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The Interaction of Credibly Conservative Monetary Policy with Labor- and Goods-Market Institutions: A Review of an Emerging Literature

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I.A. Introduction

Until recently, political economists interested in institutional-structural aspects of political-economic management of unemployment and inflation have been confronted with two disparate and somewhat contradictory literatures. One literature derived from modern game-theoretic approaches to macroeconomic policy focused on monetary authorities’ degrees of anti-inflationary conservatism and of credible autonomy from current governments. The central claim is that credibly independent and conservative central banks can achieve nominal benefits (e.g. low inflation) at no on-average real (e.g. employment) costs.¹ The other literature emerged from the study of interest intermediation in democracies and focused on institutional features of labor (and recently goods) markets. The central claim is that encompassing wage/price bargaining facilitates wage/price restraint by internalizing externalities inherent in wage/price settlements, thus providing real and perhaps nominal benefits.²

Each approach focuses on a particular institutional feature of the macro political economy: degrees of central bank conservatism and autonomy from political authority (CBI) and degrees of economy-wide coordination in wage/price bargaining (CWB).³ Their exclusive focuses

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¹ Allowing for uncertainty, incomplete, and/or asymmetric information of various sorts, real quantities may be more variant. *I.e.*, credible commitment to monetary conservatism sacrifices monetary-policy’s use for macroeconomic stabilization, which ability exists in this framework when the bank enjoys private information (see, *e.g.*, Cukierman 1992). Still, the core conclusion remains that CBI lowers inflation practically costlessly, especially as evidence that CBI produces more variant real quantities has not surfaced (see, *e.g.*, Alesina and Summers 1993).

² The relationship may be non-linear (see Calmfors and Driffill 1988).

³ Distinguishing central bank autonomy from monetary-policy conservatism, and coordination of wage/price bargaining from the concentration of wage/price bargaining-units, will be important. I conflate the
contributed to the theoretical development of each literature, now among the most influential, academically and practically, in political economy. However, monetary policy and wage/price bargaining are intimately related exercises, so policy-makers and bargainers are likely to interact strategically if each possesses the institutional-structural capacity to do so.

This chapter reviews an emerging literature on such strategic interactions of monetary policy-makers and wage/price bargainers under varying institutional-structural configurations of labor and goods markets and varying degrees of credible conservatism reflected in monetary-policy institutions. The reviewed work synthesizes and extends the established theoretical and empirical literatures on CBI and CWB. These syntheses and extensions all emphasize that the degrees of CBI and CWB interact, with each other and with other political-economic conditions (e.g. sectorial composition, international exposure, etc.), to structure the incentives facing political-economic actors involved in monetary policy and wage/price bargaining. The core result, theoretically surprising but empirically supported, is that even perfectly credible commitments to monetary conservatism have long-run, on-average real effects which depend on labor-/goods-market institutional structure, even given fully rational expectations. Conversely, the real effects of labor-/goods-market institutional structure depend on degrees of credible monetary conservatism. However, while this core conclusion is widely shared, the exact interactions predicted remain contentious. Nominal effects, meanwhile, are even more widely agreed to be similarly interactive, though this conclusion is perhaps less surprising.

The review unfolds thus. The next subsection overviews the emerging literature to be more fully reviewed later. Section II briefly reviews arguments and findings derived from standard, game-theoretic, classical models of monetary policy. Section III does likewise, also briefly, for CWB arguments. Some lingering issues in both are highlighted in passing. Section IV more fully reviews the emerging syntheses and extensions, and Section V reviews the empirical results supporting them. Section VI concludes.

former pair in CBI and the latter pair in CWB for introductory purposes only.
I.B. Overview of the Syntheses and Extensions

Several approaches to synthesizing and extending the CBI and CWB literatures have emerged. Section IV.A considers classical syntheses. Even following Barro and Gordon (1983a,b) in maintaining strict nominal-real divides by assumption, the nominal effects of CBI and CWB clearly depend on each other and, indeed, on many other aspects of the political economy. The inflation effects of any factor to which governments and central banks would respond differently logically must depend on the degree to which central banks rather than current governments control policy, i.e. on degrees of CBI. Thus, conversely, CBI’s inflation effects must depend on all such factors (Franzese 1999b). Several studies highlight, amplify, and extend this analysis for some subset of the implied interactions (CBI and CWB: Bleaney 1996, Forteza 1998, Hall and Franzese 1998, Iversen 1999, and many others reviewed here; CBI and government partisanship and/or elections: Jonsson 1995, Simmons 1996, Clark et al. 1998).

Section IV.B begins to consider the fuller syntheses, all of which emphasize private-sector actors possessing sufficient market power to behave strategically vis-à-vis monetary authorities. Soskice and Iversen (1998, 1999), e.g., demonstrate that strategic behavior of monopolistic private-sector actors alone suffices for non-neutrality of monetary-policy rules. Unfortunately, monetary authorities are non-strategic in the Soskice-Iversen framework while many other analyses reviewed here have strategic private-sector reaction to strategic monetary policy and vice versa but also add other consideration(s). Thus, isolating the effect of private-sector and monetary-authority strategic behavior per se remains problematic. Moreover, even isolated, the manner in which CBI’s real effects depend on the degree of CWB, i.e. \( \frac{\partial^2 X}{\partial CBI \partial CWB} \), itself depends critically on certain assumptions or arguments relating to elasticities of labor (goods) demand and supply and how those change with wage-/price-bargaining organization. Disagreements on those assumptions notwithstanding, all agree that, given strategic private-sectors, the credible
conservatism of monetary-policy rules affects both nominal and real variables in the long run and on average, even with fully rational expectations.

Section IV.C reviews rapidly accumulating work on strategic interactions of monetary-policy authorities with strategic, monopolistically-empowered, inflation-averse private-sector actors (Yashiv 1989; Cubitt 1992, 1995; Agell and Ysander 1993; Gylfason and Lindbeck 1994; Grünner and Hefeker 1997; Jensen 1997; Skott 1997; Zervoyianni 1997; Cukierman and Lippi 1999; Velasco and Guzzo 1999). The assumption that private-sector actors dislike inflation beyond its potential impact on real wages is justified on four grounds. First, standard monetary-policy models routinely assume policy-makers are inflation-averse, so symmetry argues for private-sector inflation-aversion. Second, the assumption is standard, if often under-motivated, in the corporatism literature. Third, private-sector actors may have some nominal assets; e.g., mandatory pension-schemes in many countries are not fully indexed. Fourth, in open economies, domestic inflation is a relative price-movement (Rama 1994, Zervoyianni 1997, Franzese 1999a). Whatever the motivation, private-sector strategic capacity implies that bargainers will take monetary-policy reactions to their behavior, and now the impacts of those reactions on inflation, into account. This implies that the location and shape of any relation between labor/goods-market institutional structure and real variables, e.g. a Calmfors-Driffell (1988) curve, depends on monetary authorities' degrees of credible conservatism. Again, unfortunately, the nature of this shifting and reshaping depends critically on assumptions/arguments regarding the elasticity of labor/goods demand and supply and how those change with wage-/price-bargaining organization.

Section IV.D reviews approaches which emphasize differences among strategic private-sector actors in addition to encompassingness of wage/price-bargaining organizations (Franzese 1996, 1999a; Iversen 1998a,b). Franzese notes that monetary authorities control inflation by

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5 After all, governments' utilities must be constructed from private-sector utilities in some manner, though highly unequal weights are likely, especially in non-democracies.

6 Franzese (1999a), however, is only a heuristic model, and Iversen (1998a,b) has implicit differential money illusion among different wage-bargainers or requires further assumptions (see below).
threatening monetary responses to wage/price settlements sufficient to induce monopoly empowered wage/price bargaininers to settle upon non-inflationary increases. The threat-size required to induce non-inflationary settlements depends on bargaining encompassingness as before but also on the differential painfulness of the threats to private-traded-, non-traded-, and public-sector bargainiers. Price-growth equilibration is achieved by creating real slack sufficient to produce non-inflationary wage/price-bargaining settlements, and the necessary amount of real slack corresponds directly to the threat-size.\(^7\) Thus, the real effects of credibly conservative monetary policy depend on encompassingness and on sectorial composition of bargaining. Iversen stresses, instead, strategic unions that dislike wage disparity in addition to standard real-wage and employment goals. Inflation may then serve to squeeze real-wage disparity for any given nominal-wage disparity produced by the (multiple) wage/price settlements. If so, the aggregate real-wage restraint any given bargaining structure produces will depend on monetary policy-rules. Thus, real effects of credible monetary conservatism depend on bargaining centralization and on differences in productivity (growth) within and among bargaining units.

II.A. CBI: Reviewing the Standard Argument

Institutional political economists in the ‘80s and ‘90s developed convincing arguments that CBI can achieve low inflation.\(^8\) Due to credibility advantages relatively autonomous central banks enjoy over political authorities, this nominal benefit is argued to have no real costs (e.g., unemployment) on average (cf. note 1). Simplifying and summarizing, the argument proceeds:

Given sticky nominal wages (Lucas and Rapping 1969) and/or prices (Mankiw 1985), and/or near-rationality (e.g., calculation costs: Akerloff and Yellen 1985),\(^9\) monetary authorities

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\(^7\) Hall (1994), Franzese (1996), Hall and Franzese (1998), Franzese and Hall (1999) make some of these or similar arguments less formally.


\(^9\) Ball and Romer (1990) show that small nominal rigidities alone cannot produce much real policy-effectiveness but small real rigidities plus small nominal rigidities produce considerable effectiveness. Akerloff-Yellen near-rationality and/or any bargaining power in labor/goods markets would generally imply both.
have incentives to create *surprise* inflation, thereby lowering real wages (prices) and pushing employment (real demand) above natural rates, which latter are exogenous. However, private-sector actors recognize this incentive and incorporate its inflationary consequences in their price expectations. In rational-expectations equilibrium, private-sector actors are not systematically surprised by monetary authorities, so real wages (prices) are unaffected, employment (output) remains at its exogenously given level on average, and average inflation is high. Contrarily, if monetary authorities could *credibly* promise to forego inflation surprises, private-sector actors could set lower wages (prices) without being surprised. Again, real wages (prices) would be unaffected, so employment (output) would remain at exogenously given levels, but now inflation is lower than without credible commitment. Finally, institutionalizing conservative central banks with relative autonomy from current political authorities may provide such credible commitment to conservatism. Thus, CBI reduces inflation without adverse real effects on average.

