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ABSTRACT: This chapter considers institutional complementarities at the macroeconomic level. It examines unemployment and inflation management in developed democracies, stressing the interactions of wage/price-bargaining institutional and sectoral structure with monetary-authority credibility and conservatism. It first briefly reviews the coordinated-wage/price-bargaining and central-bank-independence literatures, highlighting theoretical and empirical weaknesses engendered by their failure to consider potential interactions between these macro-institutions. It then synthesizes and extends these theories, showing how degrees of central-bank independence and of wage/price-bargaining coordination interact with each other and with the sectoral structure of bargaining to determine monetary-policymaker and wage/price-bargainer incentives. The results show credible monetary conservatism and traded-sector-led (not public-sector-led) coordinated bargaining to complement in producing low unemployment and to substitute in producing low inflation. The macroeconomic record of 21 developed democracies over 20 years of flexible exchange rates supports this synthesis and extension, which also resolves the theoretical and empirical problems arising in previous, non-interactive analyses.

1. Introduction

Institutional political economists interested in politico-economic management of inflation and unemployment have confronted two disparate and partially contradictory literatures. One approach derives from the modern neoclassical economics of monetary policy and stresses the monetary authority's anti-inflationary conservatism and credible autonomy from the current government. The central claim is that credibly autonomous and conservative central banks achieve

nominal (e.g., inflation) benefits at no real (e.g., employment) costs on average. The other derives from the study of interest intermediation in democracies and stresses institutions in labor and, more recently, goods markets. Its central claim is that coordinated wage/price-bargaining fosters restrained settlements by internalizing certain externalities inherent to the bargains, thereby providing real and perhaps also nominal benefits. Each argument emphasizes a single institution in the macro political economy: the degree of central-bank independence from political authority or of wage/price-bargaining coordination across the economy. This exclusivity of focus clearly facilitated theoretical development; the two literatures are now among the most influential in political economy, academically and practically. However, monetary policy and wage/price-bargaining are intimately related exercises, so the sorts of institutional interactions emphasized in this volume are especially likely to operate in this setting.

Building on these well-developed arguments and several recent contributions¹ beginning to combine their insights, I argue that the institutions of monetary policymaking and wage/price-bargaining interact, with each other and with the sectoral composition of the bargainers, in macroeconomic regulation. Specifically, *central-bank independence, coordinated wage/price-bargaining, dominant traded-sectors and dominated public-sectors are generally substitutes in producing low inflation and complements in producing low unemployment*. More broadly, the incentives facing politico-economic actors are determined by *multiple interactions* among the *set* of institutions and structures of their environments. Macroeconomic regulation of unemployment and inflation, for example, rests not on any single institution, central-bank independence or wage/price-bargaining coordination, but rather on the broader configuration of the set of relevant institutions and structures characterizing the political economy.

I structure the chapter to substantiate these arguments as follows. Sections 2 and 3 review each literature, offering a simple heuristic model designed to highlight its principle theoretical contentions and reproduce its core empirical predictions. Reconsideration of each argument and associated evidence reveals their contradictory theoretical foundations and claims and some

lingering empirical issues. Section 4 addresses these contradictions and issues by merging the literatures' insights and stressing a sectoral-structure extension of that synthesis, again offering a heuristic model to guide the argumentation. This synthesis and extension restores theoretical coherence and demonstrates the operation at the macro-political-economic level of certain institutional complementarities of the sort emphasized in this volume. Section 5 employs the post-Bretton Woods macroeconomic experiences of developed democracies to evaluate the emergent hypotheses empirically. Section 6 concludes.

2.1. Central-bank independence: reviewing the neoclassical argument

Institutional political economists in the 1980s and 1990s argued convincingly that central-bank independence lowers inflation.² Due to credibility advantages such central banks enjoy over elected governments, the inflation benefit is argued to come without real economic costs (e.g., unemployment) on average. Simplifying and summarizing, the argument proceeds thus.

First, given nominal and real rigidities in the economy, such as those created by wage/price-bargaining, the monetary authority has incentives to create 'surprise' inflation, thereby lowering real wages (prices) and thus spurring employment (real demand). Second, the private-sector is, however, aware of these incentives and incorporates their inflationary consequences into its wage/price setting. Thus, in rational-expectations equilibrium, monetary authorities cannot systematically surprise bargainers, so real wages (prices) and thus employment (output) are unaffected on average while inflation is higher. Third, if, contrarily, monetary authorities could *credibly* promise to refrain from inflationary policy, bargainers could set lower wages (prices) without fear so that, again, real wages (prices) and so employment (output) would be unaffected on average, while inflation could be lower than without such credible commitment. Lastly, institutionalizing a conservative central bank with relative autonomy from political officials is held to provide such credibility; therefore, central-bank independence provides nominal benefits without adverse real effects on average.

Looking more closely, the neoclassical model begins by specifying the utility function,

$V^m(\cdot)$, of the monetary policymaker (see Cukierman 1992:27-45):

$$V^m = -\left[\frac{1}{2} A(N^* - N)^2 + \frac{1}{2} \pi^2\right] \quad (1)$$

i.e., policymakers dislike deviations of employment and inflation from their targets ($N-N^*$ and $\pi-\pi^*$, with $\pi^*=0$ for simplicity).³ A here reflects policymakers' weight on employment relative to inflation; *conservative* can therefore be defined as having lower A , N^* , and/or π^* .

Next, with nominal contracts and market power, unexpected money-growth spurs employment beyond its natural rate (N_n), giving the economy as an expectations-augmented Phillips Curve:

$$N = N_n + \alpha(\pi - \pi^e) \quad (2)$$

where π^e is expected inflation and α the slope of the Phillips Curve (i.e., the real effectiveness of surprise money). Finally, given rational expectations and no uncertainty, abstracting from real growth or velocity shocks, and assuming for simplicity that monetary authorities directly control inflation, equilibrium inflation absent any commitment devices is found by substituting (2) into (1), maximizing with respect to π , and then applying rational expectations by setting $\pi = \pi^e$:

$$\pi_d^* = A\alpha(N^* - N_n) \quad (3)$$

Since this *discretionary equilibrium inflation* (π_d^*) involves only parameters known with certainty by the private sector (A, α, N^*, N_n), expected inflation (π^e) is actual inflation (π_d^*), so employment (N) does not deviate from its natural rate (N_n) in rational-expectations equilibrium.⁴ If, however, the bank could credibly commit to lower inflation (say its target rate, zero), expected and actual inflation would again be equal (at zero), so equilibrium employment would still be the natural rate (N_n). Call this *commitment inflation*: $\pi_c^*=0$. The argument then equates central-bank independence with credible commitment to conservative inflation-policy and thus concludes that independence lowers inflation without real costs on average.⁵

That central-bank independence lowers inflation without real costs on average has been

extensively empirically tested. Typically, postwar averages of inflation and of some real outcome are regressed on indices of independence in cross-sections of 15-21 OECD countries; rarely is the data temporally disaggregated or are any controls included.⁶ Such cross-sections reveal impressively strong negative correlation between central-bank independence and inflation and no significant bivariate correlation in those small samples between independence and virtually any real outcome. Figure 3.1 graphically summarizes the statistical case for the neoclassical model.

[Figure 3.1 Here]

Prominent *real-world* examples also bolstered the case. Germany, Switzerland, and the US have famously independent central banks and share experiences of relatively low inflation while their unemployment experiences differ considerably. Such eloquently logical argument, simple but striking quantitative evidence, and prominent empirical anecdotes have apparently convinced wide academic and policymaking audiences. Raising central-bank independence has risen on policy agendas around the world recently; and many have moved in this direction: Italy and New Zealand most notably among developed democracies. The requirements for European Monetary and the European Central Bank were also clearly designed with these arguments, with this evidence, and with the template of the *Bundesbank* in mind.

2.2. CBI: lingering theoretical issues and empirical anomalies

First, even in its own terms, the model indicates more than has generally been explored theoretically or empirically.⁷ Beyond central-bank independence lowering inflation, **(3)** implies also that anything that increases the (i) government's weight on employment relative to inflation, A , (ii) real-effectiveness of surprise money, α , (iii) government's employment or inflation targets, N^* or π^* , or that decreases the (iv) natural rate of employment, N_n , raises discretionary inflation. Central-bank independence then lowers actual inflation from this discretionary level toward the bank's target level (here zero). Accordingly, it lowers inflation more (less) the higher (lower) discretionary inflation would have been. Points (i) and (iii), for example, suggest that

independence reduces inflation more under left than right government because the left places greater weight on unemployment relative to inflation or has higher employment or inflation targets (higher A , N^* , or π^*). More importantly here, points (ii) and (iv) begin to suggest one possible avenue for synthesizing central-bank-independence and coordinated-wage/price-bargaining theories since the institutional features of the wage/price bargain directly impact the real-effectiveness of monetary expansion (α) and the natural rate of employment (N_n).

Previous estimations of the anti-inflationary impact of central-bank independence were, therefore, mis-specified.⁸ Defining CBI as the *degree* of central-bank independence, $0 \equiv$ none and $1 \equiv$ complete, the theory more precisely predicts:

$$\pi = CBI \cdot \pi_c^* + (1 - CBI) \cdot \pi_d^* \quad (4)$$

where π_d^* is the discretionary inflation from (3), and π_c^* is commitment inflation. Thus, the argument suggests that the anti-inflationary impact of central-bank independence depends on everything that determines discretionary inflation differently from commitment inflation, i.e., everything to which the inflation policies of central banks and government would respond differently. Thus, even the neoclassical theory of central-bank independence and inflation, correctly conceived, implies that *the inflation effects of central-bank independence depend on many other domestic and international structural and institutional features of the political economy in which the central bank interacts*. On that, neoclassical central-bank-independence theory, coordinated-wage/price-bargaining theory, and the synthesis and extension offered here agree. I explore this partial agreement further below.

The theoretical and empirical problems in the standard model extend further though; central banks' behavior and public announcements are also anomalous from that view. For example, the US Federal Reserve frequently announces and/or acts upon its intention to raise interest rates 'to defuse incipient inflationary pressures' or lower them 'to prevent recession'. However, *incipient inflationary pressures* do not exist in this model since the bank controls

inflation directly; nor does relaxing that assumption, which was merely simplifying and known false anyway, correct matters. Theoretically, inflation is a weighted average of discretionary and commitment inflation (π_d^* and π_c^*) as in (4). π_d^* , in turn, is a function of A , α , N^* and N_n as in (3), but none of these vary cyclically in a manner consistent with Fed behavior. By *incipient inflationary pressures* the Fed means a strong real economy. If the government's relative weight on or target for employment (A, N), monetary real-efficacy (α), and the natural rate (N_n) vary at all cyclically it would be to lower A , α , and $N^* - N_n$ in booms. That is, when the economy is pushing capacity, governments tend to fret more over inflation than employment (A lower), the real-efficacy of monetary policy (α) diminishes by the law of diminishing returns, and the gap from target to actual employment ($N^* - N$) shrinks. Thus, by this theory as seen in (3), *incipient inflationary pressures* should concern central banks *less* in booms than busts. Also, by this theory, by announcing its intention to lower interest rates, the bank weakens that very policy's effect in stemming any coming slowdown. The Fed's behavior is therefore anomalous.⁹

The *Bundesbank* behaves somewhat differently, but equally anomalously. It often directs its pronouncements specifically to wage/price bargainers or the government, more or less overtly threatening to respond to upcoming wage/price settlements or public budgets that it views as inflationary by raising interest rates.¹⁰ Thus, the *Bundesbank* identifies the sources of the *incipient inflationary pressures* it perceives: budgets and wage/price bargains. Again, though, neoclassical theory cannot explain *Bundesbank* behavior. First, public budgets do not affect inflation in this model, leaving little reason to address the government except as a price-setter for public goods and as the public-sector employer. Second, more revealingly, wage/price bargainers here simply add expected money growth to desired real-wage growth. No need to threaten a *response* then; a credible bank announcement of *fixed* intended money-growth will suffice.

Thus, the behavior and pronouncements of both *Bundesbank* and Fed seem to contradict the theory. Moreover, that the *Bundesbank* speaks differently and to different actors than the Fed is

also inexplicable from the neoclassical view. Finally, the theory has been inappropriately tested, even in its own terms, especially on the nominal side because **(4)** demands interactive empirical models, but also on nominal and real sides because necessary controls have usually been omitted. The proposed synthesis and extension, which will resolve these anomalies and begin to fill the empirical gaps, requires that we next consider wage/price-bargaining institutions.

3.1. Coordinated wage/price-bargaining: reviewing the basic argument

A largely unconnected literature developed contemporaneously showing encompassing (Olson 1965) wage/price-bargaining can achieve real, and perhaps nominal, wage and price restraint and thereby has beneficial employment, and perhaps inflation, effects.¹¹ The argument, simplified and summarized, proceeds thus. One person's wage-earnings (output-price) are another's wage-cost (input-price). Therefore, if wage/price bargains occur in highly fragmented units, this and any other aggregate externality are ignored, so fragmented wage/price settlements will be higher than optimal. They will include increments to offset expected increases elsewhere in the economy.¹² If, contrarily, bargaining occurs in encompassing or coordinated units, this externality is internalized and such increments are unnecessary. Thus, coordinated wage/price-bargaining induces wage/price restraint and therefore lowers unemployment and inflation.

