



# Strategic Interactions of Monetary Policymakers and Wage/Price Bargainers: A Review with Implications for the European Common-Currency Area

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**Abstract.** This paper reviews recent work on macroeconomic management with varying organization of wage/price bargaining and degrees of credible monetary conservatism. The emerging literature synthesizes and extends theory and empirics on central bank independence (CBI) and coordinated wage/price bargaining (CWB), arguing that the degrees of CBI and CWB interact with each other and with other political-economic conditions (sectoral composition, international exposure, etc.) to structure the incentives facing actors involved in monetary policy and wage/price bargaining. The core implication, theoretically surprising but empirically supported, is that even perfectly credible monetary conservatism has *long-run, equilibrium, on-average* real effects, even with fully rational expectations, and that these effects depend on the organization of wage/price bargaining. Conversely, wage/price-bargaining structure has real effects that depend on the degree of credible conservatism reflected in monetary-policy rules. Each also has interactive nominal effects though this is less surprising. Some disagreement remains over the precise nature of these interactive effects, but all emerging theory and evidence agree that a common, credibly conservative European monetary policy has nominal and real effects that depend on the Europe-wide institutional-structural organization of wage/price bargaining. Indeed, the one specific piece of theoretical and empirical agreement suggests that, for many member countries, the nominal gains from monetary-policy delegation to a credibly conservative European Central Bank will worsen these bargaining-policy interactions.

**Key words:** Monetary policy and wage bargaining, interactions of political-economic institutions, interactions of European Monetary Union, euro

**JEL codes:** E5, E52, E58

## I. Introduction

Until recently, political economists interested in the institutional-structural determinants of inflation and employment confronted two somewhat contradictory literatures. One, deriving from modern game-theoretic approaches to economic policy, stresses monetary authorities' degrees of anti-inflationary rigor and autonomy from governments, arguing that credibly autonomous and conservative central banks (CBI) can achieve nominal benefits at no equilibrium, long-run real costs on

average.<sup>1</sup> The other, arising from studies of democratic interest intermediation, stresses institutional organization in labor, and recently goods, markets, arguing that coordinated wage/price-bargaining (CWB) internalizes externalities inherent in wage/price settlements, thus facilitating restraint and thereby providing real and perhaps nominal benefits.<sup>2</sup>

From CBI arguments and associated evidence, most academics and policymakers have concluded that the *credible conservatism* (CC) embodied in the European Central Bank (ECB) will ensure low inflation of the common European currency at little or no real cost. Insights from CWB work seemed only tangentially relevant. Degrees of *bargaining coordination* (BC) in the currency area might affect real outcomes, possibly thereby altering the nominal benefits of the ECB; otherwise, standard CBI and CWB theories, developed independently, suggested that their effects would be independent. Such exclusive focus on the degree of BC or of CC<sup>3</sup> institutionalized in the political economy no doubt aided theoretical development in each literature, now among the most practically and academically influential in political economy. However, wage/price bargaining and monetary policymaking are intimately related exercises, so policymakers and bargainers will likely interact strategically if their institutional structure provides the organizational capacity to do so.

This paper reviews a new literature addressing such strategic interaction of wage/price bargainers and monetary policymakers under varying degrees of BC and of CC reflected in their institutional structures. Building from previous CBI and CWB theory and empirics, this work stresses that degrees of CC and BC interact, with each other and with other political-economic conditions (sectoral composition, international exposure, etc.), to structure the incentives facing political-economic actors. These interactions imply that even perfectly credible monetary conservatism has *equilibrium, long-run, on-average* real effects that depend on bargaining organization, rational expectations notwithstanding. Conversely, real effects of BC depend on degrees of CC. Nominal effects are also interactive, although this is less theoretically surprising. Intuitively: the efficacy of monetary-policy signals depends on characteristics of the sender, e.g., monetary-authorities' credibility and conservatism as previously emphasized, but also on those of the audience that must receive and react to those signals, e.g., wage/price-bargaining structure. For example, before EMU, monetary efficacy in Germany hinged on interactions of *German* bargaining organizations with *Bundesbank* monetary policy. Analogously, monetary efficacy in a single-currency Europe depends on interactions of ECB monetary policymaking with *European* wage/price-bargaining organization. Thus, even if the ECB obtains autonomy and conservatism equal to the *Bundesbank*, its monetary-policy stance will affect the European economy differently than the *Bundesbank's* has affected the German economy because their audiences differ.

The paper develops these arguments thus. Section II briefly reviews arguments and findings from standard, game-theoretic, classical models of monetary policy; Section III does analogously for CWB. Each section highlights lingering issues in

passing. Sections IV and V review emerging syntheses and extensions more fully and summarize the supportive empirical results. Section VI concludes, stressing implications for the likely functioning of ECB-led monetary policy in one-currency Europe.

## II. CBI: Reviewing the Standard Argument

In the 1980s and 1990s, political economists developed convincing arguments that CBI can reduce inflation<sup>4</sup> and, due to credibility advantages that autonomous central banks enjoy over political authorities, that this nominal benefit had no real costs on average (cf. note 1). In brief, given nominal and real rigidities,<sup>5</sup> monetary authorities have incentives to create *surprise* inflation to reduce real wages (prices) and push employment (output<sup>6</sup>) above *assumed-exogenous* natural rates. However, private actors realize this incentive and incorporate its inflationary consequences in their price expectations. In rational-expectations equilibrium, monetary authorities cannot surprise private actors systematically, so on-average real wages are unaffected, employment remains at exogenously given levels, and inflation is high. If monetary authorities could instead credibly promise to forego inflation surprises, private actors would accept lower wages, again leaving real wages and (exogenous) employment unaltered, but inflation could now be lower than without such credible commitment. If, finally, institutionalizing a conservative central bank with relative autonomy from current political authority provides credible commitment, then CBI reduces inflation with no on-average real effects.