More closely, the argument begins (often implicitly) with the quantity theory of money\(^{10}\):

\[ m + v = p + y \]  

(1)

Money supply \((m)\) plus exchange velocity \((v)\) equals prices \((p)\) plus real demand \((y)\) (all in logs).\(^{11}\) The strict version applied here assumes exogenous velocity and real demand equal to an exogenous natural rate plus some increasing function of inflation surprises. Thus, money growth and inflation are basically identical; often monetary authorities are further assumed to control money growth directly and completely.\(^{12}\) Next, monetary-policy-maker preferences, \(V^m(\cdot)\), are specified:

\[ V^m = -\left[ \frac{\varepsilon}{2} (y^* - y)^2 + \frac{1}{2} (\pi - \pi^*)^2 \right] \]  

(2)

\(^{10}\) I follow Cukierman (1992: 27-45) here and also abstract from uncertainty and imperfect information to focus on average real effects and not real variation since the former effects are the novel ones in the reviewed work.

\(^{11}\) \(m, v, \pi, \) and \(y\) can be defined so that the quantity theory is an accounting identity.

\(^{12}\) Obviously these are simplifications: money intimately affects but does not identically determine prices, and even if monetary authorities directly control money, they do not directly control prices. Equally obviously, though, money and price growth cannot diverge for long periods. However, details of links between money and prices, safely simplified away in classical models, may be critical if wage/price bargaining is explicitly considered because monetary authorities directly affect inflation by altering private-sector price-setting decisions (bargains).
Policy makers dislike deviations of real variables, e.g. output ($y$), from targets ($y^*$) and of nominal variables, e.g. inflation ($\pi$) from targets ($\pi^*$, often $\pi^*$=0 for simplicity). $c$ is policy-maker weight on real relative to nominal outcomes; thus, conservative can be defined as having lower $c$.

Next, given nominal and real rigidities, unexpected money-growth spurs output beyond its natural rate ($y_n$), which latter is assumed exogenous. E.g.: 

$$y = y_n + \alpha (\pi - \pi^*) \tag{3}$$

$\pi^*$ is expected inflation; $\alpha$ is the exogenously-given slope of the expectations-augmented Phillips' Curve. (3) and (1) entirely model the economy; (2) entirely characterizes preferences of the only strategic actor, the monetary-policy authority. The private sector has no preferences, only rational expectations: $E(\pi - \pi^*|\text{available information})=0$. Therefore, abstracting from uncertainty, imperfect information, real shocks, real growth, and velocity changes, equilibrium money-growth-cum-inflation absent commitment devices is (substitute (3) into (2), maximize over $\pi$, then set $\pi=\pi^*$, i.e. apply rational expectations):

$$\pi_{d}^* \equiv m^*_d = \pi^* + c\alpha (y^* - y_n) \tag{4}$$

$\pi_{d}^*$ is the discretionary-equilibrium inflation (absent commitment devices). $\pi_{d}^*$ involves only parameters known with certainty by the private sector ($c$, $\alpha$, $y^*$, and $y_n$), so actual inflation ($\pi$) is fully expected ($\pi^* = \pi$), implying output ($y$) does not deviate from its natural rate ($y_n$). If, however, monetary authorities could credibly commit to lower inflation (e.g., its target, $\pi^*$) expected and actual inflation would again be equal (at that lower $\pi^*$) and output would still be the natural rate ($y_n$). I.e., commitment-equilibrium inflation is $\pi_c^* = \pi^*$. CBI is then equated with credible commitment to a (fixed) low target, so CBI lowers inflation without real costs. Notice though that (3) actually assumes no on-average real effects from the start since private-sector actors simply, unbiasedly, and atomistically equate expected to actual inflation. Plus, $y_n$ and $\alpha$

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13 (2) indicates that policy makers derive disutility from too high (low) real (nominal) outcomes, so usually the targets are assumed unobtainably high (low). Thus, conservatism reduces to lower $c$; more generally, we might define agent $i$ more conservative than agent $j \iff c_i \leq c_j$, and $y_i^* \leq y_j^*$ and $\pi_i^* \leq \pi_j^*$ with at least 1 inequality strict.

14 Cukierman (1992) documents the state-of-the-art and contributes several theoretical and empirical advances. See note 1 on the complications emerging from uncertainty and incomplete/asymmetric information.
were given exogenously though logically they would depend on labor/goods-market institutional structure. The possibility exists that strategic private-sector reaction to strategic monetary-policy would affect natural rates and Phillips’ Curve relationships.

Nonetheless, that CBI lowers inflation at little or no on-average real costs may seem to have been repeatedly shown empirically. Figure 1 illustrates a typical demonstration (see, e.g., Alesina and Summers 1993), regressing postwar averages of inflation and real outcomes (here, unemployment) on CBI indices in cross-sections of 15-21 OECD countries. Statistically significant negative correlations usually emerge for nominal variables and insignificant correlations for real variables. However, data are rarely disaggregated temporally, so often observations are few and standard errors large. Equally rarely are many (any) potential alternative explanations controlled, and never have any potential interactions been considered. Insignificant correlation never necessarily means true correlations are 0, especially with large standard errors as often occur here. Insignificant results may also mask non-linearities (as, interestingly, Figure 1 vaguely suggests), or they may hide relationships between CBI and real variables that vary with levels of other variables (as all the work reviewed here contends).
Prominent real-world examples have also lent support to the hypothesis. Germany, the US, and Switzerland have highly independent central banks, and they share experiences of relatively low inflation while their employment experiences differ considerably. Such eloquently logical argumentation, simple but striking quantitative evidence, and prominent empirical anecdotes appearing to support the logic and statistics, have apparently convinced many academic and policy-making audiences. Increasing CBI has risen on policy agendas world-wide; and many countries have recently acted on this agenda: e.g., Italy and New Zealand. Bank reforms spread throughout Europe as requirements for EMU and outlines for the ECB were written with these arguments and evidence in mind, and the Bundesbank as template.

II.B. CBI: Lingering Issues and Anomalies

Cause for mild skepticism remained, but these seemed mere nuances. First, the model indicates more than that commitment reduces and discretion increases inflation. Equation (4) also implies that anything increasing monetary authorities’ weights on or targets for real outcomes (c, y*), or increasing surprise-money real-effectiveness (α), or decreasing natural rates (yn), increases discretionary inflation. Central bank autonomy, then, lowers inflation from the government’s discretionary level toward the bank’s, presumably lower, discretionary level. Thus, CBI lowers inflation more/less the higher/lower discretionary inflation under a political authority relative to that under a conservative bank. This hints at the classical synthesis since bargaining institutions clearly impact monetary-policy effectiveness (α) and natural rates (yn). These subtler implications went largely unnoticed and untested in the literature.19 Section IV.A elaborates, but note here that even classical game-theoretic models of monetary policy, correctly conceived, suggest that CBI’s nominal effects depend on many other political, economic, structural, and institutional aspects of the political economy in which the bank operates. Classical theories of CBI, those of CWB, and the syntheses and extensions reviewed here all agree on this.

Central banks’ behavior and pronouncements are also anomalous from classical

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19 There are only partial exceptions to my knowledge prior to Franzese (1999b); see section IV.A below.
perspectives. E.g., the US Federal Reserve frequently announces that it will raise interest rates to defuse “incipient inflationary pressures” (and then does so). However, *incipient inflationary pressures* do not exist in standard models since inflation is money-supply growth which banks completely control. Nor does relaxing the strict quantity theory, merely simplifying and known false anyway, correct matters. Inflation theoretically depends on \( c, \alpha, y^*-y_n \), but none of these vary cyclically in a manner consistent with Fed behavior. *Incipient inflationary pressures* presumably means an over-strong real economy. If \( c, \alpha, \) and \( y^*-y_n \) vary at all cyclically, it would be to lower \( c, \alpha, \) and \( y^*-y_n \), implying less inflationary pressure, in booms. *I.e.* when economies push capacity: policy makers likely fret more over inflation (\( c \) lower); monetary-policy real-effectiveness (\( \alpha \)) likely shrinks (diminishing returns); and target-to-natural rate gaps (\( y^*-y_n \)) are unchanged because targets are unobtainably high and natural rates are acyclical by definition. Thus, by standard theory, central banks face less *incipient inflationary pressure* in booms than busts; their words and behavior to the contrary must therefore be seen as anomalous.\(^{20}\)

The *Bundesbank* acts somewhat differently, but equally anomalously, in that it frequently directs its announcements specifically to wage/price bargainers and/or governments. Fairly overtly, it threatens to respond to upcoming wage/price settlements or government budgets it sees as inflationary by raising interest rates.\(^{21}\) Thus, the *Bundesbank* identifies sources for *incipient inflationary pressures* it perceives: governments and wage/price bargainers. Again, though, classical theory cannot explain this behavior. First, any inflation-budget connection is vague in classical theory, so banks have little reason to address governments except as price-setters for public goods, public-sector employers, and competitors for monetary-policy control. Second, bargainers in standard models simply add expected money growth (which banks control) to desired real-wage growth (which they control). No need to threaten *responses* then; banks should

\(^{20}\)Furthermore, financial-stability motives for counter-cyclical policy (see Cukierman 1992, ch. 7) cannot explain the justification the Fed offers for its behavior even if we considered it to explain the actual counter-cyclicality.

\(^{21}\) The Fed has rarely if ever mentioned wage/price bargainers. Examples of the *Bundesbank*’s quite different announcements are easily found: *e.g.*, Kennedy (1991:27-53) or *Financial Times* (24 June 1993:14).
simply announce fixed intended money-growth. Third, the Bundesbank speaks differently and to different agents than the Fed: also inexplicable from classical perspectives. The syntheses and extensions begin to resolve some of these lingering anomalies, especially this last, and to fill empirical gaps noted above, but first I review standard approaches to wage/price bargaining.

III.A. CWB: Reviewing the Standard Argument

A largely unconnected literature developed roughly contemporaneously demonstrating that encompassing (Olson 1965) wage/price bargaining can achieve real and nominal wage/price restraint and thereby has beneficial real and nominal effects. Simplified and condensed, the argument proceeds thus. With wage/price increases bargained in fragmented units, externalities of each settlement are ignored, so fragmented wage/price-increase settlements may be sub-optimally high. They may, e.g., include increments to offset increases elsewhere. Contrarily, if bargaining is encompassing or coordinated across units, externalities are internalized and extra increments are unnecessary. Thus, coordinated wage/price bargaining (CWB) induces restraint and so lowers unemployment and inflation.