A heuristic model derived from these first principles will prove useful later. Following the early literature, I begin with wage bargaining from labor's perspective. First, identify the value functions of the j worker-bargaining-units (*unions*). The core of the argument is that these j unions derive utility from the real consumption-value of their wages, ω_j^c , and from their employment prospects, ε_j , which latter are increasing in, *inter alia*, aggregate output-growth, y .¹³

$$V_j^u = V^u(\omega_j^c, \varepsilon_j(y, \cdot)) \text{ with } V_1^u \equiv \frac{\partial V^u}{\partial \omega^c} > 0, V_2^u \equiv \frac{\partial V^u}{\partial \varepsilon} > 0, \varepsilon' \equiv \frac{\partial \varepsilon}{\partial y} > 0 \quad (5)$$

Defining terms in log changes (growth rates) for comparability with the previous model, the growth of real consumption-wages for the j^{th} union (ω_j^c) is the difference between its nominal-

wage growth (w_j) and the growth in consumer prices (inflation, π):

$$\omega_j^c = w_j - \pi \quad (6)$$

The perceived marginal value to any union j of gaining higher nominal-wage-growth for itself (w_j) is found by substituting (6) into (5) and differentiating with respect to w_j :

$$\frac{\partial V_j^u}{\partial w_j} = V_1^u \left(1 - \frac{\partial \pi}{\partial w_j} \right) + V_2^u \left(\frac{\partial \varepsilon_j}{\partial y} \cdot \frac{\partial y}{\partial w_j} \right) \quad (7)$$

(7) reveals the central conclusion. Unions perceive more value from nominal wage-gains, and so exercise less *wage restraint*, the larger this expression; the lower this derivative, the more wage restraint unions are likely to exercise.¹⁴ The first term on the right indicates that the real-wage gains union j expects from any given nominal-wage increase are lower the more j expects aggregate-price inflation, π , to parallel its wage-inflation (w_j). At one extreme, j 's bargain is all-encompassing, so j expects inflation to move one-for-one with its settlement: $d\pi/dw_j = 1$. Union j expects no real-wage gains because it knows the rest of the economy will exactly follow its own nominal gains. At the other extreme, when individual bargains are vanishingly small relative to national aggregates, no union perceives aggregate inflation to respond to its little settlement: $d\pi/dw_j \approx 0$. In short, nominal wage-gains are perceived to produce real wage-gains in proportion to wage/price-bargaining fragmentation. The second term in (7) reflects the adverse aggregate-output effects of aggregate (or average) wage-gains: $dy/dw < 0$;¹⁵ unions perceive employment prospects to decline with aggregate wage-gains. Once again, though, the response of *aggregate* output to an *individual* bargain's settlement (dy/dw_j) is more negative, and union j 's employment prospects respond more to aggregate output ($d\varepsilon_j/dw_j$), the more encompassing j 's bargain. On both real-wage-gain and employment-prospect-cost side, then, unions are more disposed to deliver wage restraint the more encompassing their bargaining unit or, equivalently, the greater the coordination across bargaining units.

As with central-bank independence, an impressive amount of evidence amassed to support the coordinated-wage/price-bargaining argument (see, e.g., Cameron 1984; Bruno and Sachs 1987). Again, the quantitative evidence has typically¹⁶ involved regressing postwar averages of unemployment and inflation (or some other real and nominal variables) on an index of coordination. Figure 3.2 illustrates (the CWB index employed is described later), and, again, prominent real-world examples added to the argument convincingly. The Scandinavian countries and Austria were well known to exhibit considerable bargaining-coordination, admirable unemployment, and moderate inflation. As with central-bank independence later, the intuitive argument, striking evidence, and real-world examples put wage/price-bargaining coordination on many economic-policy agendas. Some countries (e.g., the UK and Italy) scrambled for a time, though mostly unsuccessfully, to institute such bargaining in their economies (Regini 1984).

[Figure 3.2 Here]

3.2. Coordinated wage/price-bargaining: recent theoretical and empirical extensions

Recent work extends this literature in two directions. Swenson (1989, 1991), Soskice (1990), and Layard *et al.* (1991) draw attention to the, previously virtually ignored, employer side of the wage/price bargain (the *employer-side amendment*). Calmfors and Driffill (1988), Layard *et al.* (1991), and Calmfors (1993) draw attention to market-power assumptions implicit in the union preferences assumed by the early literature (the *market-competition amendment*).

To consider these amendments, I reformulate the simple model slightly. First, unions do not unilaterally set wages; rather, *wage/price* settlements emerge from *bargains* between unions and their counterpart employer-groups (*firms*). Thus, whereas previous focus lay on the marginal utility unions perceive from nominal-wage gains, these must now be considered relative to the marginal disutility firms suffer from ceding such gains and their respective bargaining strengths. Start as before with j unions that value the real consumption-value of their wages and their members' employment prospects, which are now more sensibly modeled as increasing in the output of group j firms. Those j firms care about profits, which are a function of, *inter alia*,

product real-wages (i.e., input costs: ω^p) and demand for their firms' products (y_j):¹⁷

$$V_j^u = V^u(\omega_j^c, \varepsilon_j(y_j, \cdot)) \text{ with } V_1^u > 0, V_2^u > 0, \varepsilon' > 0 \quad (8)$$

$$V_j^e = V^e(\omega_j^p, y_j, \cdot) \text{ with } V_1^e < 0, V_2^e > 0 \quad (9)$$

(8) and (9) clarify that employers and workers bargain over wages understanding that prices will be a mark-up over wages, so they are actually bargaining over how to trade (a) wages against employment, (8), and (b) prices against demand, (9), and (a) against (b). Thus, the first conclusion of the employer-side amendment is that the institutional and structural organizations of labor *and* goods markets are *jointly* relevant to wage/price-bargaining regulation.

Next, assuming union-firm dyads Nash-bargain over nominal-wage growth, some tedious algebra yields the common-sense conclusion that wage/price-bargaining settlements will reflect unions' propensity to offer restraint and firms' arduousness in demanding it proportionately to the relative strengths of their current bargaining positions.¹⁸ Thus, for our purposes, derivatives of (8) and (9) will suffice, as those of (5) did above, to characterize the wage/price-restraint implications of coordination, larger derivatives again implying less restraint. First, define new terms in (8) and (9). Growth of *product* real-wages (ω^p) is nominal-wage growth minus growth of *j*'s *product*-prices (π_j), not *consumption*-price inflation (π_j) as for *consumption* real-wages:

$$\omega_j^p = w_j - \pi_j \quad (10)$$

Demand for and thus output of *j*'s products is increasing in aggregate income and, importantly, decreasing in *j*'s price-growth relative to its competitors' price-growth ($\pi_{i\{j\}}$):

$$y_j = y_j(y, \pi_j - \pi_{i\{j\}}) \text{ with } y_1 > 0, y_2 < 0 ; \text{ define } \rho \equiv \pi_j - \pi_{i\{j\}} \quad (11)$$

Now, substituting (6), (10), and (11) into (8) and (9), and differentiating with respect to w_j gives the marginal (dis)utility unions (firms) perceive from attaining (ceding) a nominal-wage gain:

$$\frac{\partial V_j^u}{\partial w_j} = V_1^u \left(1 - \frac{\partial \pi}{\partial w_j} \right) + V_2^u \cdot \frac{\partial \varepsilon_j}{\partial y_j} \cdot \frac{\partial y_j}{\partial y} \cdot \frac{\partial y}{\partial w_j} + V_2^e \cdot \frac{\partial \varepsilon_j}{\partial y_j} \cdot \frac{\partial y_j}{\partial \rho_j} \cdot \left(\frac{\partial \pi_j}{\partial w_j} - \frac{\partial \pi_{i\{j\}}}{\partial \pi_j} \cdot \frac{\partial \pi_j}{\partial w_j} \right) \quad (12)$$

$$\frac{\partial V_j^e}{\partial w_j} = V_1^e \left(1 - \frac{\partial \pi_j}{\partial w_j} \right) + V_2^e \cdot \frac{\partial y_j}{\partial y} \cdot \frac{\partial y}{\partial w_j} + V_2^e \cdot \frac{\partial y_j}{\partial \rho_j} \cdot \left(\frac{\partial \pi_j}{\partial w_j} - \frac{\partial \pi_{i\{j\}}}{\partial \pi_j} \cdot \frac{\partial \pi_j}{\partial w_j} \right) \quad (13)$$

The employer-side amendment, embodied in these two equations, highlights three obvious but previously under-emphasized points. (a) Consumption real-wages matter to unions while product real-wages matter to firms, and unions derive utility from their real-wage growth while firms derive disutility from theirs, so firms are more disposed than workers to demand (offer) restraint. (b) Though workers' employment concerns virtually mirror employers' output concerns, the term $d\varepsilon_j/dy_j$ reflects employment responses to output growth and underscores a key difference over how much labor will be input for the amount of output demanded at any given price. (c) Most importantly here, the term $d\pi_j/dw_j$ indicates the response of group j 's price-growth to its wage-growth; i.e., it reflects mark-up adjustments (e.g., fixed mark-ups $\Rightarrow d\pi_j/dw_j=1$). Part of any wage/price bargain, then, is a battle over the share of the product-price increases the market will bear that will accrue to wage-earners, i.e., over how to distribute productivity growth and extra-normal profits between workers and employers. The degree to which this battle will be zero-sum depends critically on the competitive situation of group j firms. Specifically, as price competition faced by j 's firms increases (decreases), their arduousness in resisting wage restraint increases (decreases). The critical role that price competition among firms plays in regulating wage/price-bargaining is central to the synthesis and extension offered below. However obvious, points (a)-(c) underscore that the institutions and structures of goods and labor markets interact to structure the incentives facing bargainers. *Wage bargains* are more correctly conceived as *wage/price bargains*, the labor-market position of unions, their institutions and structure, are no more central to wage/price restraint than the goods-market position of firms, their institutions and structure.

Regarding the *market-competition amendment*, compare (7) with (12) and (13). The first two terms of (12) and (7) are identical. Thus, all the (dis)incentives for unions to exercise wage restraint discussed in 3.1 are still present, and firms share or exceed them, but the third terms of

(12) and (13) add another consideration. Namely, union j 's employment prospects and firm j 's profits increase in group j 's output, which in turn decreases in the relative price of j 's products ($dy_j/dp_j < 0$). Thus, the more nominal-wage increases for j cause price increases for j 's products that its competitors less than match (i.e., the greater dp_j/dw_j), the more union (firm) j will have incentive to exercise (demand) restraint. Therefore, group j 's propensity to deliver restraint also depends on their expectations of the responsiveness of competitor's prices to its own.

Therefore, as Calmfors and Driffill (1988) argued, very competitive and very coordinated market structures both induce wage/price restraint. Under perfect competition in labor and goods markets, workers cannot garner wages exceeding the marginal value of their product, and, since competitor's prices do not respond to j 's, firms cannot pass the cost increase of wage gains to consumers. Any nominal gains in excess of productivity growth (i.e., any lack of restraint) will drastically harm employment prospects and profits; indeed, atomized bargainers facing perfectly competitive labor (goods) markets who exercise insufficient restraint simply lose all their jobs (demand) with certainty. The force of this incentive makes the externality consideration that the early coordinated-bargaining literature stressed irrelevant under perfect competition. Conversely, under perfect bargaining coordination across the entire economy, all concerns about prices relative to *domestic* competitors vanish since all *domestic* wages will rise with one's own. Under these conditions, incentives to exercise restraint stem only from considerations of national competitiveness, exactly as argued in the earliest literature. Between the extremes, some mix of incentives applies. More specifically, Calmfors and Driffill (1988) argue that industry-level bargaining allows workers and firms some shelter from competitive-pricing considerations—their competitors, being within the industry, will have the same wage/price settlement—but, no industry being terribly large relative to the whole, national-level concerns will still mostly be ignored. They conclude, therefore, that intermediate levels of coordination in bargaining are inferior to both zero and full coordination, yielding the now-famous hump-shaped hypothesis.

Summarizing, modern coordinated-wage/price-bargaining theory stresses economy-wide coordination; institutions and structures of labor and goods markets are equally key. Modern theory also hypothesizes a hump-shape relation between coordination and wage/price restraint. No and full coordination achieve restraint, but intermediate levels do less well. However, as with central-bank-independence theory, theoretical and empirical issues linger.

3.3. Coordinated wage/price-bargaining: theoretical and empirical problems

Three empirical controversies continue to plague theoretical development. First, much disagreement remains over the degree of coordination characterizing certain country-times. Calmfors and Driffill (1988) and Soskice (1990), e.g., dispute Japan and Switzerland. Second, a wider debate lingers over whether and how well union-membership structure might proxy for effective coordination.¹⁹ A third, more theoretically central, debate involves whether the ‘hump’ exists, what shape it takes, and where empirically nations lie on the hump. That is, coordination and restraint may relate curvilinearly, but whether the hump rises very quickly from zero coordination and then gradually declines, *vice versa*, or anything in between is theoretically ambiguous. Also unknown with any precision is where countries lie on that hump whatever its true shape since, however one resolves the measurement issue, how the resulting *empirical* index places relative to *theoretical* no and full coordination would remain unknown.²⁰

Current theory insists that empirical measures consider bargaining-coordination across the economy, among employers as well as unions; they cannot derive solely from the structure of union-membership.²¹ Moreover, estimated coordination-restraint relationships must reflect both the competition and coordination effects of labor and goods market institutions and structures. The curvature of the relationship between effective, economy-wide coordination and wage/price restraint must be estimated directly as in Iversen (1998a), or the competition-impacting and coordination-impacting features of wage/price-bargaining institutions must be separated. I follow Layard *et al.* (1991) in attempting the latter, relying on union density to capture competition-reducing and a subjective index of economy-wide coordination to represent coordination-

increasing aspects of bargaining organization.