Notice that the model of the economy in this argument, a simple expectations-augmented Phillips Curve, effectively assumes zero average real effects *ab initio*, given unbiased expectations *and exogenous monetary efficacy and natural rates*. Yet, Phillips-curve slopes and natural rates are not exogenous; they logically must depend on wage/price-bargaining structure and how it conditions bargainers' reactions to monetary policy. With strategic private-actor reactions to monetary policy affecting these rates and slopes, even credible monetary conservatism can have equilibrium real-effects.

Nonetheless, many empirical studies seemed to show that CBI lowers inflation at little or no real cost on average. Typical *demonstrations* (e.g., Alesina and Summers, 1993) regressed postwar averages of some nominal and real outcomes on CBI indices in cross-sections of (usually 15–21 OECD) countries, finding significantly negative correlations with nominal variables and insignificant correlations with real variables. However, observations were few and so standard errors large; rarely were appropriate (or often any) controls included; and any possibility of interactions was ignored.<sup>7</sup> Thus, previous results will have missed any relation between CBI and real variables that varies with levels of other variables, such as CWB. Prominent empirical anecdotes also seemed to bolster the case. Germany, US, and Switzerland have highly independent central banks and exhibited relatively low inflation and widely differing unemployment, yet their wage/price-bargaining organizations

also differ in ways that may explain the latter. Still, the logical argumentation, simple but striking evidence, and prominent anecdotes obviously convinced wide policymaking audiences as enhancing CBI rose to lead economic-reform agendas worldwide. European leaders, e.g., clearly wrote EMU requirements and outlined the ECB with these arguments and evidence in mind, and with the *Bundesbank* as template. With theory, evidence, and anecdote seeming to suggest that monetary-policy delegation to a credibly conservative ECB would lower inflation virtually without real costs, it was an easy political sell.

The details of central bank behavior and pronouncements, however, are inconsistent with standard models. The US Federal Reserve, for example, frequently announces (and enacts) monetary contraction to defuse “incipient inflationary pressure” in strong economies. Yet, in these models, inflation temptations rise in (a) monetary authorities’ weight on real relative to nominal outcomes, (b) Phillips-Curve slopes, and (c) gaps between target and natural-rate output, all of which vary counter-cyclically if at all. When economies push capacity, (a) political authorities likely fret more over inflation than output; (b) monetary-policy real-efficacy likely shrinks (by diminishing returns); and (c) target-to-natural-rate gaps narrow if anything (although the models assume both fixed). Thus, by this theory, strong economies produce *less* “incipient inflationary pressure” on central banks.<sup>8</sup> The *Bundesbank* acts similarly, and as anomalously, although it often addresses its announcements more directly to wage/price bargainers and governments, fairly overtly threatening to respond with monetary contraction to pending settlements or budgets it views as inflationary.<sup>9</sup> Standard theory cannot explain this either. First, the theory has no link from budget to inflation, so banks have little reason to address governments except as public-sector price-setters and employers and as competitors for monetary-policy control. Second, bargainers just add expected money growth, which banks fully control, to desired real-wage growth, which they fully control, so banks need not threaten *responses*, they need only to announce *fixed* intended money-growth. Third, most intriguingly, the standard perspective offers no reason that the *Bundesbank* should speak differently and to different agents than does the Fed.

### III. CWB: Reviewing the Standard Argument

CWB theory argued concurrently but independently that wage/price bargaining coordination (BC) fosters beneficial real and nominal wage/price restraint.<sup>10</sup> In brief: fragmented bargaining units will ignore any externalities to their individual settlements, fostering higher than optimal wage/price hikes that include increments to offset expected increases elsewhere. Encompassing or coordinated bargaining, contrarily, internalizes such externalities, thereby restraining settlements and so lowering inflation and unemployment.<sup>11</sup>

Suppose, e.g., unions  $j$  set nominal wages and derive utility from their real consumption-wages and employment prospects. Each  $j$ 's real consumption-wage

is its nominal wage, which it sets, less consumption prices, which it affects (via mark-ups) in proportion to the consumption share of outputs using its labor. Thus,  $j$  perceives greater marginal utility per nominal-wage increment the less impact it expects its settlement to have on *aggregate* consumption-prices. If  $j$ 's bargain is encompassing or coordinated with others, it perceives aggregate prices to move with its settlement and so little real gain from nominal hikes; conversely, if  $j$ 's bargain is small relative to the economy, it perceives aggregate prices as independent of its settlement and so large real gains. Thus, unions perceive nominal increases to produce real wage-gains in inverse proportion to their bargain's share of the economy. Against this consumption-wage benefit, which declines in BC,  $j$  weighs the adverse employment effects of its wage gains, which increase with BC. Demand for  $j$ 's goods, and so its employment prospects, improve with aggregate demand and decline in  $j$ 's price relative to its competitors. The responses of (a) competing goods and labor prices and (b) aggregate demand to  $j$ 's settlements and of (c)  $j$ 's employment prospects to total demand all increase with  $j$ 's bargain's share of the economy. If effects (b) and (c) dominate the opposite (a), which standard CWB theory implicitly assumed, then BC increases unions' propensity to deliver restraint on both employment-prospect-cost and real-wage-gain sides.