Heuristically, assume \( j \) worker-bargaining-units (unions) set their own wages and derive utility from their real consumption-wages, \( \omega_j^c \), and employment prospects, \( E_j \).

\[
V_j^u \equiv V^u (\omega_j^c, E_j) ; \quad \frac{\partial V_j^u}{\partial \omega_j^c} > 0, \quad \frac{\partial V_j^u}{\partial E_j} > 0
\]

\( j \)'s real consumption-wages (\( \omega_j^c \)) are its nominal-wages (\( w_j \)), which it sets, less consumption prices (\( p^c \)), which it affects via price mark-ups, but only in proportion to the consumption-share of products using its labor. The marginal value to \( j \) of higher nominal-wages is thus:

\[
\frac{\partial V_j^u}{\partial w_j} = V_j^u (1 - \frac{\partial p^c}{\partial w_j}) + V_j^u (\frac{\partial E_j}{\partial w_j})
\]
Equation (6) reveals the central conclusion. First, unions perceive more consumption value from nominal wage-gains, and so exercise less wage restraint, the lower \(dp^c/dw_j\). I.e., \(j\) perceives more real-wage gains *per* unit nominal-wage increase the less aggregate-price inflation (\(dp^c\)) parallels \(j\)’s wage-inflation (\(dw_j\)). If \(j\)’s bargain is all-encompassing, aggregate inflation moves perfectly with \(j\)’s settlement (\(dp^c/dw_j=1\)), so \(j\) perceives no real-wage gains since it knows its own nominal gains are matched across the whole economy.  

Conversely, if \(j\)’s bargain is small relative to national aggregates, \(j\) perceives aggregate inflation to respond little to its settlement (\(dp^c/dw_j<0\)). Since a union perceives nominal wages to produce real consumption-wages inversely proportionally to its share of the economy, fragmentation decreases union propensity to exercise nominal restraint.

The 2nd term in (6) reflects, assumed adverse, employment effects of \(j\)’s wage-gains. This relationship was originally under-specified, but later specifications could be summarized thus.

\[
E_j = E(y_j(y_j, p_j - p_{i(j)}), \omega_j^p)
\]

\[
E_y \equiv \frac{\partial E}{\partial y_j} > 0; E_{y_y} \equiv \frac{\partial E}{\partial y_j} < 0; y_j \equiv \frac{\partial y_j}{\partial y_j} > 0; y_{\omega} \equiv \frac{\partial y_j}{\partial \omega_j} < 0
\]

\[
\rho_j = p_j - p_{i(j)}; \omega_j^p = w_j - p_j
\]

Union \(j\)’s employment prospects depend positively on real demand for goods its labor produces, \(y_j\), and negatively on its real product-wage, \(\omega_j^p\). Real demand for its goods, in turn, depends positively on total real demand, \(y\), and negatively on its price relative to competitor-product prices, \(\rho_j = p_j - p_{i(j)}\). This negative (positive) sensitivity of \(j\)’s employment prospects to its goods’ relative price (aggregate real demand) provides another incentive for unions to exercise restraint.

Again, the response of competitor prices (\(dp_{i(j)}\)) and of aggregate demand (\(dy\)) to \(j\)’s settlements (\(dw_j\)), and of \(j\)’s employment prospects to total demand (\(dE/dy\)), are all greater the more encompassing \(j\)’s bargain. If the last two effects dominate the (opposite) first effect, then, on both real-wage-gain and employment-prospect-cost side, unions are more disposed to deliver wage

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24 Assuming some fixed mark-up and a closed economy: see below.

restraint the more encompassing or coordinated their bargaining.

As with CBI, considerable evidence accumulated supporting CWB arguments (see Cameron 1984, Bruno and Sachs 1987, e.g.). Econometric analyses typically regressed postwar-average real (e.g., unemployment) and nominal (e.g., inflation) outcomes on some index of bargaining structure, as Figure 2 illustrates, and prominent empirical examples added convincingly. Austria and Scandinavia were well-known to exhibit broad bargaining-coordination, admirable unemployment, and modest-to-mid-level inflation. Again, intuitive argumentation, striking evidence, and real-world examples combined to put wage-bargaining coordination on many economic-policy agendas.

**Figure 2**

<table>
<thead>
<tr>
<th>Coordinated Wage/Price Bargaining (CWB)</th>
<th>Postwar-Average Inflation Rate (INF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td>20</td>
</tr>
<tr>
<td>Greece</td>
<td>15</td>
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<tr>
<td>Japan</td>
<td>10</td>
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<tr>
<td>Norway</td>
<td>5</td>
</tr>
<tr>
<td>Portugal</td>
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<tr>
<td>Sweden</td>
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<tr>
<td>Switzerland</td>
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<tr>
<td>Denmark</td>
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<td>Austria</td>
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<td>20</td>
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<td>Portugal</td>
<td>0</td>
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<td>Spain</td>
<td>0.25</td>
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<tr>
<td>Australia</td>
<td>0.5</td>
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<tr>
<td>Austria</td>
<td>0.75</td>
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**III.B. CWB: Recent Theoretical and Empirical Extensions**

Recently, the literature expanded in two ways. Swenson (1989, 1991), Soskice (1990), and Layard *et al.* (1991) drew attention to the, previously virtually ignored, employer side of the bargain. Calmfors and Driffield (1988), Layard *et al.* (1991), and Calmfors (1993) drew attention to market-power assumptions implicit in union preference-ordering assumed by the early work.

First, unions do not unilaterally set wages; rather, *wage/price* settlements emerge from...
Exogenous productivity growth is assumed for simplicity. Thus, marginal utilities unions perceive from nominal-wage gains must be considered relative to marginal disutilities firms suffer from ceding such gains and their respective bargaining strengths. Those $j$ firms care about profits which, ceteris paribus, decrease in product real-wages ($\omega_p^j$) and increase in demand for their firms’ products ($y_j$).  

\[ V_j^u \equiv V^u(\omega_j^c, E_j(y_j, \cdot)) ; \quad V_\omega^u > 0, V_E^u > 0 \] \tag{8}

\[ V_j^e \equiv V^e(\omega_j^p, y_j, \cdot) ; \quad V_\omega^e < 0, V_y^e > 0 \]

(8) clarifies that employer-worker bargains dispute how to trade (a) wages against employment (1st equation), (b) prices against demand (2nd), and (a) against (b). Thus, institutional-structural organization of labor and goods markets are jointly relevant to wage/price-bargaining regulation.

Now, if union-firm dyads Nash-bargain over nominal-wages, some tedious algebra:

\[ \text{Max}_{w_j} [V^u(\omega_j^c, E_j(y_j, \cdot))]^a [V^e(\omega_j^p, y_j, \cdot)]^b \]

\[ \frac{a}{V_j^u} \frac{\partial V_j^u}{\partial w_j} + \frac{b}{V_j^e} \frac{\partial V_j^e}{\partial w_j} = 0 \] \tag{10}

The solution involves weighted sums of marginal utilities to unions (firms) of getting (ceding) nominal-wage gains. Weights reflect raw bargaining powers and initial utility levels of unions and firms, so non-inflationary settlements are induced by shifting bargaining powers of unions and firms and/or changing their marginal utilities from getting (ceding) nominal increases. This is where monetary policy can enter in the syntheses and extensions.

These employer-side considerations highlight three obvious but previously un-
emphasized points. (1) Consumption real-wages positively impact unions while product real-wages only negatively impact firms, so firms tend to be more disposed than unions to demand (offer) restraint. (2) Though workers’ employment concerns virtually mirror employers’ output concerns, $dE/dy_j$, which enters unions marginal utilities but not firms, reflects employment responses to output growth and underscores a key dispute over how much labor to input for given output demanded at any given price. (3) The term $dp_j/dw_j$, which enters both marginal utilities, indicates responses of group $j$’s price-growth to its wage-growth; i.e., it reflects mark-up adjustments (e.g., fixed mark-ups $\Rightarrow dp_j/dw_j=1$). Part of any wage/price bargain, then, is a battle over shares of product-price increases that markets will bear that will accrue to wage-earners, i.e., over distribution of productivity growth and extra-normal profits to workers and employers. The degree to which this battle is zero-sum depends critically on the competitive situation of group $j$ firms. Specifically, as price competition faced by $j$’s firms increases, employers’ arduousness in resisting wage restraint increases. The critical role of price competition among firms in regulating wage/price bargaining is central to several syntheses and extensions reviewed below.

Second, regarding these market-competition considerations, notice that union $j$’s employment prospects and firms $j$’s profits increase in group $j$’s output which, in turn, decreases in group $j$’s goods’ relative price ($dy_j/dp_j<0$). So, the more nominal-wage increases for group $j$ cause price increases for group $j$’s products which are less than matched by its competitors (i.e., the more positive $dp_j/dw_j$), the more workers (employers) will have incentives to exercise (demand) restraint. Incentives for workers and employers to exercise restraint, therefore, also depend on their expectations of competitor-price responsiveness to their own. Combining these considerations, we may, as Calmfors and Drifill (1988) do, expect both very competitive and very coordinated market structures to induce wage/price restraint.

Under perfect competition in labor and goods markets, workers cannot garner wages exceeding their marginal value product, and, since competitor’s prices do not respond to $j$’s
prices, firms cannot pass cost increases (wage gains) to consumers. Therefore, profits and employment prospects are drastically reduced by any nominal gains exceeding productivity growth (i.e. any lack of restraint); atomized bargainers facing perfect competition in labor (goods) markets who exercise insufficient restraint simply become unemployed (lose all their market) with certainty. The strength of this incentive makes some externalities stressed in early CWB arguments moot 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 (prices) rise with one’s own. In these conditions, incentives to exercise restraint stem only from national-competitiveness considerations as argued in the earliest literature. Between 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 since most competitors are within industry and so have the same wage/price settlement. However, at the industry level, national-level concerns will still mostly be ignored since no industry is terribly large relative to the whole. Thus, they conclude that intermediate levels of coordination are inferior to both 0 and full coordination, yielding the now-famous hump-shaped hypothesis. Although, as several, notably Calmfors (1993), Rama (1994), Cukierman and Lippi (1999), and Velasco and Guzzo (1999), have emphasized, the existence and shape of Calmfors-Driffill curves depend critically on these assumptions about elasticities with respect to relative wages (prices) and how they change as bargaining becomes more centralized. Many of the syntheses and extensions reviewed below will inherit this indeterminacy.

Summarizing: modern CWB theory focuses on economy-wide coordination; institutional-structural position of unions and firms, of labor and goods markets, are key. Modern theory also suggests non-linear, perhaps hump-shaped relationships, between CWB and wage/price restraint.