Two important theoretical omissions also remain. First, as noted above, the central-bank-independence literature hinders consideration of interactions between wage/price-bargaining and monetary institutions by assuming monetary authorities control inflation directly. Coordinated-wage/price-bargaining theory is equally ill positioned to consider such interactions because it has generally assumed passive or accommodating monetary policy, yet autonomous and conservative central banks would certainly react to inflationary wage/price settlements. As stressed in central-bank-independence theory, bargainers must consider this reaction in their bargaining; wage/price-bargaining and monetary policy interact, so theory must consider them jointly. Second, work in the bargaining tradition has also generally assumed homogenous unions and firms, yet traded-sector bargainers have different interests, both in general and *vis-à-vis* monetary policy, than do sheltered- (i.e., private-non-traded-) and especially public-sector bargainers. I turn now to a synthesis addressing these theoretical holes and the implied institutional-structural interactions.

4. Theoretical synthesis and extension

Summarizing, the central-bank literature predicts centrally that independence produces low inflation without real costs on average. This prediction has been extensively considered empirically with apparently favorable results. However, the theory actually predicts considerably more, implicitly describing how much independence reduces inflation under various political, economic, institutional, and structural conditions. These predictions have gone virtually unexplored theoretically and empirically. Moreover, the actions and pronouncements of monetary authorities contradict these more precise predictions. Meanwhile, wage/price-bargaining theory predicts centrally that coordination induces nominal and real wage restraint, and thereby helps reduce both unemployment and inflation. This too has been subjected to extensive empirical analysis. Two recent theoretical amendments may have expanded our understanding but have yet to overcome several empirical controversies. However, this literature has evolved largely without

considering either possible monetary-policy reactions to wage/price settlements or the sectorally determined interests of different types of bargainers.

Both lines of research provided indubitably valuable insights, minimally underscoring the institutional characteristics of monetary policymakers and wage/price bargainers as key variables in the politico-economic management of the macroeconomy, yet the incompatibility of their underlying assumptions hinders combination of their insights. On one hand, central-bank theory has typically assumed banks directly control inflation and that bargainers set wage growth to equal expected money growth plus their target real wage, which is assumed independent of labor- and goods-market structures. However, if wages and prices are bargained, inflation is determined by the settlement of these bargains; monetary policy matters because it affects these settlements. That distinction is important. Moreover, wage/price-bargaining implies market power, leaving the possibility that workers (employers) may desire and obtain different wages (prices) depending on expected monetary reactions and their institutional and sectoral structure. On the other hand, coordinated-bargaining theory typically (implicitly) assumed that monetary policy does not respond to wage/price bargains,²² yet monetary policy, whoever controls it, aims to manage inflation, and so must respond to wage/price settlements. Any proposed synthesis, then, must begin by redressing these contradictions.

4.1. A proposed neoclassical synthesis

One possible redress, call it a *neoclassical synthesis*, I began to describe above. Cukierman (1992) notes that, in the neoclassical model, the incentive to create surprise inflation only exists and thus there is an inflationary bias to discretionary monetary-policy only if real wages are excessive, possibly due to the monopoly power of unions.²³ The advance is to model the natural rate of employment (N_n) as decreasing in real-wage excessiveness (ω) and that excessiveness increasing *union power* (UP). That is, unions with some monopoly power target real wages exceeding market clearing, thus creating incentives for ‘surprise’ inflation. Thus, under discretion, inflation increases

in union power because, by (3), π_d^* is increasing in $(N^e - N_n)$, and now N_n is decreasing in ω , which finally is increasing in UP .

We could simply add to this the argument that coordination in bargaining, as opposed to *union power*, produces wage/price restraint rather than excessive real-wages. Thus, the natural rate (N_n) increases in coordination and decreases in union power (without coordination):

$$N_n = N_n(\omega(UP, CWB), \cdot) \quad \text{with} \quad \frac{\partial N_n}{\partial \omega} < 0, \quad \frac{\partial \omega}{\partial UP} > 0, \quad \frac{\partial \omega}{\partial CWB} < 0 \quad (14)$$

This neoclassical additive combination of the two arguments would conclude that:

- (a) Unemployment is decreasing in coordination,
- (b) Inflation is decreasing in independence, but less so the higher is coordination,
- (c) Inflation is decreasing in coordination, but less so the higher is independence, and
- (d) Unemployment is unaffected on average by independence.

The weighted-average in (4) implies the interactive hypotheses (b) and (c) as follows. *Discretionary* inflation rises as the natural rate of employment (N_n) falls, implying independence lowers inflation less the higher is N_n . The natural rate in turn increases with coordination. Thus independence lowers inflation less the greater is coordination. Conversely, coordination raises the natural rate, which lowers discretionary inflation, implying that coordination lowers inflation but less so the less discretionary is inflation (i.e., the higher is independence).

4.2. A fuller synthesis

The neoclassical synthesis retains the real/nominal divide by assuming that monetary policy directly controls inflation and that unions set wages in real levels, with expected inflation simply added thereafter, in a manner that does not depend on the monetary stance regardless of the bargainers' institutional or sectoral structure. However, wage/price-bargaining with market power in labor and goods markets cannot be so compartmentalized. These bargains set nominal wages *and prices*, leaving the monetary authority discretion over how monetary policy will react to these settlements rather than direct control over inflation.²⁴ Moreover, unions and firms may

respond to expected monetary reactions differently depending on their institutional and structural configuration. The neoclassical synthesis is therefore insufficient.

To see how, return to the heuristic model of wage/price-bargaining, but now allow the monetary authority to respond to wage/price settlements.²⁵ As before, analyzing the marginal values to unions (firms) of getting (ceding) nominal wage hikes (dV_j^u/dw_j , dV_j^e/dw_j) will suffice:

$$\frac{\partial V_j^u}{\partial w_j} = V_1^u \left(1 - \frac{\partial \pi}{\partial w_j} - \frac{\partial \pi}{\partial m} \cdot \frac{\partial m}{\partial w_j} \right) + V_2^u \left(\frac{\partial \varepsilon_j}{\partial y_j} \cdot \frac{\partial y_j}{\partial y} \right) \cdot \left(\frac{\partial y}{\partial w_j} + \frac{\partial y}{\partial m} \cdot \frac{\partial m}{\partial w_j} \right) + V_2^u \left(\frac{\partial \varepsilon_j}{\partial y_j} \cdot \frac{\partial y_j}{\partial \rho_j} \right) \cdot \left(1 - \frac{\partial \pi_{i(j)}}{\partial w_j} - \frac{\partial \pi_{i(j)}}{\partial m} \cdot \frac{\partial m}{\partial w_j} \right) \quad (15)$$

$$\frac{\partial V_j^e}{\partial w_j} = V_2^e \cdot \frac{\partial y_j}{\partial y} \cdot \left(\frac{\partial y}{\partial w_j} + \frac{\partial y}{\partial m} \cdot \frac{\partial m}{\partial w_j} \right) + V_2^e \cdot \frac{\partial y_j}{\partial \rho_j} \cdot \left(1 - \frac{\partial \pi_{i(j)}}{\partial w_j} - \frac{\partial \pi_{i(j)}}{\partial m} \cdot \frac{\partial m}{\partial w_j} \right) \quad (16)$$

The new considerations here are the terms involving dm/dw_j , which are how the j^{th} bargaining unit expects the money supply to respond to *its* settlement. Call this the *monetary threat*. That is, the central bank announces that it will not accommodate excessive *aggregate* settlements. If the bank can make that threat sufficiently large and credible for bargaining-unit j 's expected cost of getting (ceding) a nominal-wage gain to outweigh benefits, j will refrain from inflationary settlements and the threat need not be enacted. The neoclassical synthesis ends there: a credible enough bank, wielding a big enough threat, achieves low inflation at no average cost.

Note, though, that central banks cannot threaten to respond to each individual settlement differently. With only one money, monetary policy can respond only to aggregates, implying that the perceived monetary threat, dm/dw_j , involves three substantive parts: the magnitude of the central bank's threatened response to aggregate wage-growth, dm/dw , that threat's credibility, c , and the degree to which bargaining-unit j expects its settlement to affect the aggregate, dw/dw_j :

$$\frac{\partial m}{\partial w_j} \equiv \frac{\partial m}{\partial w} \cdot c \cdot \frac{\partial w}{\partial w_j} \quad (17)$$

Obviously, central-bank independence increases threat credibility, c , but it also increases the maximum acceptable employment/inflation tradeoff since *independent* means *conservative* and autonomous. Higher central-bank-independence thus shifts the expectations-augmented Phillips Curve inward (credibility) but also increases the slope at which the monetary-authority's

indifference curve is tangent to the Phillips Curve (conservatism). In other words, independent banks, by virtue of their greater credibility, can trade inflation for employment at better rates than could discretionary (i.e., political) authorities, such banks will also accept higher unemployment for any given inflation rate than a government would if trades must be made.

The questions, therefore, are whether trades must be made, i.e., whether banks must enact monetary threats, and, if so, what the likely (real) effects are. The answers hinge critically on the institutional and sectoral structure of wage/price-bargaining. Recall that dw/dw_j increases in bargaining coordination. When coordination is nearly full, all wages and prices are effectively set in the central or lead bargain ($dw/dw_j \approx 1$), so all of the bank's threat is directly perceived by that one bargaining unit. Contrarily, when coordination is nearly nil, unions and firms do not perceive other wages to rise with their own ($dw/dw_j \approx 0$), so atomistic bargaining units directly perceive little. Therefore, when coordination is very low, the threat, dm/dw , times its credibility, c , must be extremely high to restrain bargainers without being enacted. In fact, the threat would have to be *incredibly* large if coordination was not moderately high.

For example, suppose some professors have some market power and are bargaining with their university, which also has some market power. By their market power, the professors can demand excessive wages (beyond their productivity growth), and, by its, the university can cede them if it must. The settlement is likely to be inflationary. An independent central bank could threaten to respond to *aggregate* inflationary signs with monetary contraction, but this academic unit is so small relative to the aggregate that from their perspective, however credible the threat, either the bank will contract the money supply or it will not and nothing they do will alter that. Any aggregate threat would have to be catastrophically large for such atomistic bargainers to feel it sufficiently to restrain their settlement appreciably, but catastrophic threats are (*trembling-hand*) *incredible*. No democratic government would idly watch its bank inflict catastrophe.

More generally, settlements become increasingly inflationary as market power rises (absent bargaining coordination). To restrain inflation, the monetary authority must create real

contraction by enacting its threat, thereby raising unemployment (lowering output), thus making the next bargain less inflationary by reducing bargainers' market power and shifting power within bargains toward employers. Equilibrium obtains when bargainers wish nominal increases the bank will tolerate. This explains central bankers' concerns over *incipient inflationary pressures*. A bargaining perspective predicts more-excessive settlements as market power rises, and market power in labor and goods markets increases in booms and decreases in recessions. Booms (recessions) also raise (lower) unions' bargaining power relative to firms. Thus, incipient inflationary pressures are located in wage/price-bargaining, and banks defuse them by preventing the real economy from becoming 'too strong'. The final step in the argument is that how strong the real economy may become before triggering incipient inflationary pressures depends on the institutional and structural configuration of the political economy as I demonstrate below.

With perfect credibility ($c=1$) and no uncertainty, monetary threats need never be enacted (so the neoclassical conclusions will hold), but, absent full credibility or certainty, threats must periodically be enacted to work. Thus, the neoclassical conclusion that greater *credibility* is beneficial remains in tact because credibility helps reduce size or frequency of threat enactment. However, in practice, central-bank independence brings both credibility and conservatism. In (17), the former corresponds to higher c , which is unambiguously beneficial, the latter to greater willingness to increase the magnitude of the threat (dm/dw) at any given credibility level. With periodic threat enactment, the latter is ambiguous, implying the usual Keynes/Phillips tradeoff between inflation and unemployment.²⁶

The next logical question regards the conditions under which this unavoidable tradeoff is more or less costly. Simply and abstractly put: anything that lowers (raises) the enacted-threat required to restrain bargainers improves (worsens) the tradeoff. As just noted, credibility improves the tradeoff, as the central bank literature would suggest, but (17) also reveals that greater bargaining-coordination works does also by increasing dw/dw_j . Coordinated bargainers perceive monetary threats more directly than do fragmented bargainers, so threats can be smaller/less-

frequently-enacted when coordination is high than they must be when it is low. This explains the difference between the *Bundesbank's* and the Fed's behavior. The *Bundesbank* addresses its monetary pronouncements to wage/price bargainers because Germany's labor- and product-market actors have the institutionally and structurally determined incentives and *strategic capacity* (Iversen's apt phrase) to respond. The Fed has no such actors to threaten.