Evidence also amassed to support CWB arguments (e.g., Cameron, 1984; Bruno and Sachs, 1987). Regressions of nominal and real outcomes on various indices of BC found negative correlations, typically stronger on the real side. Prominent anecdotes again added convincingly; Austria and Scandinavia exhibited strong BC, admirable unemployment, and moderate inflation. Such intuitive arguments, striking evidence, and real-world examples again combined to put raising BC on many economic-policy agendas for a time.<sup>12</sup>

Recent theoretical advances clarify the virtually ignored employer role in bargaining and the market-power assumptions implicit in preference orderings assumed earlier.<sup>13</sup> First, unions do not unilaterally set wages; rather, wage/price settlements emerge from union-firm *bargains*. Thus, unions' marginal gains from wage increases, firms' marginal costs from ceding them, and their respective bargaining strengths must all be considered, implying that labor- and goods-market institutional structure jointly affect wage/price regulation. This also clarifies that monetary policy discourages inflationary settlements by shifting union-firm bargaining power (e.g., by increasing unemployment) or by changing marginal utilities from gaining or ceding nominal increases (e.g., by altering real-demand conditions). Second, classic CWB theory ignored the impact of group  $j$ 's competitive situation on its restraint propensity. Specifically, the less competitors match price hikes for  $j$ 's goods caused by  $j$ 's wage-gains, the more product-market competition will bolster firms' resolve. Likewise, the less other wage settlements match  $j$ 's, the more labor-market competition will foster union restraint. BC dampens such incentives by linking wage and price increases across competitors, so BC has *internalization-increasing effects* that foster restraint but also *competition-decreasing effects* that hinder restraint.

The combination suggests that both highly competitive and highly coordinated bargaining can induce wage/price restraint. Under perfectly competitive labor and goods markets, unions whose wage gains exceed productivity growth or firms whose price hikes exceed cost increases – i.e., atomized bargaining-units  $j$  who exercise insufficient restraint – simply lose their job or market. *Perfect* competition swamps the externalities stressed in early CWB work. Under full coordination, conversely, most relative-price concerns vanish since all domestic wages and prices move in parallel. Incentives toward restraint stem only from the international-competitiveness concerns stressed in the earliest literature. Between these never-realized extremes, Calmfors and Driffill (1988) argue that industry-level bargaining dampens competitive-pricing considerations because most competitors are within industry yet national-level concerns remain as small as the industry's share of the economy. Intermediate BC is thus inferior to both zero and full, yielding the familiar Calmfors-Driffill hump. However, as others (e.g., Calmfors, 1993; Rama, 1994; Cukierman and Lippi, 1999; Velasco and Guzzo, 1999) have noted, the shape of relationships between BC and restraint depends critically on relative-wage and -price elasticities and how BC alters them. Unfortunately, the syntheses reviewed below inherit this indeterminacy.

Other controversies also plague further theoretical and empirical progress: (a) the actual degree of BC characterizing certain country-times,<sup>14</sup> (b) how well union membership-structure may proxy for effective BC,<sup>15</sup> and (c) the exact shape of the Calmfors-Driffill hump. Even if BC relates curvilinearly to restraint with most at zero and full BC, whether restraint falls quickly and rises gradually as BC increases, vice versa, or otherwise remains theoretically ambiguous, and issues (a) and (b) will hamper empirical adjudication. Worse, even with all three issues resolved, the ranges of BC in any given sample relative to *theoretical* zero and full BC, and so the section of the hump empirically revealed, would remain unknown.<sup>16</sup> If restraint falls quickly and rises gradually in BC, e.g., the sample could easily lie entirely right of nadir, so estimates would indicate restraint rises monotonically in BC. Current theory can only recommend that empirical measures consider economy-wide BC across unions and firms<sup>17</sup> and that the estimated BC-restraint relations allow for both competition-reducing and internalization-increasing effects.<sup>18</sup> Finally, while classic CBI theory precluded strategic interactions of bargaining and monetary policy by assuming Philips-Curve slopes and natural rates exogenous even though they logically intertwine, classic CWB theory precluded interactive considerations by (implicitly) assuming accommodating or passive policy even though autonomous, conservative central banks will certainly react to inflationary settlements. Furthermore, classic CWB theory often assumed homogenous unions and firms, yet interests logically differ, in general and vis-à-vis monetary policy, across sectors.

#### IV. Reviewing the Emerging Theoretical Syntheses and Extensions

In sum, CBI theory predicts centrally that CC yields low inflation at zero average real cost; empirics seemed supportive. The theory, however, predicts more than has been explored theoretically or empirically; monetary authorities' actions and announcements contradict these more detailed predictions; and private actors have been under-specified and, particularly, assumed non-strategic. CWB theory, conversely, predicts that BC fosters nominal and real wage/price restraint, perhaps curvilinearly, and empirics seemed supportive. Recent advances clarify some issues but also raise empirical and theoretical controversies and still ignore monetary-policy reactions to wage/price settlements<sup>19</sup> and possible differential interests among bargainers. Both literatures offered valuable insights, but their juxtaposition reveals incompatibilities and inadequacies. CBI assumes direct monetary control of inflation and exogenous natural rates and monetary efficacy, yet bargaining implies market power, suggesting bargainers may interact strategically with monetary authorities, which could invalidate all three assumptions. Conversely, CWB assumes monetary policy accommodates or ignores wage/price bargains, yet whoever controls monetary policy must respond to these settlements, again suggesting strategic interaction. The emerging syntheses and extensions begin to address these issues, finding that the institutional-structural organization of the bargainers with which the monetary authorities interact is central to their *joint* efficacy in regulating both nominal and real outcomes, so, e.g., the nominal and real effects of ECB hinge critically on the organization of *European* wage/price bargaining.

Several approaches to redressing these contradictions and synthesizing and extending CBI and CWB insights have been offered. One retains strict real-nominal divides by assumption yet shows the nominal effects of CC and BC to depend on each other (and on many other political-economic conditions); a second shows that such nominal effects alone suffice to produce equilibrium real effects of CC if other actors, e.g., governments, can affect real and care about nominal outcomes. A third shows that strategic, monopolistic bargainers suffice to produce non-neutrality of non-strategic monetary rules. A fourth studies interactions between strategic monetary authorities and strategic, monopolistic, *inflation-averse* bargainers, also implying interactive real and nominal effects for CC. A fifth stresses differences among as well as coordination across strategic bargainers; there, real effects of CC depend on BC and on heterogeneity among bargaining units.