III.C. CWB: Lingering Theoretical and Empirical Issues
Three empirical controversies continue to plague theoretical development. First, disagreement remains over degrees of CWB characterizing certain country-times: e.g. Soskice (1990) and Calmfors and Driffill (1988) dispute Japan and Switzerland. Second, wider debate lingers over whether and how well union membership-structure might proxy for effective coordination (cf. Garrett and Way 1995ab, Iversen 1998ab, Hall 1994, Hall and Franzese 1998, Franzese 1999a). A third, more theoretically central, debate involves whether the “hump” exists, what shape it takes, and where, empirically, nations lie on it. Even if coordination and restraint were agreed to relate curvilinearly with greatest restraint at 0 and full coordination, whether the hump falls very quickly from 0 coordination and then gradually rises, vice versa, or anything in between would remain theoretically ambiguous. Also unknown with any precision is where countries lie on that hump whatever its true shape since, however the measurement issues may be resolved, the resulting empirical index’s placement relative to theoretical 0 and full coordination would remain unknown. In sum, current theory insists that empirical measures consider bargaining-coordination across the economy, between employers as well as unions; they cannot derive solely from union-membership structure. Moreover, estimated coordination-restraint relationships must reflect both competition and internalization effects of labor/goods market institutional structures. The curvature of relationships between effective, economy-wide CWB and wage/price restraint must be estimated directly (e.g., Iversen 1998), or competition-impacting and coordination-impacting features of wage-/price-bargaining institutions must be separated (e.g., Layard et al. 1991).

Two important theoretical omissions also remain. First, as suggested above, standard CBI theory hindered consideration of interactions between bargaining and monetary institutions by

31 We do know that 0 and full coordination do not exist empirically. Bargaining ipso facto implies some market power, implying non-zero coordination. Conversely, any international mobility in goods or labor excludes full coordination among all relevant bargainers (some are foreign).


33 Attempts at the latter rely on union density to represent competition-affecting and indices of economy-wide coordination to represent coordination-affecting factors.
assuming exogenous natural rates and direct inflation-control. The CWB literature is equally ill-positioned to consider such interactions because it generally allowed monetary policy no role, implicitly assuming passive or accommodating policy. Yet autonomous, conservative central banks would certainly react to inflationary wage/price settlements, so, as CBI theory emphasizes, bargainers must consider this reaction when bargaining. Wage-price bargaining and monetary policy interact; therefore, theory must consider them jointly. Second, CWB theory often assumes homogenous workers and employers. However, some private-sector actors will have different interests, both in general and vis-à-vis monetary policy, than others. I turn now to the emerging syntheses and extensions which address these theoretical holes and illuminate the implied institutional-structural interactions.

IV. Reviewing the Emerging Theoretical Syntheses and Extensions

Summarizing, standard CBI theory predicts centrally that credible conservatism produces low inflation without real costs on average, a claim previous empirical work seemed to support. However, the theory actually predicts considerably more than has been explored theoretically or empirically; actions and announcements of monetary authorities contradict these more precise predictions; and private-sector actors have been under-specified and, in particular, assumed non-strategic. CWB theory, meanwhile predicts centrally that coordination induces nominal and real wage restraint, and thereby has beneficial nominal and real effects; this, too, empirical analysis seemed to support. Two recent theoretical amendments expanded our understanding but also raised several empirical controversies. Still, CWB theory has evolved largely without considering either possible monetary-policy reactions to wage/price settlements or possible differential interests among bargainers.

Indubitably valuable insights have emerged from both lines of research. Minimally, they draw attention to important institutional characteristics of monetary authorities and wage/price bargainers as central to politico-economic management of the macroeconomy. However, the
incompatibility of their underlying assumptions hinders combination of their insights. On one hand, CBI theory assumes banks control inflation directly and bargainers simply set wage growth to equal expected money plus productivity growth regardless of labor-/goods-market institutional-structures. However, if wages and prices are bargained, inflation is determined by those bargaining settlements; monetary policy matters because it affects those settlements. Moreover, wage/price bargaining implies market power, raising the possibility that workers (employers) may act strategically vis-à-vis monetary authorities. On the other hand, CWB theory implicitly often assumes that monetary policy does not respond to wage/price bargains.\(^{34}\) Yet, monetary policy, whoever controls it, aims to manage inflation, and so must respond to wage/price settlements. Any proposed synthesis must begin by redressing these contradictions.

Section IV.A will consider “classical syntheses” which maintain strict nominal-real divides by assumption; these still produce interactive nominal effects. Section IV.B considers syntheses which add only private-sector actors possessing sufficient market power to behave strategically vis-à-vis monetary authorities to standard models; that suffices for the non-neutrality of credible conservatism. Section IV.C considers models with strategic monetary-policy and strategic private-sector actors with inflation-aversion; again interactive real and nominal effects for credible conservatism are implied. Finally, Section IV.D reviews work emphasizing differences among strategic private-sector actors additionally to varying wage/price-bargaining encompassingness. Real effects of credible conservatism now depend on CWB and on differences within and among bargaining units.

**IV.A. Classical Syntheses**

Even retaining strict classical nominal-real divides by assumption as standard CBI models do, nominal effects of credible conservatism clearly depend on labor/goods market institutional structure and, indeed, on many other political-economic factors. Franzese (1999b) presents the

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\(^{34}\) Scharpf’s (1984, 1987, 1991) work is exceptional (both senses) and somewhat foreshadowed the syntheses emerging now.
general argument (foreshadowed in Lohmann 1992, Jonsson 1995, and Bleaney 1996) and
provides evidence on inflation strongly supporting a weighted-average specification like that
described below. Subsets of the implied interactions, regarding CBI and CWB, are more
and others reviewed below, and, regarding CBI and government partisanship and/or elections, in

CBI refers, in part, to CB monetary-policy autonomy from government. Lohmann (1992) shows this to imply that actual monetary policies will be central banks’ desired policies to degrees
given by CBI and governments’ desired policies to remaining (1-CBI) degrees. Thus:

\[
m^* = CBI \cdot m^*_b + (1 - CBI) \cdot m^*_g
\]

\[
m^*_b = \pi^*_b + c^*_b (y^*_b - y_n)
\]

\[
m^*_g = \pi^*_g + c^*_g (y^*_g - y_n)
\]

b (g) refers to banks (governments) and * to targets or equilibria. Even ignoring any potential
strategic interactions between monetary authorities and wage/price bargainers, even maintaining
direct inflation-control by the CB (i.e., \(m = \pi\)), CBI’s nominal impact:

\[
\frac{\partial \pi}{\partial CBI} = -(m^*_g - m^*_b) = -[(\pi^*_g - \pi^*_b) + \alpha \{c^*_g (y^*_g - y_n) - c^*_b (y^*_b - y_n)\}]
\]

Thus, anything that differentially impacts central banks’ and governments’ desired policies alters
CBI’s inflationary impact; vice versa, any such factors’ impacts depend on CBI. In particular,

\[35\] few dispute that CWB affects \(y_n\) and \(\alpha\), so the nominal effects of CBI and CWB generally depend
on each other (and on anything which else affects \(\pi^*_g, \pi^*_b, c^*_g, c^*_b, y^*_g, y^*_b, \alpha, \text{ and } y_n\)).

---

35 Rescale CBI to 0=full dependence and 1=full autonomy. More precisely, Lohmann (1992) demonstrates
that, for similarly scaled costs of replacing central bankers, \(r\), equilibrium policy is \(rCB+(1-r)G\) where CB is
banks’ and G governments’ desired policies. She does not emphasize the present implications of this result.
Jonsson (1995) and Bleaney (1996) posit (11)’s first line, but ignore its general implications.

36 This merely exemplifies a still more general result. Virtually any principal-agent problem can be
characterized by the principal’s desired policy, \(f(X)\), the agent’s, \(g(Z)\), and the costs, \(a\), to principals of direct
policy-control, \(k\). Policy is then \(k=h(a; g(Z)+(1-h(a))f(X))\) with \(0<h(a)<1\) and \(h(a)\) weakly increasing, so \(dk/da\)
depends on \(X, Z, f(\cdot), g(\cdot), \text{ and } h(\cdot)\).

37 Central bank conservatism implies \(\pi^*_g > \pi^*_b, c^*_g > c^*_b, \text{ and/or } y^*_g > y^*_b\), so CBI generally reduces inflation.
Focusing on labor/goods market institutional structure, note (as Cukierman 1992 does) that policy-maker incentives toward surprise inflation, and therefore inflationary biases, only exist insofar as real wages are excessive.\textsuperscript{38} \textit{i.e.}, $y_n$ decreases in real-wage excessiveness; excessiveness, in turn, increases in labor/goods institutional structures that ameliorate competition effects (\textit{monopoly power}, $MP$) but decreases in structures that internalize externalities (\textit{bargaining coordination}, $BC$):

$$y_n = y^n(MP, BC); \quad y_1^n < 0, y_2^n > 0$$

(13)

This classical additive combination of CBI and CWB logic thus concludes that:

(a) Natural rates decrease in bargaining coordination and increase in monopoly power
(b) Inflation decreases in central-bank autonomy, but less so (more so) the higher is bargaining coordination (monopoly power)
(c) Inflation decreases (increases) in bargaining coordination (monopoly power), but less so the higher is central-bank autonomy, and
(d) Natural rates are unaffected on average by central-bank autonomy (by assumption).

Formally, assuming unobtainably high and invariant targets, reducing (12) clarifies:

$$\frac{\partial \pi}{\partial CBI} = -z - \alpha (c_g - c_b) y^n(MP, BC)$$

(14)

Two aspects of (14) are key. First, notice that \textit{credible conservatism} has two parts: central bank independence (CBI) and central bank conservatism relative to governments ($c_g - c_b$). Beneficial nominal effects of each increase (decrease) in labor/goods market monopoly power (bargaining coordination). Second, effects of $MP$ and $BC$ on natural rates ($y_1^n$, $y_2^n$) may depend on credibility and conservatism; if so, then there would be additional \textit{strategic} interaction effects.

This classical synthesis, however, retains strict real/nominal divides by assuming that wages are effectively set in real levels, with expected inflation simply added thereafter, and that monetary policy identically controls inflation. Thus, strategic interactions are debarred. However, given wage/price bargainers with market power in labor/goods markets, these nominal bargains

\textsuperscript{38} Specifically: “employment [must be] a decreasing function of the real wage rate...[\textit{i.e.}]...own effects [must] dominate cross-effects in labor demands or...supply of labor in the competitive segment of the labor market [must be] relatively irresponsible 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.
will take expected nominal reactions into account, thereby altering $y_n(\cdot)$ and $\alpha$. Classical syntheses are accordingly insufficient. Bleaney (1996), Forteza (1998), Hall and Franzese (1998), and Iversen (1999) analyze the nominal effects of these strategic interactions effects directly, but several works in sections IV.B-IV.D analyze the nominal and real effects of such strategic interactions, so I defer further discussion.