Further implications follow from the differential impact of monetary constriction, which raises interest rates and causes exchange appreciation, across various economic sectors. Refer to (15) and (16). Higher interest rates reduce investment and so hurt employers and workers in sectors dependent on domestic demand, i.e., all *private* sectors ($dy/dm < 0$, $dy_j/dy > 0 \forall$ private-sector j). Public-sector workers, contrarily, are unharmed or even benefit by this because public employment is counter- or a-cyclical ($dy_j/dy \leq 0 \forall$ public-sector j). The investment-reducing effect of enacted threats therefore hurts private- more than public-sector actors, so private-sector bargainers will be more responsive to monetary threats. Thus, the aggregate economy must suffer disproportionately less (more) when the bank must restrain private- (public-)sector actors.

The exchange-rate appreciation caused by enacted threats has three impacts. First, appreciation reduces total demand for domestically produced goods and so, again, harms all sectors dependent on private-sector demand while the public sector remains relatively unharmed or benefits. Second, appreciation raises the price of tradeables relative to non-tradeables and so is especially painful to bargaining units competing in tradeables ($dp_{i(j)}/dm < 0 \forall$ traded-sector j). Finally, exchange appreciation lowers import prices thus reducing the consumption-price index. By raising consumption real-wages, this actually works against enforcing restraint from unions,²⁷ but I suspect this last effect is dominated by the others. Note, though, that it implies again that employer-led is more conducive than labor-led coordination to wage/price restraint.

Adding all of these considerations, monetary-threat enactment would be most costly to bargainers in the private and especially the private-traded sector and least costly to bargainers in

the (non-competing) public sector. Accordingly, traded-sector bargainers will be most responsive to monetary threats and public-sector actors least responsive, so the aggregate economy must suffer less to restrain trade-sector-led than public-sector-led wage/price-bargaining. Moreover, coordinated wage/price-bargainers are more responsive to monetary threats, and, finally, all bargainers are more responsive the greater the credibility of the monetary authority. Thus, important institutional complementarities operate at the macroeconomic level: *central-bank independence reduces inflation most efficiently (i.e., at least real cost) in political economies characterized by traded-sector-led coordinated-wage/price-bargaining and least efficiently in those characterized by uncoordinated bargaining or public-sector-led coordinated bargaining.*

A related set of interactions operates between bargaining coordination and sectoral structure. Public-sector bargainers have little incentive to exercise restraint or to respond to monetary threats appropriately; contrarily, traded-sector bargainers are especially disposed to exercise restraint and to respond to monetary threats appropriately. Thus, coordinated bargaining operates differently depending on the sectoral composition of the economy and the way it is institutionalized in wage-price bargaining. Coordination is most effective, both *per se* and in its interaction with monetary authorities, when traded-sector actors dominate bargaining and public-sector actors follow. Provided the traded sector continues to dominate, coordination will be more beneficial the larger the public sector 'brought into line'. Conversely, if public sectors dominate, coordination is less efficient *per se* and in interaction with monetary authorities; public-sector-led coordination may even be costly since a *lack* of restraint may be coordinated across bargains. Provided the public sector leads, coordination will be less beneficial (more costly) the larger the traded sector because the traded sector will most bear the costs of monetary authorities' attempts to restrain public-sector bargainers. In both cases, sheltered sectors are intermediate.

In sum, then, the proposed synthesis and extension implies:

(a1) Central-bank independence has interactive real effects: it is less costly (or more beneficial) when bargaining is coordinated and traded-sector led and more costly

- when bargaining is uncoordinated or coordinated but public-sector led.
- (a2) Central-bank independence has interactive nominal effects:** it reduces inflation less when bargaining is coordinated and traded-sector led and more when bargaining is uncoordinated or coordinated and public-sector led.
- (b1) Coordinated wage/price-bargaining has interactive real effects:** when traded-sector led, it is more beneficial the higher central-bank independence; when public-sector led, it is less beneficial (or more costly) the higher central-bank independence.
- (b2) Coordinated wage/price-bargaining has interactive nominal effects:** it reduces inflation more when traded-sector led and less (possibly increasing it) when public-sector led. Greater central-bank independence dampens these effects.
- (c) Sectoral structure has interactive real and nominal effects:** Traded-sector dominance enhances the efficacy of coordinated bargaining in delivering wage/price restraint and so has more beneficial real effects the higher coordination and central-bank independence and larger (smaller) beneficial inflation effects the higher coordination (central-bank independence). Provided the traded sector continues to dominate, these effects are magnified by larger public sectors. Public-sector (sheltered-sector) dominance works oppositely (intermediately).

Broadly, this theoretical synthesis and extension uncovered a highly interactive political economy; the effect of any single institutional or structural feature on both real and nominal macroeconomic outcomes depends on the wider configuration of other institutions and structures present. More specifically, central-bank independence and coordinated wage/price-bargaining with traded- dominating public-sectors are generally complements in producing beneficial real outcomes—they tend to augment each other’s efficacy in, e.g., reducing unemployment—and substitutes in producing beneficial nominal outcomes—either can suffice to reduce inflation.²⁸

5. Empirical evidence

I offer first a brief review of evidence amassing in favor of existent syntheses and extensions and

then some new evidence that, in addressing the present theory, extends and modifies previous offerings and may resolve one emerging controversy.

5.1. A brief review of previous evidence

The empirical trail begins with Hall (1994) who, charting postwar-average inflation and unemployment by wage/price-bargaining coordination and central-bank independence, noted an interactive pattern. Hall and Franzese (1998) summarize that pattern tabularly, showing postwar-average (a) inflation declines in independence and in coordination, (b) unemployment declines in coordination, but that (c) the unemployment costs of independence (benefits of coordination) decrease as coordination (increase as independence) increases—real-outcome *complementarity*—and (d) the inflation benefits of independence and coordination each decrease as the other increases—nominal-outcome *substitutability*. Their regression analyses employing postwar-average, decade-frequency, and annual data in 18 OECD countries support these conclusions.

Using decade-frequency data in 21 OECD countries, Franzese (1994, 1996) tests several hypotheses regarding interactive real effects of independence, coordination, and sectoral structure. Beyond interactions of independence and coordination, which yielded substantively congruent and statistically stronger results than Hall and Franzese (1998), these models include traded- and public-sector employment-shares and their interactions with independence. Results strongly supported that public-sector employment-share and independence interact detrimentally in unemployment regulation. When independence is high, increasing public-sector employment-share increases unemployment whereas, when it is low, increasing public-sector employment-share lowers unemployment. That traded-sector employment-share improves unemployment outcomes and more so the greater independence was also supported, though less strongly.

Garrett and Way (1995a) criticize Hall (1994) and Franzese (1994) for their subjective coordination indices. Replacing those indices with ‘union strength’ (union concentration plus wage-bargaining coverage)—a procedure argued against here, following Swenson (1989, 1991) and Soskice (1990)—they nonetheless find similar institutional interactions. Using postwar

quinquennial data in 13 OECD countries, they conclude central-bank independence and union strength interact beneficially in regulating inflation, unemployment, and real-growth. Garrett and Way (1995b, 1999ab) provide more-direct evidence of the adverse effect of public-sector employment-share on coordinated bargainers' ability to deliver wage/price restraint. They estimate, in the same sample, a curvilinear relation between union strength and unemployment, allowing 'public-sector strength' (public-sector share of total union-membership) to alter that relation. They found a hump-shaped relation between union strength and unemployment when public-sector strength is low (low and high union strength producing low unemployment) that becomes increasingly linear-positive as public-sector union-membership share rises [low (high) public-sector-led union-strength producing low (high) unemployment].

Iversen (1996, 1998abc, 1999a) provides further evidence of real effects of monetary conservatism that depend on wage/price-bargaining institutions and *vice versa*, but his findings differ importantly. He argues that monetary conservatism reduces unemployment when wage-bargaining *concentration*—not coordination—is intermediate and increases (has little effect on) unemployment when it is high (low). His findings from quinquennial data in 15 OECD countries, 1973-93 support these predictions. The sample and the measure of bargaining *concentration* differ from the rest, the latter notably regarding placement of Japan and Switzerland, which reflects the empirical controversy between Calmfors and Driffill (1988) and Soskice (1990). The measure of monetary conservatism and credibility also differs, using actual exchange-rate movements additionally to an independence index. These differences are still disturbing, though, because Iversen finds monetary conservatism to have unemployment *benefits* over most of the sample range and unemployment *costs* in the most concentrated-bargaining countries: almost opposite previous results. I suggest below that the present synthesis and extension resolves the apparent controversy, but, first, I emphasize the agreement across all these studies.²⁹

First, all agree that wage/price-bargaining and monetary policymaking institutions interact in determining *both* real and nominal outcomes. The classical divide between the real and nominal

economy was misleading, so institutional analysis must consider, as far as possible, the functioning of *networks* of institutions since the effects of any particular institution depend on the others operating in that environment. Second, all agree that central-bank independence operates more efficiently at intermediate than at low coordination. They disagree more regarding high coordination. Third, the nominal effects of central-bank independence and bargaining coordination, and of their interaction to the degree it has been explored, are broadly agreed.³⁰

5.2. Empirical evidence on this theoretical synthesis and extension

Empirical evaluation of theory involves determining the relevant sample, measuring the variables identified (plus controls), specifying the model suggested by theory, estimating that model, and inferring from the results to the theory. First, regarding sample selection, all these arguments presuppose wage/price-bargaining in relatively liberal-market economies and that central banks can attain legal autonomy from current governments, if only partially, and conduct appreciably distinct national monetary policy. These considerations suggest restricting the sample to larger, established capitalist democracies. I count 21 such countries: US, Japan, Germany, France, Italy, UK, Canada, Austria, Belgium, Denmark, Finland, Greece,³¹ Ireland, the Netherlands, Norway, Portugal,³⁰ Spain,³⁰ Sweden, Switzerland, Australia, and New Zealand. Further, I exclude the Bretton Woods fixed-exchange-rate era as it limited national monetary-autonomy and to increase comparability with Iversen (1996, 1998abc, 1999a). Wage/price-bargaining occurs at most annually, so annual data in these 21 countries 1974-1990 comprise the sample.

Second, regarding variable measurement, the theory emphasizes three independent variables—central-bank independence, wage/price-bargaining coordination, and sectoral structure—and two dependent variables—inflation and unemployment. I measure inflation (π) by consumer-price inflation (IMF and OECD sources).³² Unemployment (U) are internationally comparable figures (OECD sources). Central-bank independence (I) is indexed 0-1, averaging five commonly-used indices.³³ Wage/price-bargaining coordination (C) is indexed subjectively as in

Hall and Franzese (1998) and valued (0, 0.25, 0.5, 0.75, 1). C builds from Soskice's (1990) EWC, Layard *et al.*'s (1991) BO and LO, and secondary sources, and is extended here, using Layard *et al.* (1991), to Greece (0), Portugal (.25), and Spain (0). C is intended to reflect economy-wide coordination, whether employer- or labor-led, as theory has suggested. Regarding sectoral structure, the theory distinguishes public, sheltered, and traded sectors. The *desired* data are the proportions of employment covered by wage/price-bargaining in sectors whose products respectively do not compete in the market, do not compete with foreign products, and compete with foreign products. The *available* data are government employment and employment by single-digit ISIC sectors³⁴ as shares of total employment (OECD sources). Since the theory predicts oppositely for traded and public sectors with sheltered sector intermediate, government employment (G) divided by manufacturing employment (M) may summarize a proxy for public-relative-to-traded sectoral-structure (S).³⁵ Appendix 1 details the controls employed; note that union density is included (union members share of total employment) as Section 3 suggested. I indicate these controls below by $\alpha'X_1 + \gamma'X_2$ where the first term represents the constant, time-serial controls, dummies for non-democratic country-times, and their coefficients, and the second represents the other, more substantive, controls and their coefficients.

Third, regarding model specification, (4) showed inflation to be a weighted average of what it would be if the political authority fully controlled monetary policy, π_d^* , and if a fully autonomous and conservative central bank controlled inflation, π_c^* , with the weight on the latter given by the degree of central-bank independence. The present theory emphasizes wage/price-bargaining coordination, sectoral structure, and their interaction among potential determinants of discretionary inflation, π_d^* , and of unemployment, U , though a weighted average form is not expected on the real side. Finally, in both cases, the impact of sectoral structure (G/M) should differ according to whether the public (numerator) or the traded (denominator) sector dominates. That is, the impact of G/M should be non-linear in a manner most easily enabled by entering G/M

and $(G/M)^2$ in the regressions. The specifications matching the theory are therefore:

$$\pi = \alpha'_\pi X_1 + (1 + \beta_{i,2}I) \cdot \gamma'_\pi X_2 + \beta_{i,1}I + (1 + \beta_{i,2}I) \cdot [\beta_c C + \beta_{s,1}S + \beta_{s,2}S^2 + \beta_{cs,1}C \cdot S + \beta_{cs,2}C \cdot S^2] + \varepsilon_\pi \quad (18)$$

$$U = \alpha'_u X_1 + \gamma'_u X_2 + \theta_i I + \theta_c C + \theta_{s,1}S + \theta_{s,2}S^2 + \theta_{ic} I \cdot C + \theta_{is,1} I \cdot S + \theta_{is,2} I \cdot S^2 + \theta_{cs,1} C \cdot S + \theta_{cs,2} C \cdot S^2 + \theta_{ics,1} I \cdot C \cdot S + \theta_{ics,2} I \cdot C \cdot S^2 + \varepsilon_\pi \quad (19)$$

The expression inside square brackets in (18) reflects the interaction of bargaining coordination with sectoral structure in determining discretionary inflation. The term $(1 + \beta_{i,2}I)$, which multiplies that and the controls, reflects the prediction that central-bank independence lowers inflation from discretionary levels toward the bank's target level as independence increases. If this is true, we should estimate $\beta_{i,2} < 0$ (see Franzese 1999ac).