To presage, all these approaches, classic CBI theory included, imply that the *nominal* effects of CC depend on the institutions and structure of labor/goods markets. The second approach shows that this suffices to imply interactive *real* effects of CC because governments' incentives to undertake real reform depend partly on its potential to lower inflation, which depends on the CC of the central bank. EMU, e.g., alters member nations' incentives to undertake politically costly real reform intended to reduce inflation bias. Other approaches go further, concluding: *if private actors have sufficient market power to interact strategically with*

monetary authorities, then the CC embodied in monetary institutions affects both nominal and real variables on average, in equilibrium, even with fully rational expectations, and beyond any changes in other policy instruments that such CC may induce. These approaches agree that CC has real effects because it alters relationships between bargaining organization and wage/price restraint, but sharp disagreement remains, largely inherited from the indeterminacy of CWB theory, on the signs and shapes of these relationships and on how the degree of CC alters them. These disagreements will unfortunately debar shared predictions much more specific than that the real effects of the ECB's CC will depend on the degree of BC exhibited at the European level. Still, one specific conclusion that is shared will suggest that, for many countries, monetary delegation to a conservative ECB will worsen the interaction of monetary policy and wage/price bargaining.

#### 4.1. RETAINING THE STRICT, CLASSICAL NOMINAL-REAL DIVIDE

The first approach retains nominal-real divides by assumption and distinguishes the conservatism of the monetary authorities ( $c$ ) from the autonomy of central bank from political authority ( $CBA$ ). Franze (1999b) elaborates the general case, which shows the nominal effects of  $CBA$  to depend on the institutions and structure of bargaining (and many other political-economic factors), and shows the evidence strongly supportive.<sup>20</sup> The logic is simple; virtually by definition of autonomy, the bank controls monetary policy to the degree given by  $CBA$  and the government controls it to the remaining degree, giving:<sup>21</sup>

$$\begin{aligned}
 m^* &= CBA \cdot m_b^* + (1 - CBA) \cdot m_g^* \\
 m_b^* &= \pi_b^T + \frac{\alpha}{c_b}(y_b^T - y_n) \\
 m_g^* &= \pi_g^T + \frac{\alpha}{c_g}(y_g^T - y_n)
 \end{aligned} \tag{1}$$

with money growth  $m$ , inflation  $\pi$ , a real variable  $y$ , Philips–Curve slope  $\alpha$ , monetary-authority conservatism  $c$ , and  $_b$  referring to banks,  $_g$  governments,  $_n$  natural rates,  $*$  equilibria, and  $^T$  targets. Lines two and three are just equilibrium money-growth in the classic CBI model. Line one shows that, even excluding any strategic interactions between monetary authorities and other actors and retaining direct policymaker control of inflation (i.e., assuming  $m \equiv \pi$ ), the nominal effect of  $CBA$  depends on *everything* that differentially impacts banks' and governments' desired policies and, vice versa, any such factors' nominal effects depend on  $CBA$ :

$$\frac{d\pi}{dCBA} = -(m_g^* - m_b^*) = -[(\pi_g^T - \pi_b^T) + \alpha\{(y_g^T - y_n)/c_g - (y_b^T - y_n)/c_b\}]. \tag{2}$$

Thus, since BC affects  $y_n$  and  $\alpha$ , the nominal effects of  $CBA$  and BC depend on each other (and on anything else that impacts  $\pi_g^T$ ,  $\pi_b^T$ ,  $c_g$ ,  $c_b$ ,  $y_g^T$ ,  $y_b^T$ ,  $\alpha$ , or  $y_n$ ).



Note that inflationary biases in the classic model only exist insofar as targets exceed natural rates,  $y^T > y_n$ . Thus, since  $y_n$  decreases in real-wage excessiveness, which rises in labor/goods institutional structures that lessen competition (e.g., monopoly power) but declines in those that enhance internalization (e.g., coordination), adding CWB logic directly to standard CBI theory yields:

- (a) Bargaining coordination (monopoly power) reduces (increases) natural rates;
- (b) *CBA* reduces inflation, less (more) so the higher is bargaining coordination (monopoly power);
- (c) Bargaining coordination (monopoly power) reduces (increases) inflation, less so the higher *CBA*;
- (d) *CBA* does not affect natural rates on average (by assumption).

Note that CC has two parts: central bank autonomy (CBA) and conservatism relative to government ( $c_b - c_g$ ); the beneficial nominal effects of each increase (decrease) in the monopoly power (coordination) of bargainers. Moreover, the effects of bargaining institutions on the natural rate,  $y_n$ , and monetary efficacy,  $\alpha$ , may also depend on monetary credibility and conservatism due to *strategic* interaction effects (see below).<sup>22</sup> Even without such strategic interactions, though, a simple additive combination of CBI and CWB logic implies that the ECB's nominal effects will depend on many factors that would affect the desired policies of the ECB and of European political authorities differently, including the organization of bargaining in Europe.

As noted, these nominal effects alone can induce other policy changes with equilibrium real effects. E.g., since autonomous, conservative central banks reduce the inflation cost of inferior labor/goods-market organization, delegation to the ECB will reduce member-government incentives to undertake economically beneficial but politically costly reforms. Thus, a conservative ECB has real costs directly proportional to its nominal benefits (Ozkan et al., 1998). Likewise, all *Euro* members will receive the nominal benefits of any one's reforms, so mutual delegation to the ECB creates classic externalities with under-investment in reform (Calmfors, 1998). If, contrarily, exchange-rate policy substituted for labor/goods-market nominal-flexibility, then common-currency commitments will increase the value of pro-flexibility reforms (Sibert and Sutherland, 1998). Alternatively, if under EMU, members whose inferior labor/goods-market institutions raised inflation temptations received side-payments to ignore them, this would have generated incentives to under-invest in reform that would disappear with the side-payments when these members delegate monetary control to the ECB (Sibert, 1999).<sup>23</sup> Thus, in political-economic general equilibria where governments react strategically to monetary authorities, the *real* effects of the ECB's CC are non-zero and correlate, positively or negatively, with its nominal effects, which, in turn, depend on BC in and across member countries (see Figure 1).