**IV.B. Strategic Private-Sector Actors:**

Soskice and Iversen (1998, 1999) demonstrate that strategic private-sector bargainers suffice to produce long-run, on-average real effects for monetary policy credible conservatism. This summary follows the simpler (1998) model; the (1999) work derives similar results in a full Blanchard-Fisher (1989, p. 433) model. Real effects stem from collective-action problems among bargainers, not from lack of credibility, so assume money-supply rules are fully credibly known:

$$M = P^{1-\beta}$$  \hfill (15)

$\beta \in (0,1]$; $\beta = 0$ ($\beta = 1$) implies full (non-)accommodation; thus $\beta$ indexes monetary conservatism. Prices are $P = \prod P_i^{1/N}$. Given many Bertrand competitors, constant returns to scale, and labor productivity normalized to unity, price of good $i$ equals wages in sector $i$. Real demand for good $i$, $q_i$, is accordingly:

$$q_i = e_i = m / N - \eta p_i = m / N - \eta w_i$$  \hfill (16)

ei is employment in $i$, equal to $q_i$, for simplicity. $m$ is real money supply. There are $N$ equally-sized sectors and unions ($N$ inversely indexes coordination). $\eta$ is relative-price, $p_i = P / P$, demand-elasticity. Finally, sectorial monopoly unions make real-wage/employment trade-offs by:

$$U_i = \omega_i^\alpha e_i$$  \hfill (17)

$\omega_i = W / P$ are real consumption-wages. Substituting (15) and (16) into (17) and maximizing with respect to nominal wages, $W_n$, which unions are assumed to control, produces:

$$\omega_i^* = \frac{\alpha - \frac{\beta}{N-1}}{\eta (1 + \frac{\beta}{N-1})} \cdot e_i$$  \hfill (18)
The equilibrium is symmetric, so \( \omega_i^* = \omega^* = 1 \); therefore equilibrium employment is:

\[
e^* = \frac{\eta (1 + \frac{\beta}{N-1})}{\alpha - \frac{\beta}{N-1}}
\]

Thus, unless \( N = \infty \), i.e. outside of perfect competition, (credible) monetary-conservatism, \( \beta \), has real rational-expectations-equilibrium effects.

The real effects of monetary-conservatism in this model vary with the number of unions, \( N \), and vice versa as in Figure 3. Monetary conservatism, i.e. higher \( \beta \), increases employment and does so increasingly as bargaining becomes more concentrated, going from perfect competition, where there are no real effects, to \( N = 1 \) at which point the equilibrium is undefined. Standard classical models go astray because they ignore the dependence of real money supply on wage/price decisions, \( d(M/P)/dW_i = \beta/(N-1) \), which is non-zero and decreasing in \( N \) for \( N < \infty \).

![Figure 3](image)

**Figure 3**: The employment effects of monetary conservatism as a function of the concentration of bargaining.

Equation \([18]\) can then be viewed as a bargained real-wage schedule, showing how the bargained or target real wage increases as the employment rate and the importance attached to wages (\( \alpha \)) increases, and falls as the product-market demand becomes more elastic, and as \( [\beta/(N-1)] \), the degree of [monetary] restraint [perceived by bargainers], increases. It can also be seen that \( [\beta/(N-1)] \) will be small [large]...if \( N \) is large [small] (1989, p. 115).

Two issues regarding the Soskice-Iversen approach differentiate it, and its conclusions, from others reviewed below. First, monetary authorities are non-strategic; money-supply rules are exogenous, neither deriving from policy-maker optimization nor responding to bargaining settlements. Yet, if bargainers are strategically responding to money-supply rules, then monetary policy-makers are likely to respond strategically to bargainers. Second, as critically, real-demand
elasticity is fixed, exogenous and, in particular, assumed independent of $N$ in the comparative statics. However, as the number of sectors bargaining a single wage, $N$, decreases, relative-price elasticities are likely to diminish. \emph{i.e.}, no Calmfors-Driffill competition effect operates here. These differences, plus private-sector inflation-aversion, led others to markedly different conclusions about the particulars of the, agreed non-zero, real effects of monetary conservatism.\footnote{Constant returns to scale also differentiate this approach from Velasco and Guzzo’s (1999). Another problematic, technical issue is that at union weight on real wages, $\alpha$, $\alpha=\beta/(N-1)$ employment is undefined, and wages are 0. As $\alpha$ approaches $\beta/(N-1)$ from below $e^*$ goes to $\infty$; as $\alpha$ approaches $\beta/(N-1)$ from above $e^*$ goes to $-\infty$.} These issues aside, the core intuition remains. Private-sector actors facing exogenous monetary conservatism perceive abilities to affect real money-supply proportional to their share of the economy. Accordingly, real effects of monetary conservatism are generally non-zero and typically larger the more encompassing wage/price bargaining.

\textbf{IV.C.1 A Strategic, Inflation-Averse Monopoly Union and a Monetary Authority:}

Several others explore strategic interactions of monetary-policy authorities with a strategic, \emph{monopoly} private-sector actor (Yashiv 1989; Cubitt 1992, 1995; Agell and Ysander 1993; Gylfason and Lindbeck 1994; Grüner and Hefeker 1997; Jensen 1997; Skott 1997; Zervoyianni 1997). Here, credible conservatism has real effects \emph{if the monopoly wage/price bargainer directly dislikes inflation}.\footnote{Constant returns to scale also differentiate this approach from Velasco and Guzzo’s (1999). Another problematic, technical issue is that at union weight on real wages, $\alpha$, $\alpha=\beta/(N-1)$ employment is undefined, and wages are 0. As $\alpha$ approaches $\beta/(N-1)$ from below $e^*$ goes to $\infty$; as $\alpha$ approaches $\beta/(N-1)$ from above $e^*$ goes to $-\infty$.}

Empirically, private-sector inflation-aversion is large and well-documented (see, \emph{e.g.}, Hibbs 1987 ch. 4). Theoretically, inflation-aversion is justified on four grounds. First, standard monetary-policy models routinely assume inflation-averse policy-makers, so mere symmetry argues for private-sector inflation-aversion. If monetary policy-makers are benevolent dictators, then their utility is some combination of private-sector utilities. More realistically, any government’s utilities must derive from private-sector utilities, though highly unequal weights are likely especially in non-democracies. Thus, if policy makers care about inflation, then some private-sector actors must. If not, then why inflation matters at all is hard to see. Indeed, any
reason adduced for justifying policy-maker inflation-aversion in standard models, e.g. association between average inflation and inflation volatility, could justify private-sector aversion. Second, inflation-aversion is standard, though often under-motivated, in CWB theory. Possible motivations include, third, private-sector actors having some nominally denominated assets (mandatory pension-schemes, etc.) which are incompletely indexed. Fourth, in open economies, domestic inflation is a relative price-movement unless domestic production and consumption bundles are the same, i.e. unless there is no trade (Rama 1994, Grüner and Hefeker 1997, Zervoyianni 1997, Franzese 1999a). Whatever the motivation, strategic private-sector bargainers will take monetary-policy reactions to their behavior, now including the inflation-impacts of those reactions, into account.

Gylfason and Lindbeck (1994) give perhaps the simplest exposition of this approach. Start with the quantity theory, (1), normalizing \( v \) to 0 as...

...the simplest possible way to capture the crucial inverse relationship between output and the price level for given money supply...[Add]...the simplest possible aggregate supply as an increasing function of prices for given nominal wages \([Y=P-W]\)...All elasticities are set equal to 1 for simplicity and without material loss of generality (p. 36).

The equilibrium (AD=AS) solution is then simply:

\[
Y = \frac{M-W}{2} \quad ; \quad P = \frac{M+W}{2} \tag{20}
\]

If money and wages are exogenously dictated by government and monopoly union, equilibrium solutions have standard Keynesian properties: \(dY/dM,dP/dM,dP/dW>0,dY/dW<0\).

Simple as this is, Gylfason and Lindbeck note, the standard CBI model is simpler still since output is at least endogenous here. The true advance, though, is to consider \( M \) and \( W \) as jointly optimally chosen (see also Cubitt 1992) by a strategic government maximizing:

\[
V = -\left( Y - Y^*_g \right)^2 - v(\Delta P - \Delta P^*_g)^2 \tag{21}
\]

which is standard, and a strategic monopoly-union maximizing:

\[
U = -\left( W - P - \omega_u^* \right)^2 - u(\Delta P - \Delta P^*_u)^2 \tag{22}
\]

as standard in the monopoly-union literature but adding inflation-aversion. Cournot-Nash has each
actor maximizing (21) or (22) over M or W, subject to (20), giving reaction functions:

\[ W = w_2 + w_1 M \quad \text{where} \quad w_2 = \frac{2\omega_u^* - 2uY_u^* + 2qP_u^*}{1 + u + q} \quad \text{and} \quad w_1 = \frac{1 + u - q}{1 + u + q} \quad (23) \]

\[ M = m_2 + m_1 W \quad \text{where} \quad m_2 = \frac{2Y_g^* + 2vP_g^*}{1 + v} \quad \text{and} \quad m_1 = \frac{1 - v}{1 + v} \quad (24) \]

Thus, the union fully accommodates money-supply increases, i.e. classical nominal-real divides obtain, only if its weight on inflation, \( q \), is 0. Likewise, government fully accommodates wage increases only if \( v \), its inflation-weight, is 0. The more each weighs inflation, the less it accommodates. Generally then, output and prices depend on all preference parameters of both parties \((u, q, v)\) and all targets \((\omega_u^*, Y_u^*, P_u^*, Y_g^*, P_g^*)\). The equilibrium in output and prices is:

\[ Y = \frac{m_2(1 - w_1) + w_2(m_1 - 1)}{2(1 - m_1w_1)} \quad ; \quad P = \frac{m_2(1 + w_1) + w_2(m_1 + 1)}{2(1 - m_1w_1)} \quad (25) \]

(25) implies that if the union is indifferent to inflation, \( q=0 \), then output depends only on union preferences/targets while government preferences/targets influence only inflation. If \( q \neq 0 \), and union and government targets, \( Y^* \) and \( P^*=P_{t-1}Y^* \), are equal, then output and inflation are:

\[ Y = Y^* - \frac{v(Y^* + \omega_u^*)}{(1 + u)v + q} \quad ; \quad \Delta P = \frac{Y^* + \omega_u^*}{(1 + u)v + q} \quad (26) \]