The modeled effects of central-bank independence, wage/price-bargaining coordination, and sectoral structure on inflation are all interactive. For example, the impact of independence on inflation ($d\pi/dI$) is:

$$\frac{\partial \pi}{\partial I} = \beta_{i,1} + \beta_{i,2} \cdot \gamma'_\pi X_2 + \beta_{i,2} \cdot [\beta_c C + \beta_{s,1}S + \beta_{s,2}S^2 + \beta_{cs,1}C \cdot S + \beta_{cs,2}C \cdot S^2] \quad (20)$$

We expect this to be generally negative, but its magnitude will depend on the degree of bargaining coordination and the sectoral structure.³⁶ The modeled effect of wage/price-bargaining coordination on inflation ($d\pi/dC$) is:

$$\frac{\partial \pi}{\partial C} = \beta_{i,2} \cdot I \cdot [\beta_c + \beta_{cs,1}S + \beta_{cs,2}S^2] \quad (21)$$

We expect this to be generally negative also, but the magnitude will depend on the degree of central-bank independence and the sectoral structure. Coordination may even increase inflation if public-sector employment sufficiently dominates traded (i.e., if S high enough). Finally, the modeled effect of sectoral structure on inflation, specifically of an increase in government-relative-to-manufacturing employment ($S \equiv G/M$), is:

$$\frac{\partial \pi}{\partial S} = \beta_{i,2} \cdot I \cdot [\beta_{s,1} + \beta_{s,2}S + \beta_{cs,1}C + \beta_{cs,2}C \cdot S] \quad (22)$$

which analogously depends on C and I and also on the level of S itself since sectoral structure has non-linear effects. We expect increases in S generally to increase inflation, especially when G is large relative to M , though this will depend on degrees of independence and coordination.

Likewise, (19) reflects our contention that the unemployment effects of bargaining coordination, central-bank independence, and sectoral structure are interactive. The modeled effect of independence on unemployment (dU/dI) is:

$$\frac{\partial U}{\partial I} = \theta_i + \theta_{ic}C + \theta_{is,1}S + \theta_{is,2}S^2 + \theta_{ics,1}C \cdot S + \theta_{ics,2}C \cdot S^2 \quad (23)$$

which depends on bargaining coordination and sectoral structure. The effect may be positive or negative since independence has both conservatism and credibility effects, but it should generally be decreasing as coordination rises when the traded sector dominates (low S) and generally be increasing as coordination rises when the public sector dominates (high S). Symmetrically, the modeled effect of bargaining coordination on unemployment (dU/dC) is:

$$\frac{\partial U}{\partial C} = \theta_c + \theta_{ic}I + \theta_{cs,1}S + \theta_{cs,2}S^2 + \theta_{ics,1}I \cdot S + \theta_{ics,2}I \cdot S^2 \quad (24)$$

which should generally be negative but depends on I and S , and may even become positive for large enough public-relative-to-traded sectors and high enough central-bank independence. Finally, the modeled effect of sectoral structure on unemployment (dU/dS) depends on the degrees of independence and coordination and upon its own level as follows:

$$\frac{\partial U}{\partial S} = \theta_{s,1} + \theta_{s,2}S + \theta_{is,1}I + \theta_{is,2}I \cdot S + \theta_{cs,1}C + \theta_{cs,2}C \cdot S + \theta_{ics,1}I \cdot C + \theta_{ics,2}I \cdot C \cdot S \quad (25)$$

We expect a positive effect when independence, coordination, and public-relative-to-traded sector (S) are large because under these conditions public sectors are large in the economy and any coordinated bargains, and central banks react with costly real consequences. Conversely, when the public sector is not so large as to dominate, increases in G/M actually increase the value of coordination and independence, and so (25) could be negative at lower S .

Finally, regarding model estimation and inference, (18) and (19) were both estimated by

least-squares with robust standard-errors.³⁷ Table 3.1 summarizes the inflation-equation estimation. The central result is clear: central-bank independence, bargaining coordination, and sectoral structure interact in determining inflation. That central-bank independence interacts with bargaining coordination and sectoral structure (and the controls, X_2) to determine inflation is reflected in the coefficient b_{i2} being negative and highly statistically significant.³⁸ Similarly the interaction of bargaining coordination and sectoral structure is strongly supported by the estimated coefficients b_{cs} and b_{cs2} (joint significance, $p \approx .0001$).³⁹ One cannot read the substantive meaning of these statistically significant results from the coefficient estimates directly or simply because the impact of each factor depends on many other institutional and structural variables as shown in (20)-(22). I defer substantive discussion until after reporting the unemployment results to consider the real and nominal effects together.

[Table 3.1 Here]

Central-bank independence, bargaining coordination, and sectoral structure equally clearly interact in determining unemployment. The joint significance of coefficients (e)-(k) firmly establishes the relevant interactions: $p \approx .02$. That central-bank independence has real effects, implying that the neoclassical synthesis is insufficient, is established by the joint significance of coefficients (b), (e)-(g), and (j)-(k) (i.e., those on variables involving λ): $p \approx .003$. The analogous tests for bargaining coordination and sectoral structure also strongly support the broad claim of institutional and structural interaction. Again the substantive meaning of these statistically significant coefficients is not clear from the coefficients in Table 3.2 alone because the effects of independence, coordination, and sectoral structure on unemployment are interactive [as shown in equations (23)-(25)].

[Table 3.2 Here]

The substantive import of these results is revealed by the estimated impact of each variable over a relevant sample range of the other variables. I covers 0.15-0.95 in the sample; C covers 0-

1; and most $S \equiv G/M$ observations lie between 0.25-1.25). Consider, for example, the estimated inflation-impact of a 0.1 increase in the central-bank-independence index (about the spacing in the ascending sequence Sweden-Italy-Ireland-Netherlands-Austria-US-Switzerland-Germany). That effect depends on the degree of bargaining coordination and on the sectoral structure within which such bargaining occurs. Setting all other variables to their means, our estimates indicate that the effect is as shown in Table 3.3.

[Table 3.3 Here]

All theory suggests central-bank independence will generally lower inflation. Every entry but the extreme top-right—and the sample has no observations with those characteristics—is indeed negative. The syntheses implied further that independence should lower inflation less when the institutional and sectoral structure of wage/price-bargaining is anti-inflationary anyway and more when the institutional and sectoral structure is less anti-inflationary itself. That is, the issue is how much the central bank must do by itself (i.e., monetarily) to constrain inflation since central-bank independence, bargaining coordination, and traded-dominating-public sectoral-structure are *substitutes* in producing low inflation. Thus, the estimated anti-inflationary impact of independence should be less as bargaining coordination increases, which the table affirms.

Further, as public-relative-traded-sector size increases beyond some point it begins to reflect public-sector dominance, and public-sector dominance is inflationary, so independent central banks should have to do more monetarily to reduce inflation as S increases beyond that point. Conversely, prior to that point, the traded sector dominates and so provides greater anti-inflationary benefits the larger the public sector it dominates, leaving less for independent central banks to do with brute monetary force. Thus, the anti-inflationary impact of independence should initially decline and then begin to rise again beyond some point as G/M increases. Table 3.3 exhibits just such a pattern. In fact, how large the public sector must be before it begins to dominate appears to decline as coordination increases suggesting that public sectors dominate

coordinated bargaining more easily than uncoordinated bargaining.⁴⁰

Consider next the inflation-impact of a 0.25 increase in bargaining coordination. First, theory suggests such coordination should generally reduce inflation, and indeed every entry in Table 3.4 is negative. Second coordination should reduce inflation less the greater central-bank independence since, with a more independent central bank, coordinated bargainers need reduce inflation less on their own: a substitute property. Reading the table left to right confirms this. Finally, as public sectors grow relative to traded sectors, coordination should become less able to deliver anti-inflationary wage/price restraint. Reading top to bottom, the estimates support this also since the estimated impact of coordination on inflation is less negative as G/M increases.

[Table 3.4 Here]

The remaining derivatives, representing the inflation effects of increases in public-relative-to-traded-sector employment, G/M , are more difficult to present because they depend on three factors—central-bank independence, bargaining coordination, and the level of G/M itself—and so require three dimensions. Summarizing those results (see Franzese 2001), public-sector dominance increases inflation most when coordination is high and independence is low. That is, as argued, increased public-sector dominance when coordination is high increases the degree to which coordinated bargains are inflationary, producing largest net inflationary effects absent a central bank sufficiently autonomous and conservative to resist that monetarily.

We argued that the unemployment impact of central-bank independence may be positive or negative but should decrease (increase) in coordination if the latter is traded-sector (public-sector) dominated. Reading Table 3.5 from left to right shows that indeed the unemployment effect of central-bank independence becomes less positive (more negative) as bargaining coordination increases when government-relative-to-manufacturing employment is low (below about one) and reverses direction once government comes to dominate manufacturing employment.⁴¹ Thus, *central-bank independence and traded-sector dominant / public-sector dominated coordinated-wage/price-bargaining are complements in the production of low unemployment. Reverse the*

sectoral structure, and independence and coordination become complements in the production of high unemployment.

[Table 3.5 Here]

Finally, consider the estimated unemployment-impact of a 0.25 increase in wage/price-bargaining coordination. Theory suggests coordination generally reduces unemployment, and indeed our estimates broadly support that claim: most Table 3.6 cells are negative. Furthermore, provided the traded-sector dominates, coordination should reduce unemployment more the more independent the central bank because its monetary threats help enforce restraint by coordinated traded-sector bargainers and, *vice versa*, coordinated traded-sector bargainers respond best to such monetary threats. However, if the public sector comes to dominate coordination, the relationship can reverse. Independent central banks will fight against coordination on public-sector-led bargaining because it tends to be inflationary; thus, the impact of coordination when both independence and G/M becomes less salutary. With a sufficiently adverse sectoral structure, coordination will be detrimental to unemployment performance *if* the central bank is sufficiently autonomous and conservative to resist the inflationary results of such coordination monetarily.

[Table 3.6 Here]

The estimated unemployment effects of sectoral structure require three dimensions to present (see Franzese 2001), but may be summarized succinctly: increasing government-relative-to-manufacturing employment when the public sector already dominates, coordination is high, and the central bank is independent, increases unemployment, as expected.

6. Conclusion

The arguments and evidence presented here synthesize and extend two literatures central to institutional political economy: central-bank independence and coordinated bargaining.

First, contrary to much neoclassical theory, central-bank independence does have real rational-expectations-equilibrium and on-average effects; their manifestation depends on the institutional structure of wage/price-bargaining and the sectoral composition of bargainers. The

real effects of a central bank's anti-inflationary stance depend not only on the credibility of that stance, as previously emphasized, but also upon the incentives and capacity of wage/price bargainers to respond. Central-bank independence is most costly in real terms when coordination is low or when it is high but characterized by public-sector dominance of the traded sector and least costly or even beneficial when coordination is high and traded-sector led. These are complementary relationships: the real economic efficiency of central-bank independence and traded-sector-led coordinated-bargaining are each enhanced by a high degree of the other. Second, central-bank independence lowers inflation less (more) the more (less) anti-inflationary is the rest of the political economy. These are substitute relationships: an independent central bank needs to do less monetarily to control inflation if wage/price-bargaining (and other factors) are already conducive to low inflation. Third, these new arguments and evidence resolve two empirical anomalies for previous theory regarding the actions and announcements of central banks. The *Bundesbank* speaks differently and to different entities than does the US Federal Reserve because their audiences are differently structured institutionally; and both the Fed and the *Bundesbank* react to real strength in the economy as *incipient inflationary pressure* because real strength weakens the incentives of bargainers to exercise wage/price restraint.

Conversely, the coordinated-wage/price-bargaining literature has virtually ignored the likely response of monetary policy to wage/price settlements and the impact of sectoral structure on the incentives of wage/price bargainers to exercise restraint autonomously and to respond to expected monetary-reactions. I have argued and the evidence supports that the impact of coordination, on both nominal and real outcomes, depends upon the sectoral composition of those being coordinated and upon the institutional characteristics of the monetary authority. Coordinated bargaining most reduces unemployment when traded-sector actors dominate public-sector actors, especially when monetary policy is controlled by a conservative and credibly independent central bank. Coordination least reduces (or even increases) unemployment when public sectors dominate traded sectors, especially when monetary policy is credibly conservative.

These are complementary relationships. Conversely, traded-sector-led coordinated-bargaining reduces inflation but less so when the central bank is independent because then inflation would have been low anyway. These are substitute relationships.

Finally, previous studies of interactions between central-bank independence and coordinated wage/price-bargaining have highlighted individual interactions between some two of independence, coordination, and sectoral structure. I have argued and shown empirically that the impact of *each* of these politico-economic features depends on both of the others.