Theory	Predictions	Graphical Illustration
Standard CBI Theory	CC has nominal benefits, greater the more inflationary government policy would be: $\frac{d\pi}{dCC} = \pi_c(X_c) - \pi_g(X_g) < 0$  CC has no real effect: $\frac{dUE}{dCC} = 0$	
Traditional CWB Theory	BC has real benefits: $\frac{dUE}{dBC} < 0$  BC has, perhaps smaller, nominal benefits: $\frac{d\pi}{dBC} < 0$	
Modern CWB Theory	BC has non-monotonic real and nominal effects, with most-adverse outcome between its extremes. Exact shape indeterminate.	
Political-Economic General-Equilibrium Theories	CC has nominal benefits as in classical CBI theory: $\frac{d\pi}{dCC} = \pi_c(X_c) - \pi_g(X_g) < 0$  CC has real costs proportional to its nominal benefits: $\frac{dUE}{dCC} \propto \frac{d\pi}{dCC}$	
Strategic Bargainers (Soskice and Iversen Model)	CC has real benefits that increase in BC: $\frac{dUE}{dCC} < 0, \frac{dUE^2}{dCCdBC} < 0$	

Figure 1a. Illustration of the theories and predictions from the reviewed work.

4.2. ADDING STRATEGIC WAGE/PRICE BARGAINERS

The above approaches continue to debar strategic interactions between wage/price bargainers and monetary authorities, but, if such interactions alter  $y_n$  and  $\alpha$ , syntheses that maintain such strict real-nominal divides will not suffice. Soskice and Iversen (1998, 1999) show that strategic bargainers with monopolistic power in-

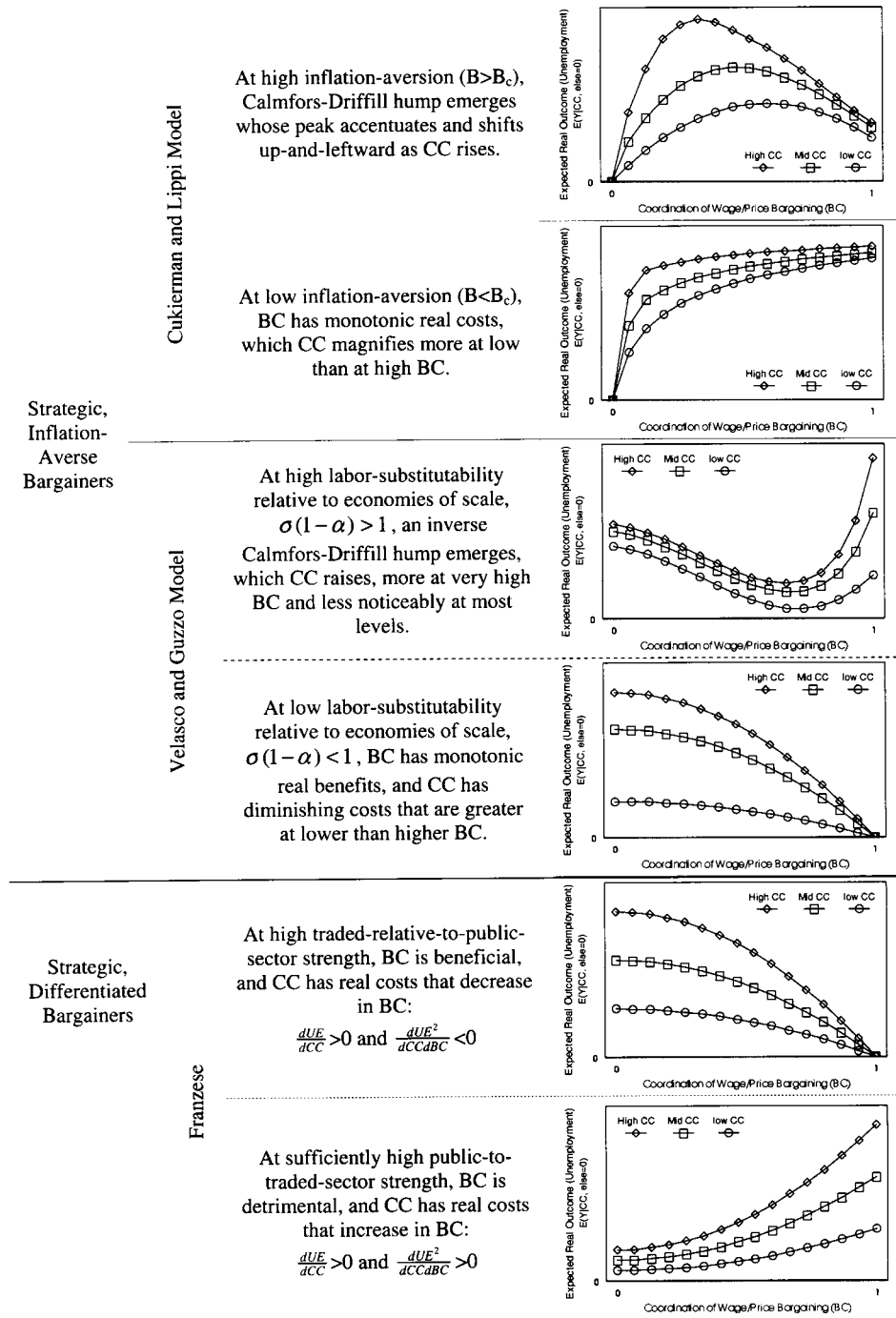


Figure 1b.