So, if the union targets real-wage/employment combinations above the labor-demand curve at full employment, i.e. if \( \omega_u^* > Y^* \), then strategic interaction of union and government spawns stagflation defined as \( Y < Y^* \) and \( \Delta P > \Delta P^* \). Even if the union’s targets are on the full-employment labor-demand curve, and output targets are equal, government conservatism \( \Delta P_g^* < \Delta P_u^* \) alone implies stagflation. If they Nash bargain using some weighted average of their utilities, inflation biases but not output biases disappear. Note, finally, the implications of (26) for monetary conservatism’s real and nominal effects:
\[ \frac{\partial Y}{\partial v} = - \frac{Y^* + \omega_u^*}{(1 + u)v + q} + \frac{v(Y^* + \omega_u^*)(1 + u)}{[(1 + u)v + q]^2} \]  

\[ \frac{\partial (\Delta P)}{\partial v} = - \frac{(Y^* + \omega_u^*)(1 + u)}{(1 + u)v + q} \]  

\[ \frac{\partial (\Delta P)}{\partial v} = - \frac{(Y^* + \omega_u^*)(1 + u)}{(1 + u)v + q} \]  

\[ \frac{\partial (\Delta P)}{\partial v} = - \frac{(Y^* + \omega_u^*)(1 + u)}{(1 + u)v + q} \]  

I.e., if a monopoly union and the monetary authority target the same employment and inflation, and if the union’s targeted real-wage/employment combination is not above the labor demand curve, then credible conservatism is neutral nominally and really (because \(\omega_u^*=-Y^*\)). If either condition is violated, then credible conservatism has real and nominal effects which depend critically on the preferences/targets of the monopoly union and the government as shown in (25).

Cubitt (1989) and Yashiv (1989) appear to have originated this approach. Cubbitt (1992) uses it to consider games in which government, union, both, or neither can pre-commit to M or W strategies. The games are Stackelberg/Government-Leads (GL), Stackelberg/Union-Leads (UL), and Nash with and without a pre-commitment stage. Results differ depending on who can lead (interestingly the government may prefer to follow). Cubbitt (1997) uses it to explore three aspects of corporatism beyond the centralization of bargaining (monopoly-union models assume full centralization): (1) greater union-weight on inflation, (2) higher union aggregate-output target, (3) greater alignment of union and government output-targets, and (4) cooperative play by union and government. The results of these considerations can be derived from (25) above.

Another result common to this approach is that a monetary authority indifferent toward inflation may achieve optimal (0 inflation and unemployment) outcomes. Skott (1997) nicely summarizes the intuition behind these types of models:

These results may seem paradoxical but the intuition is straightforward. If the central bank is inflation averse (or pre-committed to a particular rate of inflation or growth of nominal demand), the union can take advantage of this aversion (pre-commitment): high money-wage increases will buy lower output (and higher real wages). Whether and to what extent the union will want to exploit this possibility depends on the terms at which it can purchase output changes (that is, the central bank’s [relative weights on inflation and output]) as well as on its own relative preferences for inflation and output... At one extreme we have the inflation-indifferent central bank...which makes it infinitely expensive for the union to reduce output [below the banks target], y''; at the other extreme, the output-indifferent central bank implies that it is costless for the union to reduce output, so the union achieves its bliss point, y'. In between those
two extremes are outcomes with [inflation] \( \pi > 0 \) and \( y^* > y > y^* \) (p. 613).

Grüner and Hefeker (1997) and Zervoyianni (1997) use similar approaches to analyze EMU and international exposure, respectively, assuming monopoly unions in each country and monetary policy determined by various combinations of the governments involved. The central conclusion there, as also for different reasons in Soskice and Iversen (1998), Hall and Franzese (1998), and Franzese (1999a), is that exchange-rate commitments are not functionally equivalent to domestic monetary-policy credible-conservatism because the nature of the wage/price-bargainer interaction with the monetary authority differs. Macroeconomic outcomes depend on the characteristics of the monetary signaler and signal, as CBI theory emphasizes, but also on characteristics of the audience (bargainers) as emphasized here.

IV.C.2 Strategic, Inflation-Averse Private-Sector Actors and a Monetary Authority:

Cukierman and Lippi (1999) and Velasco and Guzzo (1999) extend this approach by allowing union concentration to vary. Cukierman-Lippi consider \( n \) unions and a monetary policy-maker with utilities similar to (21) and (22). All labor is unionized by craft, so labor is perfectly substitutable across industries but imperfectly across unions. Union \( j \)'s labor-demand curve is:

\[
L_j^d = \left[ \frac{\alpha}{n} (d - \omega_j) - \gamma (\omega_j - \bar{\omega}) \right]L
\]

(29)

\( \alpha, d, \gamma \) are positive parameters; \( \gamma \) reflects substitutability across labor types. \( \omega_j \) is \( j \)'s real wage, and \( \bar{\omega} \) is arithmetic mean real-wage. \( L \) is total labor supply. (29) implies aggregate labor-demand \( \alpha (d - \bar{\omega})L \), which does not depend on \( n \), and also that elasticity of labor-demand facing \( j \) is:

\[
\eta_j = \frac{\alpha + \gamma (n - 1)}{\alpha (d - \omega_j) - n\gamma (\omega_j - \bar{\omega})}
\]

(30)

which is generally increasing in \( n \). This reflects Calmfors-Driffill’s competition effect of decreasing centralization. The sequence, as usual, is each union \( j \) sets nominal wages, taking other unions’ wages and CB reaction functions as given. Then the CB fulfills its reaction function (fully credible commitment) by picking monetary policy and thus determining inflation.

\( ^{40} \) Unless \( \omega_j > \bar{\omega} \) which does not obtain in equilibrium.
Solving backward, the CB’s optimization implies inflation, which it controls, will be:

\[ \pi = \frac{\alpha^2}{\alpha^2 + C} (\Phi + \pi^e) \quad ; \quad \Phi \equiv \Phi^1 - \Phi^c \quad (31) \]

\( \pi^e \) is expected inflation; \( \omega^e \) is market-clearing real-wage, so \( \Phi \) is average real-wage premium; \( C \) is conservatism of the monetary authority, i.e., its weight on inflation relative to unemployment.

Applying rational expectations to (31) shows that equilibrium inflation is simply:

\[ \pi = \frac{\alpha^2}{C} \phi \quad (32) \]

This is the standard Barro-Gordon (1983a) result, except that \( \phi \) may turn out to depend on \( C \).

Assuming that \( j \) sets wages and then firms choose \( L_j \), the unions’ optimization produces the following symmetric equilibrium:

\[ \Phi_j = \phi = \frac{Z}{\alpha \left[ (1 - Z)B^\alpha \frac{\alpha}{C} + A[\alpha Z + \gamma (n - 1)] \right]} \quad \forall j \]

\[ Z = 1 - \frac{\partial \pi}{\partial w_j} = 1 - \frac{\alpha^2}{(\alpha^2 + C)n} \quad (33) \]

\( B \) (\( A \)) is union-weight on inflation (\( j \)’s unemployment):

\[ Z \] is the impact of a 1-unit increase in the nominal wage rate on the typical union’s real wage rate taking into consideration the reaction function of the CB. Thus, \( Z \) is a measure of the effectiveness of changes in the nominal wage in bringing about changes in the real wage (p. 12).

Critically, \( Z \) depends (positively) on both \( n \) (CWB\(^{-1}\)) and \( C \) (CBI), the former because the impact of \( j \)’s nominal wages are only \( 1/n \) of the aggregate and the latter because conservative monetary-policy turns more of nominal into real wage-gains. Equilibrium unemployment is \( u = \alpha \phi \), so both inflation and unemployment increase in average real-wage premiums produced by the interaction of monetary and wage/price bargaining institutions. So, \( \phi \), and therefore unemployment and inflation, depend on \( C, n, \alpha, \gamma, A, \) and \( B \). Once again, strategic non-neutralities arise; this time, though, for two reasons.

First, because unions care about inflation and banks directly control it, increasing inflation in response to unemployment, unions may moderate their demands so as to lessen monetary-
authority’s inflationary temptations. The larger \( j \)’s share of the economy, the more the bank is responding directly to \( j \), so the more \( j \) moderates. Oppositely, the more conservative expected policy, the less inflationary temptations are succumbed to, so the less this restraint-inducing mechanism operates. This mechanism also drove the monopoly-inflation-averse-union results above. Second, Cukierman-Lippi emphasize a “competition-induced strategic non-neutrality (CISNN)” which arises because the marginal impact of an increase in \( j \)’s nominal wages on \( j \)’s real wage, \textit{i.e.} \( Z \), depends positively on \( C \) whereas the marginal impact of an increase in \( j \)’s nominal wages on \( j \)’s \textit{relative} wage does not. The higher \( C \), the narrower this differential and thus the less moderation induced by the CISNN. This is similar to the mechanism driving the Soskice-Iversen results.

\[
\frac{\partial \varphi}{\partial B} < 0, \quad \frac{\partial \varphi}{\partial \gamma} < 0, \quad \lim_{n \to \infty} \frac{\partial \varphi}{\partial B} = \lim_{n \to \infty} \frac{\partial \varphi}{\partial \gamma} = 0 \quad (\text{Proposition 1})
\]

\[
\frac{\partial \varphi}{\partial n} = f(C, \alpha, B, A, \gamma, n) < 0 \forall n \text{ if } B < \frac{AC^2 \gamma}{\alpha^3} \equiv B_c \quad (\text{Proposition 2i})
\]

\[
\frac{\partial \varphi}{\partial n} = f(C, \alpha, B, A, \gamma, n) < 0 \text{ at low } n \text{ and } f(\cdot) > 0 \text{ at high } n \text{ if } B > B_c \quad (\text{Proposition 2ii}) \quad (34)
\]

\[
\text{Max } \varphi \text{ occurs at } 1 \text{ if } B < B_c \text{ and at } n^* = \frac{\alpha^2 \sqrt{\alpha \chi (\alpha^2 + C) - C \alpha^2}}{\alpha^2 + C} \text{ if } B > B_c
\]

\[
\lim_{n \to \infty} \varphi = 0 < \varphi \mid_{n=1} = \frac{C^2}{\alpha^2 [B \alpha^2 + AC^2]} \quad (\text{Proposition 4})
\]