This consideration may also resolve one key point of contention in those previous studies. Iversen (1996, 1998abc, 1999a) found *monetary conservatism* to have beneficial unemployment effects under intermediate bargaining *centralization* and detrimental effects under high *centralization*. Others found *central-bank independence* uniformly more beneficial as *coordination* increased. The italicized difference notwithstanding, these findings seemed disturbingly different. The theory and evidence here, showing a beneficial interaction of coordination with independence when traded dominate public sectors but the reverse relationship when public sectors dominate, suggest a resolution. Adverse sectoral structure combined with coordination could explain the detrimental unemployment effects of independence Iversen observed at high centralization. In Iversen's model, bargainers seek wage equality and achieve it more the greater is centralization. Since economies become increasingly service oriented as they advance, and since productivity growth in services lags that in industry, wage equalization makes private-sector service-provision increasingly costly in growing economies where wage/price-bargaining achieves wage-equality. With the private sector 'priced out' of service-provision, public-sector service-provision must rise or growth and employment will suffer. Thus, centralization or coordination *with wage-equalization* virtually forces governments in growing economies to increase public-sector employment, but that sectoral trend will eventually weaken the ability of coordination to produce beneficial nominal and real outcomes as shown here. In this situation, governments increasingly must choose between a high-inflation/low-unemployment

equilibrium without monetary conservatism, or a low-inflation/high-unemployment one with it. In this light, much less dispute exists between Iversen's arguments and findings and these and others' arguments than first appears. In fact, together, they suggest that coordination accompanied by wage-equalization might be inherently unstable in the long-run because jointly they tend to produce public-sector growth, which is incompatible with coordination on wage/price restraint.

Concluding most broadly, this analysis demonstrated that and explained how several institutional interactions, exhibiting both substitute and complement relations, operate at the macroeconomic level. That is, the politico-economic regulation of inflation and unemployment depends on the broad network of institutions and the structural setting within which wage/price bargainers and monetary policymakers interact. More specifically, I have shown how central bank autonomy and conservatism and the coordination and sectoral structure—traded, sheltered, and public—of wage/price-bargaining interact in regulating inflation and unemployment.

Appendix 1: Controls in the Regression Equations

Equations (18) and (19) included time-serial controls,⁴² dummies for Greece, Portugal, Spain, and for the authoritarian periods therein,⁴³ trade-openness (O : exports-plus-imports share of GDP), terms-of-trade (T : export-import price-index ratio), their product, the natural log of real GDP *per capita* (Y), the partisan left-right center of the current government (CoG), a pre-election year indicator (ELE), and union density (UD). (18) also controlled for financial-sector employment-share (F) and average inflation in the other 20 countries in that year (π_a : inflation abroad). Similarly, (19) controls for average unemployment abroad (U_a). In the text, X_1 refers to the time-serial controls plus dummies and X_2 to the other factors. Table 3.7 gives sample descriptive statistics.

[Table 3.7 Here]

References

- Agell, Jonas and Bengt-Christer Ysander. 1993. "Should Governments Learn to Live with Inflation? Comment." *American Economic Review* 83(1): 305-11.
- Alesina, Alberto and Lawrence H. Summers. 1993. "Central Bank Independence and Macroeconomic Performance." *Journal of Money, Credit, and Banking* 25(2): 151-63.
- Alvarez, R. Michael, Geoffrey Garrett, and Peter Lange. 1991. "Government Partisanship, Labor Organization, and Macroeconomic Performance." *American Political Science Review* 85(2): 539-56.
- Bade, Robin and Michael Parkin. 1982. "Central Bank Laws and Monetary Policy." Department of Economics, University of Western Ontario. Typescript.
- Barro, Robert J. and David B. Gordon. 1983a. "Rules, Discretion, and Reputation in a Model of Monetary Policy." *Journal of Monetary Economics* 12(1): 101-21.
- Barro, Robert J. and David B. Gordon. 1983b. "A Positive Theory of Monetary Policy in a Natural Rate Model." *Journal of Political Economy* 91(4): 589-610.
- Berger, Suzanne, ed. 1981. *Organizing Interests in Western Europe: Pluralism, Corporatism, and the Transformation of Politics*. Cambridge: Cambridge University Press.
- Bleaney, Michael. 1996. "Central Bank Independence, Wage-Bargaining Structure, and Macroeconomic Performance in OECD Countries." *Oxford Economic Papers* 48(1): 20-38.
- Bruno, Michael and Jeffrey Sachs. 1987. *The Economics of Worldwide Stagflation*. Cambridge: Harvard University Press.
- Calmfors, Lars. 1993. *Centralization of Wage Bargaining and Macroeconomic Performance—A Survey*. Seminar Paper No. 536. Stockholm, Institute for International Economic Studies.
- Calmfors, Lars. 1998. "Macroeconomic Policy, Wage Setting, and Employment—What Difference Does the EMU Make?" *Oxford Review of Economic Policy* 14(3): 125-51.
- Calmfors, Lars and John Driffill. 1988. "Centralisation of Wage Bargaining and Macroeconomic Performance." *Economic Policy* 6: 13-61.

- Cameron, David R. 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: Studies in the Political Economy of Western European Nations*. New York: Oxford University Press. Pp. 143-78.
- 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.
- Clark, William Roberts, Usha Nair Reichert, with Sandra Lynn Lomas, and Kevin L. Parker. 1998. "International and Domestic Constraints on Political Business Cycles in OECD Economies." *International Organization* 52(1): 87-120.
- Cubitt, Robin P. 1989. *Precommitment and the Macroeconomic Policy Game*. D.Phil. Thesis, Oxford University.
- Cubitt, Robin P. 1992. "Monetary Policy Games and Private Sector Precommitment." *Oxford Economic Papers* 44(3): 513-30.
- Cubitt, Robin P. 1995. "Corporatism, Monetary Policy and Macroeconomic Performance: A Simple Game Theoretic Analysis." *Scandinavian Journal of Economics* 97(2): 245-59.
- Cukierman, Alex. 1992. *Central Bank Strategy, Credibility, and Independence: Theory and Evidence*. Cambridge: MIT Press.
- Cukierman, Alex. 1996. "The Economics of Central Banking." Working Paper No. 36-96. Tel Aviv: The Stackler Institute for Economic Studies, Tel Aviv University.
- Cukierman, Alex and Francesco Lippi. 1999. "Central Bank Independence, Centralization of Wage Bargaining, Inflation and Unemployment—Theory and Evidence." *European Economic Review* 43(7): 1395-434.
- Cukierman, Alex, Bilin Neyapti, and Steven B. Webb 1992. "Measuring the Independence of Central Banks and Its Effect on Policy Outcomes." *World Bank Economic Review* 6(3): 353-98.
- Eijffinger, Sylvester C. W. and Jakob De Haan. 1996. *The Political Economy of Central Bank Independence*. Princeton: Special Papers in International Economics 19 (May). Princeton

University, Department of Economics, International Finance Section.

Forteza, Alvaro. 1998. "The Wage Bargaining Structure and the Inflationary Bias." *Journal of Macroeconomics* 20(3): 599-614.

Franzese, Robert J., Jr. 1994. "Central Bank Independence, Sectoral Interest, and the Wage Bargain." Cambridge: Harvard Center for European Studies Working Paper #56 (reprint: 5-1, 1995).

Franzese, Robert J., Jr. 1996. *The Political Economy of Over-Commitment: A Comparative Study of Democratic Management of the Keynesian Welfare State*. Ph.D. Thesis, Department of Government, Harvard University, Cambridge, MA. Chapter IV: 212-295.

Franzese, Robert J., Jr. 1999a. "Exchange-Rate Regimes and Inflation in the Open and Institutionalized Economy." Paper Presented at the American Political Science Association Annual Meetings.

Franzese, Robert J., Jr. 1999b. "Partially Independent Central Banks, Politically Responsive Governments, and Inflation." *American Journal of Political Science* 43(3): 681-706.

Franzese, Robert J., Jr. 2000. "Credibly Conservative Monetary Policy and Labor—Goods Market Organization: A Review with Implications for ECB-Led Monetary Policy in Europe." In Jakob de Haan, ed., *Fifty Years of the Bundesbank: Lessons for the European Central Bank*. London: Routledge. Pp. 97-124.

Franzese, Robert J., Jr. 2001. *Explaining Macroeconomic Policies: Institutional Interactions in the Evolving Political Economies of Developed Democracies*. Chapter IV. New York: Cambridge University Press, forthcoming.

Franzese, Robert J., Jr. and Peter A. Hall. 2000. "The Institutional Interaction of Wage-Bargaining and Monetary Policy." In Torben Iversen, Jonas Pontusson, and David Soskice, eds., *Unions, Employers, and Central Banks: Macroeconomic Coordination and Institutional Change in Social Market Economies*. Cambridge: Cambridge University Press. Pp. 173-204.

Franzese, Robert J., Jr., Cindy D. Kam, and Amaney A. Jamal. 1999. "Modeling and Interpreting

Interactive Hypotheses in Regression Analysis.” Paper Presented at the American Political Science Association Annual Meetings.

Garrett, Geoffrey and Christopher Way. 1995a. “Labor Market Institutions and the Economic Consequences of Central Bank Independence.” Paper presented at the American Political Science Association Annual Meetings.

Garrett, Geoffrey and Christopher Way. 1995b. “The Sectoral Composition of Trade Unions, Corporatism and Economic Performance.” In Barry Eichengreen, Jeffrey Frieden, and Jürgen von Hagen, eds., *Monetary and Fiscal Policy in an Integrated Europe*. New York: Springer-Verlag. Pp. XX-XX.

Garrett, Geoffrey and Christopher Way. 1999a. “The Rise of Public Sector Unions, Corporatism, and Macroeconomic Performance.” *Comparative Political Studies* 32(4): 411-34.

Garrett, Geoffrey and Christopher Way. 1999b. “Public Sector Unions, Corporatism, and Wage Determination.” in Torben Iversen, Jonas Pontusson, and David Soskice, eds., *Unions, Employers, and Central Banks: Macroeconomic Coordination and Institutional Change in Social Market Economies*. New York: Cambridge University Press. Pp. 267-91.

Golden, Miriam. 1993. “The Dynamics of Trade Unionism and National Economic Performance.” *American Political Science Review* 87(2): 439-54.

Golden, Miriam and Michael Wallerstein. 1995. “Trade Union Organization and Industrial Relations in the Post-War Era in 16 Nations.” Paper Presented at the Midwest Political Science Association Annual Meetings.

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

Grüner, Hans-Peter and Carsten Hefeker. 1999. “How Will EMU Affect Inflation and Unemployment in Europe?” *Scandinavian Journal of Economics* 101(1): 33-47.

Gylfason, Thorvaldur and Assar Lindbeck. 1994. “The Interaction of Monetary Policy and Wages.”

Public Choice 79(1-2): 33-46.

Hall, Peter A. 1994. "Central Bank Independence and Coordinated Wage Bargaining." *German Politics and Society* Autumn: 1-23.

Hall, Peter A. and Robert J. Franzese, Jr. 1998. "Mixed Signals: Central Bank Independence, Coordinated Wage-Bargaining, and European Monetary Union." *International Organization* 52(3): 505-36.

Headey, Bruce. 1970. "Trade Unions and National Wage Policies." *Journal of Politics* 32(2): 407-39.

Iversen, Torben. 1996. "Power, Flexibility and the Breakdown of Centralized Wage Bargaining: The Cases of Denmark and Sweden in Comparative Perspective." *Comparative Politics* 28(3): 399-436.

Iversen, Torben. 1998a. "Wage Bargaining, Central Bank Independence and the Real Effects of Money." *International Organization* 52(3): 469-504.

Iversen, Torben. 1998b. "Hard Choices for Scandinavian Social Democracy in Comparative Perspective." *Oxford Review of Economic Policy* 14(2): 59-75.

Iversen, Torben. 1998c. "Wage Bargaining, Hard Money and Economic Performance: Theory and Evidence for Organized Market Economies." *British Journal of Political Science* 28(1): 31-61.

Iversen, Torben. 1999a. "Decentralization, Monetarism, and the Social-Democratic Welfare State in the 1980s and 90s." In Torben Iversen, Jonas Pontusson, and David Soskice, eds., *Unions, Employers and Central Banks: Macroeconomic Coordination and Institutional Change in Social Market Economies*. Cambridge: Cambridge University Press. Pp. 205-31.

Iversen, Torben. 1999b. "The Political Economy of Inflation: Bargaining Structure or Central Bank Independence?" *Public Choice* 99(2): 237-58.

Iversen, Torben, Jonas Pontusson, and David Soskice, eds. 1999. *Unions, Employers and Central Banks: Macroeconomic Coordination and Institutional Change in Social Market Economies*. Cambridge: Cambridge University Press.

- Jensen, Henrik. 1997. "Monetary Policy Coordination May Not Be Counterproductive." *Scandinavian Journal of Economics* 99(1): 73-80.
- Jonsson, Gunnar. 1995. "Institutions and Macroeconomic Outcomes—the Empirical Evidence." *Swedish Economic Policy Review* 2(1): 181-212.
- Kennedy, Ellen. 1991. *The Bundesbank: Germany's Central Bank in the International Monetary System*. London: Pinter.
- Lange, Peter. 1984. "Unions, Workers, and Wage Regulation: The Rational Bases of Consent." In John H. Goldthorpe, ed., *Order and Conflict in Contemporary Capitalism: Studies in the Political Economy of Western European Nations*. New York: Oxford University Press. Pp. 98-123.
- Lange, Peter and Geoffrey Garrett. 1985. "The Politics of Growth: Strategic Interaction and Economic Performance in Advanced Industrial Democracies, 1974-80." *Journal of Politics* 47(3): 792-827.
- Lange, Peter, Michael Wallerstein, and Miriam Golden. 1995. "The End of Corporatism? Wage Setting in the Nordic and Germanic Countries." In Sanford M. Jacoby, ed., *Workers of Nations: Industrial Relations in a Global Economy*. Oxford: Oxford University Press. Pp. 101-26.
- Layard, Richard, Stephen Nickell, and Richard Jackman. 1991. *Unemployment: Macroeconomic Performance and the Labour Market*. New York: Oxford University Press.
- Lehmbruch, Gerhard and Philippe C. Schmitter, eds. 1982. *Patterns of Corporatist Policy-Making*. London: Sage.
- Lohmann, Susanne. 1992. "Optimal Commitment in Monetary Policy: Credibility Versus Flexibility." *American Economic Review* 82(1): 273-86.
- Olson, Mancur. 1965. *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge: Harvard University Press.
- Ozkan, F. Gulcin, Anne C. Sibert, and Alan Sutherland. 1997. "Monetary Union, Entry Conditions, and Economic Reform." Centre for Economic Policy Research, Discussion Paper: 1720.