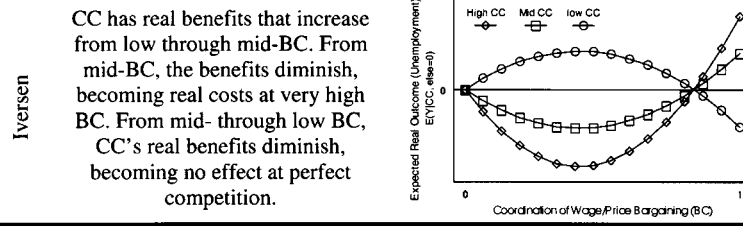


Figure 1c.

duce *equilibrium, long-run, on-average* real effects for CC.<sup>24</sup> Non-neutrality stems from bargainers' collective-action problems, not from any lack of credibility, so they model money supply as fully known to follow  $M = P^{1-\beta}$  with aggregate price  $P \equiv \prod_{i=1}^n (P_i^{n-1})$ .  $\beta \in [0 \dots 1]$  indexes monetary conservatism:  $\beta = 0$  ( $\beta = 1$ )  $\Leftrightarrow$  full (non-)accommodation. Next,  $n$  equal-sized unions with perfect sectoral monopolies Bertrand compete under constant scale-returns and fixed labor productivity of one, which implies good  $i$ 's price equals sector  $i$ 's wage:  $P_i = W_i$ . Lastly, they assume real demand for  $i$  equal to its employment,  $q_i = e_i$ , and given by:

$$q_i = e_i = \frac{m}{n} - \eta p_i = \frac{m}{n} - \eta w 3_i \tag{3}$$

with real money-supply  $m$ , relative price  $p_i \equiv P_i/P$ , and relative-price demand-elasticity  $\eta$ . Sectoral-monopoly unions set  $W_i$  to maximize weighted products of their real consumption-wages,  $\omega_i$ , and their sector's employment,  $e_i$ , with weight  $\alpha$  on  $\omega_i$ . The symmetric equilibrium employment is thus:

$$e^* = \frac{\eta \left(1 + \frac{\beta}{n-1}\right)}{\alpha - \frac{\beta}{n-1}} \tag{4}$$

Thus, unless  $n = \infty$  (i.e., outside perfect competition), monetary conservatism,  $\beta$ , has real rational-expectations-equilibrium effects, which vary with the number of unions,  $n$ .<sup>25</sup> Specifically, conservatism (higher  $\beta$ ) raises employment and does so increasingly as BC rises ( $n$  falls) from perfect competition,  $n = \infty$ , with zero real effects, to  $n = 1$ , where the equilibrium is undefined (see Figure 1). Intuitively, when  $n$  is low, each large bargaining unit perceives its nominal gain to produce *aggregate* real-money-supply contraction, and more so the less accommodating the monetary authority (i.e., the higher  $\beta$ ). Encompassing bargaining thus induces more restraint as conservatism,  $\beta$ , increases. As  $n$  becomes large, however, this effect vanishes because real money supply becomes increasingly exogenous to the extremely atomized bargainers.

The Soskice-Iversen models thus conclude that CC has beneficial real effects that increase with BC. Classic CBI theory missed this by ignoring the real money

supply's dependence on wage/price decisions,  $\frac{d(M/P)}{dW_i} = \frac{\beta}{n-1}$ , which is non-zero and declines in  $n$  for  $n < \infty$ . By this analysis, highly conservative monetary rules (high  $\beta$ ) interact best with highly coordinated bargaining systems (low  $n$ ) such as in Germany under the *Bundesbank* and *IG Metal-Gesamptmetal*-led bargaining. The ECB conducting similarly conservative policy, however, would face a far less coordinated *European* bargaining system (higher  $n$ ), and so would have less beneficial real effect. Soskice and Iversen (1998) stress, however, that the European bargaining system to which the ECB must respond is as yet undetermined. They suggest that Europe could evolve a system wherein lead-bargains in one country set wage-increase precedents that the rest follow. The ECB could then interact more directly with the pattern-setter: a more beneficial arrangement.

Two aspects of the Soskice–Iversen approach differentiate it, and its conclusions, from those below. First, monetary policy here is non-strategic; the exogenous money-supply rules do not derive from optimal policymaker responses to bargaining settlements. Such strategic interactions are more likely bi-directional. Second, they assume relative-wage demand-elasticity,  $\eta$ , exogenously fixed and, critically, independent of  $n$ , yet, as the number of sectors encompassed in a single wage/price-bargain rises, relative-wage elasticity likely diminishes.<sup>26</sup> No such Calmfors–Driffill competition effect operates here, so they find BC monotonically increasingly beneficial in CC. These differences plus bargainer inflation-aversion led others to markedly different conclusions about CC's real effects.<sup>27</sup> Nonetheless, their core intuition is widely shared: strategic bargainers facing monetary-policy rules (reaction functions elsewhere) perceive an ability to affect *real* money supply in proportion to their share of the economy and the monetary rule's conservatism. Thus, all agree the real effects of CC are generally non-zero and dependent on (and generally improving in) BC.