Equilibrium real and nominal outcomes (33) clearly depend on \( C \) and \( n \) and their interaction, but interpretation is difficult. Cukierman-Lippi nonetheless manage to derive (34). Proposition 1 establishes that union inflation-aversion and cross-craft substitutability unambiguously improve unemployment and inflation, though these effects vanish as \( n \) approaches infinity (perfect competition). Proposition 2 establishes that, beyond a critical amount of inflation-aversion relative to other model parameters, \( B_c = AC \gamma / \alpha^4 \), a Calmfors-Driffill curve obtains; short of that, real and nominal outcomes are strictly improving in decentralization (competition effects
dominate). If \( B > AC^2 \gamma / \alpha^3 \), then the peak of the Calmfors-Driffill curve moves toward centralization as \( C \) increases. The full decentralization end of the Calmfors-Driffill curve is always lower than the full centralization end (Proposition 4). From these can be teased some insight into the derivatives and cross-derivatives of central interest here:

\[
\frac{\partial u}{\partial C} > 0 \text{ if } B > 0 \text{ and } / \text{ or } (\gamma > 0 \text{ and } n > 1) \quad ; \quad \lim_{n \to \infty} \frac{\partial u}{\partial C} = 0 \quad (\text{Proposition 5})
\]

\[
\lim_{n \to \infty} \frac{\partial \pi}{\partial C} < 0 \forall B \text{ but } \frac{\partial \pi}{\partial C} > 0 \text{ is possible at some } n \text{ given sufficient } B \quad (\text{Proposition 6})
\]

We can glean from these that the net real effects of all the interactions implicit in (33) are to determine whether Calmfors-Driffill curves exist—unemployment monotonically rises in centralization if not—and, if one exists, how the interactions of credible conservatism, \( C \), and centralization \( n^{-1} \), shift and reshape it. Proposition 5 states that, excluding perfect competition, if (a) labor is not perfectly non-substitutable and there is more than 1 union, or (b) union(s) are inflation averse, then credible monetary conservatism unambiguously increases unemployment. It generally decreases inflation, but sufficient inflation aversion can even overturn that result at some \( n \). Focusing on unemployment, the Calmfors-Driffill curve at higher \( C \) is argued to lie entirely above the curve at lower \( C \); as \( C \) increases, the peak of the curve becomes more accentuated and drifts toward higher centralization (see Cukierman-Lippi Figures 2 and 3). In short, these considerations imply that locations and shapes of any relations between labor/goods-market institutional structure and real variables, e.g. Calmfors-Driffill (1988) curves, depend on degrees of credible conservatism. Unfortunately, the direction and nature of this shifting and reshaping produces highly non-linear predictions which depend critically on assumptions or arguments regarding especially the elasticity of labor (goods) demand and supply, and also many other model parameters, and how those change with wage-/price-bargaining organization.

There are some problematic elements of the model. First, *craft* unions are a strange
assumption in most sectors of most countries; the result is an emphasis on inter-union over inter-firm substitution. Both elasticities are presumably relevant; most would reverse the emphasis. Second, improving on Soskice-Iversen, labor-demand elasticity with respect to real wages does depend on $n$, so Calmfors-Driffill competition effects are present. Otherwise, though, all the key elasticities are still parameters, determined by assumption. Third, isolation of the CISNN, which seems identical to Soskice-Iversen’s only non-neutrality, by removing inflation-aversion is the next logical step. Finally, firms as employers are still largely absent from all of these models. No wage bargaining, only wage setting: unions set wages and firms take them; the only bargains are between unions and CB’s each of whom wholly control their wages and the money supply.

Velasco and Guzzo (1999) make some inroads on endogenizing some key parameters and introducing (unfortunately only 1) representative firm. The firm employs a continuum of symmetric workers to produce the single consumption-good; workers supply labor according to an intertemporal utility function which includes consumption positively and labor-squared and inflation-squared negatively. The firms’ profit-maximization decision produces a symmetric labor demand for each worker-type. Each equal-sized union maximizes its members utilities. Since everything is symmetric, unions optimally set equal wages for all their workers. Key to the union’s problem, then, is elasticity of demand for each worker as perceived by the union, as in other models. That depends, in turn, on elasticity of substitution between worker-types and a returns-to-scale parameter, both from the firm’s production function via its profit-maximization decision, and (inversely) on the number of unions. Bertrand competition among unions and between each and the government, with unions setting wages first, the government setting inflation next, and the firm setting employment and output last, produces a large set of results, many of which run contrary to conventional wisdom:

**Result 1:** As $\beta_p \rightarrow 0$, (worker inflation-aversion $\rightarrow 0$), or as $n \rightarrow \infty$ (perfect competition in the labor market is approached, the model reproduces to the conventional Barro-Gordon results.

**Result 2:** For given $n \leq \infty$ and $\beta_p \neq 0$, an inflation-indifferent central bank ($\beta_p = 0$) maximizes population welfare and produces 0 inflation and optimal output and employment levels.
**Result 3:** For given $n<\infty$ and $\beta_p \neq 0$, employment and output decrease in CBC.

**Result 4:** For given $n<\infty$ and $\beta_p \neq 0$, inflation is hump-shaped in CBC, and maximized at $\beta^*_s = \left\{ \gamma \beta_p / ((n-1)(1-\alpha)^2) \right\}^{\frac{1}{3}}$.

**Result 5:** For given $n<\infty$ and $\beta_p \neq 0$, welfare is U-shaped in CBC, and minimized at $\beta^{**} = \left\{ \gamma \beta_p / ((n-2)(1-\alpha)^2) \right\}^{\frac{1}{3}}$.

**Result 6:** For given $\beta_s$, $n<\infty$ and $\beta_p \neq 0$, if elasticity of substitution among worker-types is sufficiently small then economic performance and welfare uniformly decrease in $n$; otherwise they are hump-shaped with optimum performance at an intermediate $n$.

Key to the radical differences between Velasco-Guzzo and classical CBI theory are, as they note, private-sector inflation-aversion and private-sector strategic-behavior. However, their conclusion that absence of either returns one to classical models, contradicts Soskice-Iversen and Cukierman-Lippi. Perhaps the severe symmetry in Velasco-Guzzo obscured or swamped the CISNN; there are no relative wages in the Velasco-Guzzo equilibrium. This appears to underlie some radical differences with Calmfors-Driffill as well. Velasco-Guzzo also note, in this context, that their production function assumes all worker-types are necessary to production. This allows competition-effects to increase as $n$ increases, but toward a fixed parameter of the production function rather than toward infinity as Cukierman-Lippi and Calmfors-Driffill assume. Thus, even in the limit, competition effects are limited in Velasco-Guzzo.

Figures 4a-5b in Velasco-Guzzo illustrate the implications of all this for the real and nominal effects of CBC and $n$. Summarizing these three dimensional graphs, CBC has positive real costs, $dR/dCB>0$; the shape of those real costs depend on elasticity of substitution among worker types, $\sigma$, returns to scale, $\alpha$, bargaining centralization, $n^{-1}$, and CBC itself. The marginal costs diminish with CBC ($d^2R/dCBC^2<0$). For $\alpha(1-\alpha)<1$, they also diminish with centralization, but with $\alpha(1-\alpha)>1$ they increase with centralization (though only noticeably so for $n<3\pm$). These differences notwithstanding, Velasco-Guzzo suffers from the same sensitivity to elasticity assumptions that plagued Cukierman-Lippi and from the same conflation of inflation-aversion and strategic-private-sector effects.

**IV.D. Strategic, Differentiated Private-Sector Actors and Strategic Monetary Authorities:**

Two final approaches emphasize differences among strategic private-sector actors
additionally to wage/price-bargaining encompassingness (Iversen 1998a,b; Franzese 1999a).

Franzese (1999a) argues that monetary authorities do not directly control prices; therefore they must control inflation by threatening monetary-policy responses to wage/price settlements sufficient to induce monopolistically-empowered wage/price bargainers to settle upon non-inflationary increases. Returning to (10), the monetary authority essentially announce schedules $dM/dP$ which shift power-balances in worker-firm Nash bargains toward acceptable (to them) nominal growth. The severity of threatened reactions required to induce non-inflationary settlement depends on bargaining coordination, as in most models above, because only $1/N$ of threats are directly perceived by bargainers. In this aspect, only the attempt to bring monetary-policy directly into worker-firm bargains is unique.

Also emphasized, however, is that monetary (re-)actions do not impact all bargainers equally. Enacted threats (real contraction) hinder domestic real-demand and so injure all actors dependent on domestic demand, i.e. all private-sector actors, but they also increase export relative to import prices, thereby especially injuring traded-sector actors. Since, inflation equilibration is achieved by creating or threatening real slack sufficient to produce non-inflationary wage/price settlements, the rest of the economy must suffer disproportionately less when primarily traded-, disproportionately more when primarily public-, and intermediately when primarily private-non-traded-sector bargainers must be restrained. If threats are ever enacted, then monetary conservatism involves familiar macroeconomic trade-offs, though monetary credibility, for any given conservatism, is unambiguously beneficial.

Credibly conservative monetary policy therefore has real effects which depend on bargaining coordination and on its sectorial composition. Franzese (1999a) conjectures that CBI, CWB, and T/G (traded-relative-to-public employment) are strategic complements in producing beneficial real outcomes (reducing real costs), but that they are strategic substitutes in producing beneficial nominal outcomes (the latter follows directly from (11)). However, the model is merely

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heuristic, employing versions of (5)-(10) plus the relations \( dM/dP \) and \( dP/dW_j \) to sign marginal utilities so as to illustrate and guide the argument. Clearly much work remains to be done, but potential gains from distinguishing conservatism and credibility, incorporating the wage-price bargain directly into the analysis, and allowing for differentiation among bargainers in strategic relations to monetary authorities were highlighted.

Iversen (1998a,b) also emphasizes differences among bargainers, but he stresses strategic unions *that dislike wage disparity* in addition to having standard real-wage and employment goals. Key to his logic is that inflation erodes real-wage disparity relative to the nominal-wage disparity that had been produced by the (multiple) wage/price settlements. Thus, lax monetary policy may provide “nominal slack” which is useful to unions in undoing some disparity that might otherwise be produced by wage settlements. An interesting aspect of this model is its relatively clear non-linear prediction. Nominal slack is increasingly necessary the more the wages of more disparate-productivity workers are bargained within the same encompassing units, so monetary conservatism can have quite adverse effects at high bargaining concentration. Contrarily, as the economy approaches perfect competition, wage disparity is increasingly determined by relative marginal-value-products and decreasingly the result of bargaining, so monetary conservatism is expected to be increasingly neutral. Finally, for intermediately organized economies, wage-disparity is less problematic but monetary conservatism can help enforce cooperative “lead-bargain” coordination (*e.g.*, as practiced in Germany).\(^{42}\)

Thus, the non-zero on-average real effects of credible conservatism depend on bargaining encompassingness and on the differences in productivity (growth) within and among bargaining units. Iversen’s (1998a, 1998b) results, however, either rely on differential money illusion among different wage-bargainers or requires further assumptions regarding why decreasing wage disproportionality *via* aggregate inflation rather than directly is sought/allowed/ignored. Still, the model clearly illustrates how preferences of high- and low-productivity (growth) workers differ.