- Rama, Martin. 1994. "Bargaining Structure and Economic Performance in the Open Economy." *European Economic Review* 38(2): 403-15.
- Regini, Marino. 1984. "The Conditions for Political Exchange: How Concertation Emerged and Collapsed in Britain and Italy." In J.H. Goldthorpe, ed., *Order and Conflict in Contemporary Capitalism: Studies in the Political Economy of Western European Nations*. New York: Oxford University Press. Pp. 124-42.
- Rogoff, Kenneth. 1985. "The Optimal Degree of Commitment to an Intermediate Monetary Target." *Quarterly Journal of Economics* 100(4): 1169-90.
- Rubinstein, Ariel. 1982. "Perfect Equilibrium in a Bargaining Model." *Econometrica* 50(1): 97-109.
- Scharpf, Fritz W. 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: Studies in the Political Economy of Western European Nations*. New York: Oxford University Press. Pp. 257-90.
- Scharpf, Fritz W. 1987. "Game-Theoretical Interpretations of Inflation and Unemployment in Western Europe." *Journal of Public Policy* 7(3): 227-57.
- Scharpf, Fritz W. 1991. *Crisis and Choice in European Social Democracy*. Ithaca: Cornell University Press.
- Sibert, Anne C. 1999. "Monetary Integration and Economic Reform." *The Economic Journal* 109(452): 78-92.
- Sibert, Anne C. and Alan Sutherland. 2000. "Monetary Union and Labor Market Reform." *Journal of International Economics* 51(2): 421-35.
- Skott, Peter. 1997. "Stagflationary Consequences of Prudent Monetary Policy in a Unionized Economy." *Oxford Economic Papers* 49(4): 609-22.
- Soskice, David. 1990. "Wage Determination: The Changing Role of Institutions in Advanced Industrialized Countries." *Oxford Review of Economic Policy* 6(4): 36-61.

- Soskice, David and Torben Iversen. 1998. "Multiple Wage-Bargaining Systems in the Single European Currency Area." *Oxford Review of Economic Policy* 14(3): 110-24.
- Soskice, David and Torben Iversen. 2000. "The Non-Neutrality of Monetary Policy with Large Price or Wage Setters." *Quarterly Journal of Economics* 115(1): 265-84.
- Swenson, Peter. 1989. *Fair Shares: Unions, Pay, and Politics in Sweden and West Germany*. Ithaca: Cornell University Press.
- Swenson, Peter. 1991. "Bringing Capital Back In, or Social Democracy Reconsidered." *World Politics* 43(4): 513-44.
- Velasco, Andrés and Vincenzo Guzzo. 1999. "The Case for a Populist Central Banker." *European Economic Review* 43(7): 1317-44.
- Yashiv, Eran. 1989. "Inflation and the Role of Money Under Discretion and Rules: A New Interpretation." Working Paper No. 8-89, PSIE, MIT, November.
- Zervoyianni, Athina. 1997. "Monetary Policy Games and Coalitions in a Two-Country Model with Unionised Wage-Setting." *Oxford Economic Papers* 49(1): 57-76.

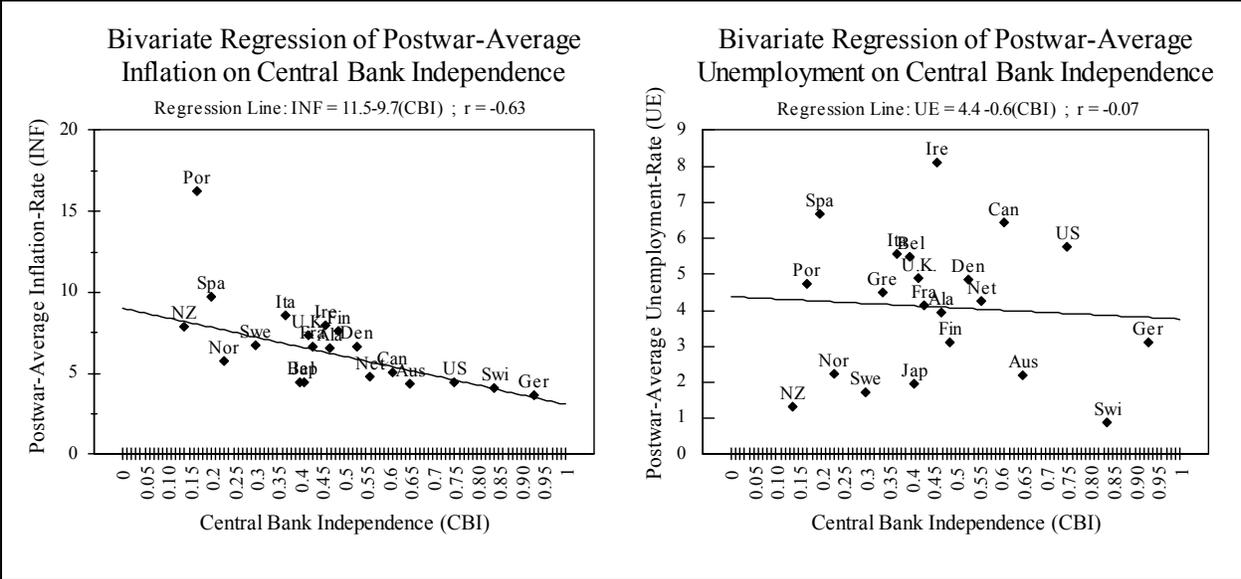


Figure 3.1: Bivariate relations of central bank independence with inflation and unemployment

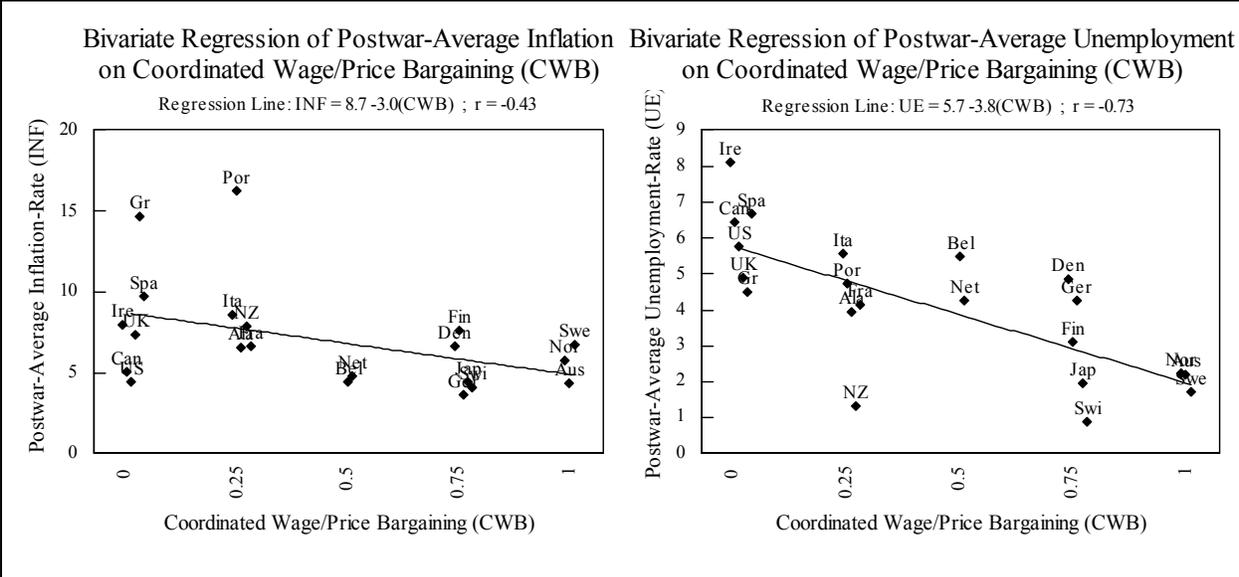


Figure 3.2: Bivariate relations of coordinated wage/price-bargaining with inflation and unemployment

Table 3.1: Estimation results for the inflation equation (18)

Coefficient (Associated Variable)	Estimated Coefficient	Standard Error	t-Statistic	Two-Sided p-Level
$b_c (C)$	-28.150	5.818	-4.838	0.000
$b_s (S)$	-34.834	9.968	-3.495	0.001
$b_{s2} (S^2)$	+16.000	5.301	3.018	0.003
$b_{cs} (C \cdot S)$	+43.699	11.734	3.724	0.000
$b_{cs2} (C \cdot S^2)$	-19.267	5.955	-3.235	0.001
$b_{i1} (I)$	-8.954	11.748	-0.762	0.447
$b_{i2} (I \cdot [●])$	-0.691	0.157	-4.413	0.000
Summary Statistics				
Number of Observations	347	Degrees of Freedom	323	
R-Squared	0.523	Std. Err. of Regression	1.960	
Adjusted R-Squared	0.489	Durbin-Watson Stat.	1.976	

Notes: Non-germane results suppressed to conserve space. Complete results available at <http://www-personal.umich.edu/~franzese>. Estimation by weighted, two-stage, non-linear least squares with White's robust standard errors (see note 36).

Table 3.2: Estimation results for the unemployment equation (19)

Coefficient (Associated Variable)	Estimated Coefficient	Standard Error	t-Statistic	Two-Sided p-Level
(a) C	+11.826	3.847	3.074	0.002
(b) I	+20.314	6.885	2.951	0.003
(c) S	+14.921	7.132	2.092	0.037
(d) S ²	-4.924	4.372	-1.126	0.261
(e) I·C	-29.423	9.204	-3.197	0.002
(f) I·S	-35.596	15.317	-2.324	0.021
(g) I·S ²	+14.163	8.753	1.618	0.107
(h) C·S	-22.523	8.465	-2.661	0.008
(i) C·S ²	+8.385	4.740	1.769	0.078
(j) I·C·S	+54.697	20.051	2.728	0.007
(k) I·C·S ²	-22.201	10.651	-2.084	0.038
Summary Statistics				
Number of Observations	347	Degrees of Freedom	320	
R-Squared	0.907	Std. Err. of Regression	0.637	
Adjusted R-Squared	0.899	Durbin-Watson Stat.	2.082	

Notes: Non-germane results suppressed to conserve space. Complete results available at <http://www-personal.umich.edu/~franzese>. Estimation by weighted, two-stage, linear least squares with White's robust standard errors (see note 36).

Table 3.3: Estimated inflation-impact of increasing central-bank independence

	CWB=0.00	CWB=0.25	CWB=0.50	CWB=0.75	CWB=1.00
G/M=0.25	-1.20	-0.88	-0.57	-0.25	+0.07
G/M=0.50	-0.81	-0.62	-0.42	-0.23	-0.04
G/M=0.75	-0.55	-0.44	-0.34	-0.23	-0.12
G/M=1.00	-0.43	-0.37	-0.30	-0.24	-0.18
G/M=1.25	-0.45	-0.39	-0.33	-0.27	-0.20

Notes: Cell entries give the estimated first-year impact of a 0.1 increase in CBI in a political economy with the CWB and G/M listed in that column and row. The equation is dynamic, so these impacts will accumulate over time if the hypothetical CBI increase is permanent.

Table 3.4: Estimated inflation-impact of increasing coordination of wage/price-bargaining

	CBI=0.15	CBI=0.35	CBI=0.55	CBI=0.75	CBI=0.95
G/M=0.25	-4.13	-3.49	-2.86	-2.22	-1.58
G/M=0.50	-2.49	-2.11	-1.72	-1.34	-0.95
G/M=0.75	-1.39	-1.18	-0.96	-0.75	-0.53
G/M=1.00	-0.83	-0.70	-0.58	-0.45	-0.32
G/M=1.25	-0.81	-0.69	-0.56	-0.44	-0.31

Notes: Cell entries give the estimated first-year impact of a 0.25 increase in CWB in a political economy with the CBI and G/M listed in that column and row. The equation is dynamic, so these impacts will accumulate over time if the hypothetical CWB increase is permanent.

Table 3.5: Estimated unemployment-impact of increasing central-bank independence

	CWB=0.00	CWB=0.25	CWB=0.50	CWB=0.75	CWB=1.00
G/M=0.25	+1.23	+0.80	+0.37	-0.06	-0.48
G/M=0.50	+0.61	+0.42	+0.22	+0.03	-0.16
G/M=0.75	+0.16	+0.14	+0.11	+0.09	+0.07
G/M=1.00	-0.11	-0.04	+0.04	+0.12	+0.20
G/M=1.25	-0.21	-0.10	+0.01	+0.11	+0.22

Notes: Cell entries give the estimated first-year impact of a 0.1 increase in CBI in a political economy with the CWB and G/M listed in that column and row. The equation is dynamic, so these impacts will accumulate over time if the hypothetical CBI increase is permanent.