#### 4.3.1. ADDING A MONOPOLY, STRATEGIC, INFLATION-AVERSE WAGE/PRICE BARGAINER

Several others<sup>28</sup> explore interactions of a strategic monetary authority with one strategic monopoly bargainer. In these models, CC has equilibrium real effects *if the wage/price bargainer is inflation-averse*. Empirically, private-actor inflation-aversion is quite large and well-documented (see, e.g., Hibbs, 1987, ch. 4); theoretically, inflation-aversion can be justified on four grounds. First, monetary-policy models routinely assume inflation-averse policymakers, so symmetry demands private-actor inflation-aversion. Moreover, any actual government's utility must derive from some combination of private-actor's utilities, albeit likely with quite unequal weight especially in non-democracies; so, if policymakers dislike inflation, some private actors must also.<sup>29</sup> Any reason adduced for policymaker inflation-aversion (e.g., correlation of inflation levels and volatility) therefore also justifies private-actor aversion. Second, inflation-aversion is standard, if often under-motivated, in CWB theory. Possible motivations include, third, private-

actor holdings of non-fully indexed nominal assets, especially mandatory ones like some tax systems or pension schemes. Last, *domestic* inflation is a *relative* price-rise in any open economy unless domestic consumption and production bundles are equal (i.e., given trade).<sup>30</sup> Regardless of theoretical motivation, a strategic inflation-averse bargainer will consider monetary-policy reactions to their behavior, including the inflation-effects of such reactions, in its bargaining.

Gylfason and Lindbeck (1994), e.g., start with the quantity theory,  $Y + P = M + V$ , setting  $V = 0$ , as "...the simplest possible way to capture the crucial inverse relationship between output and the price level for given money supply." They add  $Y = P - W$  as "...the simplest possible aggregate supply as an increasing function of price for given nominal wage," and set all elasticities to one for simplicity. Aggregate equilibrium (AD = AS) then implies:  $Y = 0.5(M - W)$ ;  $P = 0.5(M + W)$ . If government and monopoly union exogenously dictated money and wages respectively, then the equilibrium would have standard Keynesian properties:  $\frac{dY}{dM}, \frac{dP}{dM}, \frac{dP}{dW} > 0$ ;  $\frac{dY}{dW} < 0$ .<sup>31</sup>

Cournot-Nash equilibria are more novel. Subject to AD = AS, strategic governments minimize over  $M$  losses quadratic in output and inflation deviations from targets, as standard, and the strategic monopoly-union minimizes over  $W$  losses quadratic in real-wage, output, and inflation deviations from targets, also standard but adding inflation-aversion. This gives reaction functions<sup>32</sup> wherein the union fully accommodates money increases, so real-nominal divides obtain, only if it disregards inflation and government fully accommodates wage increases, leaving the union unable to affect output, only if it disregards inflation. Each accommodates less the more it weighs inflation. Generally, output and prices depend on all preference parameters of both parties; but, if union and government targets,  $Y^T$  and  $\Delta P^T$ , are equal, further insights emerge. If the union's real-wage and employment targets lie above the labor-demand curve at full employment, union-government strategic interactions spawn *stagflation*:  $Y < Y^T$  and  $\Delta P > \Delta P^T$ . If union targets lie on the curve, government conservatism,  $\Delta P_g^T < \Delta P_u^T$ , alone will imply stagflation. Only if monopoly union and monetary authority target equal employment and inflation and the union's target real-wage/employment combination is *not* above labor demand, is CC neutral *nominally and really*. If either is violated, CC has equilibrium real and nominal effects that depend critically on the preferences and targets of both the monopoly union and the government.<sup>33</sup>

One common, surprising result of this approach is that *ultra-liberal* monetary authorities, those indifferent to inflation, may achieve optimal (zero inflation and unemployment) outcomes. Skott (1997) nicely summarizes the intuition behind this and the related results:

... If the central bank is inflation averse (or committed to a particular inflation rate or growth of nominal demand), the union can take advantage of this aversion (pre-commitment): high money-wage increases will buy lower output (and raise 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 (i.e., 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 . . . the inflation-indifferent central bank . . . makes it infinitely expensive for the union to reduce output [below the bank's 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,  $y^*$ . Between those extremes are outcomes with  $\pi > 0$  and  $y^{**} > y > y^*$  (p. 613).

Grüner and Hefeker (1997) and Zervoyianni (1997) analyze exchange-rate commitments and international exposure, respectively, assuming an inflation-averse monopoly union in each of two countries and monetary policy set by various combinations of the governments. They conclude, *inter alia*, that domestic monetary-policy credible-conservatism is *not* functionally equivalent to exchange-rate schemes because the set of wage/price-bargainers with which the relevant monetary policymakers interact differs.<sup>34</sup> Similar insights drive this review's application of the emerging syntheses to ECB-led European monetary policy. Single-bargainer models, however, are ill-suited to such analysis because bargaining structure cannot be varied and member-country delegations to the ECB neither start from nor end in monopoly-union settings.

#### 4.3.2. ADDING VARYINGLY ORGANIZED, STRATEGIC, INFLATION-AVERSE WAGE/PRICE BARGAINERS

Cukierman and Lippi (1999) and Velasco and Guzzo (1999) allow union concentration to vary. The former consider  $n$  unions and a monetary policymaker with utilities similar to 4.3.1. They assume all labor is unionized by *craft*, so that labor is perfectly substitutable across industries but imperfectly across unions. They allow higher centralization (lower  $n$ ) to reduce labor-demand elasticity to reflect Calmfors–Driffill's competition effect, but fix substitutability across crafts,  $\gamma$ . Each union sets its nominal wages, taking others' and the bank's reaction function as given; the bank fulfills its reaction function (fully credible commitment), setting monetary policy and so inflation. Reflecting the unions' fully rational expectations, equilibrium is:

$$\pi = \frac{\alpha^2}{c}\varphi; \quad \varphi \equiv \varpi - \omega^c \quad (5)$$

$$u = \alpha\varphi; \quad \varphi \equiv \varpi - \omega^c \quad (6)$$

$\pi \equiv$  inflation;  $u \equiv$  unemployment;  $\omega^c \equiv$  market-clearing real-wage. The key term,  $\varphi$ , is the average *real-wage premium*.  $c$  is the bank's weight on nominal relative to real targets (CC), and  $\alpha$  plays a similar role to the Phillips Curve slope. This would be exactly the classic CBI result, except that  $\varphi$  depends on  $c$ .