\(^{42}\) This mechanism operates in Franzese (1999a) also.
from each other intrinsically, and vis-à-vis their strategic interaction with monetary authorities.  

V. The Accumulating Empirical Support:

Evidence is rapidly amassing supporting some of these claims. The empirical trail begins with Hall (1994) who, charting postwar-average inflation and unemployment by CBI and CWB, noted interactive patterns. Hall and Franzese (1998) summarize the patterns tabularly, showing that postwar-average (a) inflation declines in CBI and CWB, (b) unemployment declines in CWB and rises in CBI, (c) the unemployment increase in CWB (decrease in CBI) itself decreases (increases) as CBI (CWB) increases, suggesting a strategic complementarity in real outcomes, and (d) the inflation decreases in CBI and CWB both tend to decrease as the other increases, suggesting a strategic substitutability in nominal outcomes. Their regression analyses, using postwar-average, decade-frequency, and annual data in 18 OECD countries 1950-90, also support these conclusions (though (d) only weakly).

Franzese (1994, 1996 ch.4) used decade data in 21 OECD countries to test for interactive real effects of CBI, CWB, and sectoral structure. In addition to CBI-CWB interactions, which produced results substantively congruent with and statistically stronger than those in Hall and Franzese (1998), these models include traded-sector and government-employment shares and their interactions with CBI. The results strongly support claims that government employment and CBI interact detrimentally in real-outcome determination. With high CBI, greater government employment-shares were associated with higher unemployment, whereas with low CBI, greater government employment-shares lowered unemployment. Also, traded-sector employment-share seemed to improve unemployment outcomes, and more so the greater CBI, but that result was less strong statistically.

Garrett and Way (1995a) criticized Hall (1994) and Franzese (1994) for using subjective indices of coordination. Replacing CWB with union strength (union concentration plus coverage

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43 Plus, the model laid some of the groundwork for Soskice and Iversen (1998, 1999).
The results loosely suggest a $dR/d\text{CBI}$ curve ($R$ is some real variable) shifted down from those estimated by Hall and Franzese (1998) and Garrett and Way (1995a) but otherwise similarly shaped. This suggests one set of regressions controls linearly for something correlated with CBI that the other set excludes. The likely candidate is trade-openness which the latter studies include and which, by omitted-variable rules, would produce the down-shift observed in Cukierman-Lippi. Whether controlling for trade-openness is advisable is a separate question.

Garrett and Way (1995b) provide more-direct evidence of deleterious effects of public-sector employment on CWB’s ability to deliver wage/price restraint. They estimate a curvilinear relationship between union strength and unemployment, allowing public-sector strength within the union movement (public-sector union-members’ share of union-membership) to alter that relationship. Using quinquennial unemployment data from 13 OECD countries, they find a Calmfors-Driffill hump-shaped relationship between union strength and unemployment when public-sector strength is low, but also that high union strength functions increasingly counter-productively as public-sector strength rises.

Cukierman and Lippi (1999) regress 5-year averages of unemployment and inflation centered on 1980, 1990, and 1994 in 19 OECD countries on a tricotomized index of CWB (high, medium, low) derived from OECD (1997), Cukierman’s (1992) LVAU index of CBI, and the interaction of the last with the first three (plus controls). Their findings indicate that increasing CBI increases unemployment at low CWB, reduces it at intermediate CWB, and also, though more moderately, reduces it at high CWB. This accords strongly with their predictions, reviewed above, regarding that CBI reshapes the Calmfors-Driffill curve, but does not support their claims (and others’) about how CBI changes that curve, e.g. CBI did not appear generally to increase unemployment. Their inflation findings likewise accord with some of the shifting and reshaping implications, keeping in mind an implicit weighted-average specification as in (11) above.\footnote{The results loosely suggest a $dR/d\text{CBI}$ curve ($R$ is some real variable) shifted down from those estimated by Hall and Franzese (1998) and Garrett and Way (1995a) but otherwise similarly shaped. This suggests one set of regressions controls linearly for something correlated with CBI that the other set excludes. The likely candidate is trade-openness which the latter studies include and which, by omitted-variable rules, would produce the down-shift observed in Cukierman-Lippi. Whether controlling for trade-openness is advisable is a separate question.}
Iversen (1998a, 1998b) provides further evidence supporting real effects for CBI which depend on wage/price bargaining institutions and *vice versa*, but the precise effects found differ radically from others’. Iversen argues monetary credible conservatism reduces unemployment when wage-bargaining *concentration* is intermediate, increases unemployment when it is high, and has little effect when low. His findings in quinquennial data (15 OECD countries, 1973-93) support those predictions. Sample, measurement of bargaining *concentration*,\(^{46}\) and measurement of monetary-conservatism-and-credibility\(^{47}\) all differ from the rest though. With such differences in sample and measures, the differing results are not surprising, but they are disturbingly different in that his findings suggest “hard money” has unemployment *benefits* over much of the sample and unemployment *costs* in the most concentrated-bargaining countries: opposite several other theoretical and empirical results regarding CBI and CWB. As suggested below, arguments and evidence in Franzese (1999a) may help explain these differences.

Franzese (1999a) considers real and nominal outcomes in annual data from 21 OECD countries 1974-90, relating them to CBI, CWB, G/T, and (G/T)^2, where G is government and T traded-sector employment-share. The findings strongly supported the claim that CWB is more beneficial the more traded-sector dominate government-sector workers, indeed it can become detrimental given sufficient government-sector dominance. That sectorally determined impact of CWB is then magnified in its real effects and diminished in its nominal effects by CBI. *I.e.*, the evidence supports first that CBI and CWB are strategic complements (substitutes) in real-(nominal-) outcome determination and second that the impact of CWB, both *per se* and in its strategic interaction with monetary authorities, depends critically on the exposure of the bargainers being coordinated to competition. This strongly suggests a resolution to the controversy mentioned above over the impact of CBI at high-CWB. Possibly, Iversen (1998a, 1998b) attributes to wage-equalization among productivity-differentiated workers bargaining in

\(^{46}\) Notably regarding Japan and Switzerland, over which Soskice (1990) and Calmfors and Driffill (1988) also dispute. However, his sensitivity analysis leans against that being the sole source of the different findings.

\(^{47}\) He uses *actual* exchange-rate movements in addition to an average of standard CBI indices.
concert what Franzese (1999a) attributes to competitive-exposure-differentiated workers acting as bargaining leaders. These are supply and demand sides of the same empirical coin since high- and low-productivity-growth and traded-and-government-sector workers are empirically much the same sets of workers.\textsuperscript{48}

VI. Conclusion:

Some controversies notwithstanding, empirical work exploring these interactions of credible conservatism and labor/goods market institutional-structure agree on three important results. First, all found that institutions of wage/price bargaining and of monetary policy-making interact in determining both real and nominal outcomes. Accordingly, strict classical divisions between real and nominal economies seem empirically unwarranted, and institutional analyses need to consider, as much as possible, the functioning of networks of institutions since the effects of particular institutions tend to depend on others operating in the same environment. Second, all found that the real effects of CBI are more palatable or less unpalatable with intermediate than with low coordination; \textit{i.e.}, all found that over the empirically intermediate range of their CWB measure, $d^2R/dCBI dCWB < 0$. Disagreement regards effects at high-coordination/concentration and the sign of (agreed non-zero) $dR/dCBI$, \textit{i.e.} whether this generally non-zero curve lies above or below 0 and at what level of CWB it crosses if it does. Third, outside of these disagreements, the nominal effects are broadly agreed theoretically and empirically. These nominal impacts should be less controversial, though.

Important points of theoretical agreement also emerged. First, and most important, all agree that strategic private-sector actors can over-turn the strong neutrality result of standard classical CBI theory and modify any version of CWB theory. Second, all agree that inflation aversion among private-sector actors would also suffice to produce non-neutrality of credible conservatism, and that private-sector inflation-aversion would imply positive real costs for

\textsuperscript{48} What I believe Franzese (1999a) clarifies is that the generally adverse sign of $d^2R/dCBI dCWB$ Iversen (1998a, 1998b) predicts at high CWB depends on a particular sectorial composition of the workforce occurring at high CWB. Franzese (1999a) also suggests why this composition may, in fact, be likely to occur at high CWB.
monetary conservatism if private-sector actors are strategic (i.e., outside of perfect competition). Third, all would agree with the general statement that, in general, strategic private-sector action implies that credible conservatism shifts and reshapes any relation between CWB and real outcomes. However, the highly non-linear nature of some of the resulting predictions makes empirical inference in limited samples quite problematic.

The disagreements regard the nature of this shifting and reshaping and stem primarily from different assumptions about key elasticities, especially real and relative wage-elasticities of labor demand and real and relative price-elasticities of output demand, and how these change with the institutional-structure of wage/price bargaining. Escaping this dependence on arbitrary assumptions may prove impossible, but clearer exposition of the implications of different assumptions should be possible though it awaits further theoretical development.

That theoretical development can proceed from several directions. Perhaps the first goal would be to isolate the several sources of non-neutrality in several of these models. Soskice-Iversen is exemplary in this regard as it isolates only the differential impact of credible conservatism on relative-wage responsiveness and real-wage responsiveness to nominal-wage increases (plus strategic unions). The monopoly-inflation-averse-union models are also exemplary as they effectively assume away relative wage effects and only consider inflation-aversion (and the strategic union). Cukierman-Lippi and Velasco-Guzzo have several sources of non-neutrality operating in their models, two of which, but perhaps not the only two, are the inflation-aversion and the relative-real-wage difference highlighted separately in the other works. Part of the current confusion about the nature of these agreed non-neutralities probably rests in some of these mechanisms operating in some models but not others.

On the other hand, identifying possible sources of non-neutrality may be in its infancy; Franzese and Iversen, e.g., also introduced a differential-impact-of-credible-conservatism-on-differentiated-bargainers mechanism. Thus, another, perhaps simultaneous task, would be
identify possible sources of non-neutrality. A promising avenue for this may be open-economy considerations which provide a strong justification for domestic-inflation aversion. For now, the strong conclusion is simply that credible conservatism is not generally neutral.
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