Table 3.6: Estimated unemployment-impact of increasing coordination of wage/price-bargaining

	CBI=0.15	CBI=0.35	CBI=0.55	CBI=0.75	CBI=0.95
G/M=0.25	+1.04	+0.18	-0.68	-1.53	-2.39
G/M=0.50	+0.38	0.00	-0.38	-0.76	-1.15
G/M=0.75	-0.12	-0.17	-0.21	-0.25	-0.30
G/M=1.00	-0.46	-0.31	-0.16	0.00	+0.15
G/M=1.25	-0.65	-0.43	-0.22	-0.01	+0.21

Notes: Cell entries give the estimated first-year impact of a 0.25 increase in CWB in a political economy with the CBI and G/M listed in that column and row. The equation is dynamic, so these impacts will accumulate over time if the hypothetical CWB increase is permanent.

Table 3.7: Descriptive statistics for the data

	π	U	π_a	U_a	O	T	Y	CoG	ELE	F	UD	CWB	CBI	G/M
Mean	8.7	6.1	9.0	6.2	0.5	1.0	9.3	5.5	0.3	6.8	0.4	0.4	0.5	0.8
Median	7.7	5.7	8.8	6.7	0.5	1.0	9.3	5.6	0.2	6.8	0.4	0.3	0.4	0.7
Maximum	29	21	15	8.6	1.4	1.5	9.8	10.0	1.4	11.6	0.8	1.0	0.9	1.8
Minimum	-0.7	0.0	4.0	2.4	0.1	0.7	8.5	2.8	0.0	2.1	0.1	0.0	0.2	0.3
Std. Dev.	5.6	4.0	3.2	1.7	0.3	0.1	0.3	1.6	0.3	2.3	0.2	0.4	0.2	0.3

NOTES

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1. Scharpf (1984, 1987, 1991) presages. Franzese (2000) reviews later advances (Cubitt 1989, 1992, 1995; Yashiv 1989; Agell and Ysander 1993; Franzese 1994, 1996, 1999ab, 2001; Garrett and Way 1995ab, 1999ab; Gylfason and Lindbeck 1994; Hall 1994; Rama 1994; Jonsson 1995; Bleaney 1996; Iversen 1996, 1998abc, 1999a; Jensen 1997; Ozkan *et al.* 1997; Skott 1997; Calmfors 1998; Forteza 1998; Hall and Franzese 1998; Soskice and Iversen 1998, 2000; Cukierman and Lippi 1999; Velasco and Guzzo 1999; Grüner and Hefeker 1999; Iversen *et al.* 1999; Sibert 1999; Zervoyianni 1997; Franzese and Hall 2000; Sibert and Sutherland 2000).

2. *Independence*, in this literature, means *autonomy and conservatism*. Core works include Barro and Gordon (1983ab); Rogoff (1985); Lohmann (1992). Cukierman (1992) provides textbook compilation, and Eijffinger and De Haan (1996) offer a briefer review of theory and evidence.

3. Any real quantity (e.g., output) can substitute for employment here. Notice **(1)** actually implies policymakers derive *disutility* from *too-high* employment. To avoid this odd implication, Cukierman (1992:28) stipulates $N^* > N$; alternatively, assume a full-employment target.

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4. Actually, as Gylfason and Lindbeck (1994) note, the standard model assumes this result *ad initio*, given rational expectations and (2), in which natural rates are exogeneity.
 5. Adding information asymmetry, uncertainty, and/or incomplete information to this model, independence produces more-variant real outcomes (a real cost), but credible commitment still lowers inflation without affecting real variables on average (see Cukierman 1992).
 6. Alesina and Summers (1993) could serve as graphical summary of the standard approach. Eijffinger and De Haan (1996) review the empirical literature, revealing few exceptions.
 7. Jonsson (1995), Bleaney (1996), Simmons (1996), Clark *et al.* (1998), Hall and Franzese (1998), Iversen (1999b) are partial exceptions. Franzese (1999ab) gives the general treatment.
 8. At best, they might be reasonable estimates of the *average* inflation-impact of independence across the various configurations of other relevant factors occurring in their particular sample.
 9. Furthermore, the ‘financial-stability-motive’ for the observed counter-cyclical policy (see Cukierman 1992:117-35) cannot explain the justification the Fed offers for its behavior.
 10. The Fed, contrarily, rarely mentions wage/price bargainers. Examples of the *Bundesbank’s* quite different announcements are easily found: see, e.g., Kennedy (1991:27-53) or *Financial Times* (24 June 1993:14).
 11. Headey (1970) foreshadows. Core works include Berger (1981); Lehmbruch and Schmitter (1982); Cameron (1984); Lange (1984); Lange and Garrett (1985); Bruno and Sachs (1987); Calmfors and Driffill (1988); Soskice (1990). Carlin and Soskice (1990) and Layard *et al.* (1991) provide textbook treatments; Calmfors (1993) is an excellent briefer review.
 12. The multiple bargains are often viewed as prisoners’ dilemma in which *i*’s preferences order thus: all units except *i*, all, none, and lastly only *i* exercise restraint. N.b., this ordering assumes market power since being the only unit raising wages (prices) is most preferred, which is only

likely if employment (demand) is relatively wage (price) inelastic, which defines market power.

13. This sensitivity of the unions' members' employment prospects to aggregate economic performance drives the incentive for wage restraint in the standard model. It, in turn, responds to an individual union's wage-settlement in proportion to the encompassingness of its bargain. The assumed monotonicity of these relationships has been much criticized recently (see below).

14. More precisely, more (less) wage restraint is exercised the lower (higher) w_j (wage inflation) at which $dV/dw=0$.

15. This relationship was usually under-specified. Bruno and Sachs (1987), Carlin and Soskice (1990), and Layard *et al.* (1991) later specified it more exactly; the negative relationship remains.

16. Exceptions were less rare in this case (e.g., Alvarez *et al.* 1991; Layard *et al.* 1991).

17. I assume exogenous productivity growth for simplicity; given that, assuming it is zero and dropping it from these formulations is no further loss of generality.

18. Nash bargaining is both convenient and especially appropriate because, though a cooperative-game solution-concept, it produces equilibria identical to a non-cooperative game of offers and counter-offers such as wage/price-bargaining (Rubinstein 1982). Nash-bargaining solutions are found by maximizing bargaining-power-weighted products of the bargainers' utilities with respect to variable(s) being bargained, here nominal-wage growth (w_j):

$$\underset{w_j}{Max} [V^u(\omega_j^c, \varepsilon(y_j))]^a [V^e(\omega_j^p, y_j)]^b$$

The solution sets a weighted sum of the marginal utilities to unions (firms) of getting (ceding) a nominal-wage gain to zero. The weights reflect the exogenous bargaining powers and the initial utility levels of the unions and the firms.

$$\frac{a}{V_j^u} \cdot \frac{\partial V_j^u}{\partial w_j} + \frac{b}{V_j^e} \cdot \frac{\partial V_j^e}{\partial w_j} = 0$$

Franzese (1994, 1996) details derivation of this solution.

19. On this point, compare, e.g., Franzese (1994, 1996, 2001), Hall (1994), Garrett and Way (1995ab, 1999ab), Iversen (1996, 1998abc, 1999a), Hall and Franzese (1998), Cukierman and Lippi (1999), Franzese and Hall (2000).

20. Zero and full coordination are excluded though. Bargaining *ipso facto* implies some market power since perfect competition in labor and goods markets allows only market-clearing wages and prices. Conversely, any international mobility in goods or labor excludes full coordination among all relevant bargainers.

21. Golden (1993), Golden and Wallerstein (1995), and Lange *et al.* (1995) add more considerations.

22. Scharpf's (1984, 1987, 1991) work is exceptional (both senses), foreshadowing the synthesis emerging from the references in note 1 from which this current offering builds.

23. Specifically: 'employment [must be] a decreasing function of the real wage rate...[i.e.]...own effects [must] dominate cross-effects in labor demands or...the supply of labor in the competitive segment of the labor market [must be] relatively irresponsive to the real wage rate, or...both conditions [must] hold' (p. 41). If any unemployment is involuntary, then labor supply is effectively in excess and therefore wage inelastic, so Cukierman's conditions will hold.

24. Cukierman *et al.* (1992) implicitly recognize this, positing (not deriving from explicit bargaining) price inflation as determined jointly by money and nominal-wage growth.

25. For expositional simplicity, I now assume prices are fixed mark-ups on wages, thus reducing the variables being bargained to the nominal-wage growth rate, w_j .

26. One neglected line of research, then, is the degree to which the concepts *monetary conservatism* and *monetary credibility* are theoretically and practically separable.

27. Employers *qua* employers are unaffected, but, of course, they benefit as consumers.

28. The difference with the neoclassical synthesis offered above is primarily **(a1)** that central-bank independence has real effects (on average). These arguments extend and modify Franzese (1994, 1996) by partitioning the monetary threat in **(17)**, addressing the difference between sectoral size and sectoral dominance, and more directly considering the nominal implications and the interaction of wage/price-bargaining institutions with sectoral structure. They extend and modify Hall and Franzese (1998) and Franzese and Hall (2000) in these ways and by considering sectoral structure. Cukierman and Lippi (1999) and Velasco and Guzzo (1999) differ in that wage bargainers may also dislike inflation *per se*. They reach some different substantive conclusions, but share core real-side implications. Iversen (1996, 1998abc, 1999a) argues differently that independence has real benefits when *centralization* (not coordination) is intermediate, costs when centralization is high, and little effect when bargaining is decentralized. The differences arise because his wage bargainers also have a preference for wage equality and because he incorporates the hump-shaped hypothesis into the theoretical analysis differently. A resolution of these differences is offered below. Franzese (2000, 2001) elaborates on this resolution; the former also offers a fuller review of this burgeoning literature (see note 1).

29. Cukierman and Lippi (1999) also share these agreements. See Franzese (2000) for elaboration and a more-complete review.

30. As shown above, even the neoclassical synthesis agrees on the last point. See also Franzese (2000).

31. Dummy variables for Greece, Portugal, and Spain, and one for authoritarian periods therein included in both equations, acknowledging those country-years' ambiguous sample membership.

32. *IMF sources* = IMF IFS CD-ROM 6/96. *OECD sources* = OECD Economic Outlook 61 and Historical Supplement diskettes, and OECD Main Accounts II, Detailed Tables diskettes.

33. Cukierman's (1992) LVAU and QVAU; Grilli *et al.*'s (1991) EC and POL; Bade and Parkin's (1982) CBI. Averaging expands coverage and, under plausible assumptions, reduces measurement-error variance.

34. Agriculture, extraction, construction, manufacturing, utilities, exchange, transport-shipping-communications, finance, other services, other.

35. 'Government employees' may contain workers who do not bargain wages, and some public-sector workers as defined theoretically will not be counted in 'government employment' as measured. Most manufacturing is traded and conducts wage/price-bargaining, but manufacturing certainly omits many other traded sectors. Plus, manufacturing is likely more unionized than most sectors, and government employees are variably unionized and able to bargain across countries, typically more unionized and able to bargain in countries with large public sectors than small. All these considerations may confound G/M as a measure of public-relative-to-traded-sector structure as theoretically defined, but the proxy is the best possible at this time.

36. The effect also depends on all X_2 given the weighted-average form in (4); see Franzese (1999ab). Franzese *et al.* (1999) offer guidance for interpreting interactive terms in regression.

37. Specifically, I employ weighted (W) two-stage (2S) least-squares (LS). WLS is necessary because high unemployment and inflation both exhibited greater (stochastic) variance than low. The weights are $1/(1+Y)^5$, with Y the dependent variable. I use 2SLS to mitigate endogeneity concerns regarding contemporaneously measured independent variables; instruments are simply the one-year lag of all variables. White's robust standard-errors are reported since scale is unlikely to be the only source of heteroskedasticity. The inflation equation is estimated by non-linear (N)

W2SLS since its weighted-average (convex-combinatorial) form is not linear. The reported results are robust across applications of any subset combination of these techniques.

38. Indeed, b_{i2} is not unreasonably far from the -1 one would expect if the functional form of (18), its variables, and their measurement, were all exact.

39. Wald F-tests, more appropriate with robust standard errors, reported here.

40. This supports an argument of Garrett and Way (1995b, 1999ab).

41. However, when coordination is low, central-bank independence actually has less detrimental (more beneficial) unemployment effects as G/M increases. Perhaps the different bargaining rights and strengths of public relative to traded-sector actors in high- and low-coordination countries is behind this result. Especially in low-coordination countries, public-sector workers may be relatively powerless in wage/price-bargaining or even be legally denied bargaining rights. If so, their increase relative to traded workers will not force central bank enactment of monetary threats because it decreases the proportion of the economy that bargains. This requires further exploration but should not distract from the strong central conclusion summarized in the text.

42. Three lags of the dependent variable proved sufficient in each equation. The resulting residuals exhibited no significant serial correlation, and coefficients on the lags added to well less than one, erasing any unit-root or correlated-residual concerns.

43. Spain's dummy was significantly negative in (18) and positive in (19); Greece's and Portugal's were small and insignificant in both. The authoritarian dummy was small and insignificant in (19) and negative and nearly significant in (18).