This strategic non-neutrality arises for two reasons. First, because unions dislike inflation, which the bank will increase in response to higher unemployment, unions

may moderate their wage demands to lessen that temptation. The larger its share of the economy, the more union  $j$  perceives bank responses directly, so the more it moderates. Conversely, the more conservative the bank (higher  $c$ ), the less  $j$  expects it to succumb to such temptations, so the less this restraint-inducing mechanism, which drove results in 4.3.1 also, operates. Second, the model also reveals a *competition-induced strategic non-neutrality* (CISNN), which arises because the marginal *real*-wage effect  $j$  perceives from higher nominal wages increases in  $c$  while the relative-wage effect perceived is independent of  $c$ . Higher  $c$  narrows this differential and thus alters unions' CISNN-induced moderation. A similar mechanism seems to drive the Soskice–Iversen results. However, the direction of CC's effect on the CISNN depends heavily on elasticity assumptions, regarding  $\alpha$  and  $\gamma$ , and their relation to  $n$ .<sup>35</sup>

Equilibrium nominal and real outcomes depend on  $c$  and  $n^{-1}$  (CC and BC) and their interaction, but highly non-linearly, complicating interpretation. Cukierman–Lippi manage several propositions. (1) Higher union inflation-aversion,  $B$ , and cross-craft substitutability,  $\phi$ , lower unemployment and inflation, though these effects vanish at  $n = \infty$  (perfect competition). (2) Beyond a critical amount of inflation-aversion relative to other terms,  $B_c = Ac^2\gamma/\alpha^3$ , a Calmfors–Driffill curve relates  $n^{-1}$  (BC) to real-wage premia,  $\varphi$ ; short of  $B_c$ , real and nominal outcomes strictly worsen in BC (competition effects dominate). (3) If inflation-aversion exceeds  $B_c$ , the Calmfors–Driffill curve adverse peak shifts toward decentralization as  $c$  rises (see Figure 1); (4)  $n = \infty$  always dominates  $n = 1$ . The net of these interactive effects determine if Calmfors–Driffill curves exist – BC monotonically raises real-wage premia if not – and how CC-BC interactions shift and reshape that relation.

The comparative statics of core interest are as follows. If labor is incompletely substitutable and  $n > 1$  (i.e., outside perfect competition) *or* if unions are inflation averse, CC unambiguously *reduces* employment. (CC also generally lowers inflation, but sufficient inflation aversion can even upend that at some  $n$ .) Visually, in BC-unemployment space, Calmfors–Driffill curves at higher CC lie entirely above those at lower CC, and peaks accentuate and drift toward lower BC as CC rises (see Figure 1). Unemployment peaks at intermediate BC with sufficient inflation-aversion but strictly rises in BC at less. Broadly, then, relations between BC and real outcomes depend on degrees of CC, but the nature of this shifting and reshaping of Calmfors–Driffill curves hinges critically on assumptions regarding substitution elasticities across labor and goods types (and other parameters) and how BC alters those elasticities. For these purposes, suffice to note that CC generally reduces employment, generally more at low-to-mid BC than at mid-to-high BC, although these effects fade at BC extremes. Thus, Cukierman–Lippi suggests that CC interacts best with mid-to-highly coordinated bargainers, producing low inflation at low, but positive, real costs. Monetary conservatism from the ECB, contrarily, likely achieves low inflation only at relatively high real cost because



European labor and goods markets include many poorly coordinated bargaining units, each retaining appreciable monopoly power.

Other model aspects warrant further development. First, European labor organizes more by industry or sector than by craft, so the craft-union assumption likely overemphasizes inter-union relative to inter-firm substitution. Second, as in Soskice–Iversen, only labor-demand *real*-wage-elasticity depends on  $n$ , so BC has no competition-reducing effects here either, but, unlike Soskice–Iversen, inflation-aversion may reproduce a Calmfors–Driffill hump here even though labor-demand *relative*-wage-elasticity remains exogenous to  $n$ , submerging the hump's original source. Analyzing a Cukierman–Lippi model without inflation-aversion and Soskice–Iversen with strategic monetary policy may help clarify the CISNN. Finally, employers (and governments) are largely absent in all these models. Unions set wages and firms take them; the only bargains are between unions and central banks, each of whom fully controls its instrument: wages and money supply.

Velasco and Guzzo (1999) offer a model with a representative firm employing a continuum of labor types to produce a single good, endogenizing more key parameters. Profit maximization produces symmetric labor demand for each labor-type. Equal-sized unions maximize workers' intertemporal utilities, which weigh consumption against labor and inflation. The strong symmetry implies unions optimally set equal wages for all workers. Otherwise, the model resembles Cukierman–Lippi. Real-wage labor-demand elasticity for each worker as the union perceives it is again central. It again depends positively on the number of unions,  $n$ , and on substitution elasticity between worker-types,  $\sigma$ , and returns-to-scale,  $\alpha$ , though now via the firm's production function and profit-maximization decision in general equilibrium. Bertrand games among unions and between each union and the monetary authority, with unions setting wages first, the authority setting inflation next, and the firm setting employment and output last, produce several startling results.

First, outside perfect competition, strategic inflation-averse unions moderate wage demands to reduce policymakers' inflation temptations, more so the less conservative the monetary authority. This mechanism operates as in all inflation-averse-bargainers models to imply CC reduces restraint and employment. Second, however, the CISNN operates very differently than in Cukierman–Lippi, wherein, given sufficient inflation-aversion relative to labor-demand real-wage-elasticity, a Calmfors–Driffill curve emerges that shifts up and peaks further left as CC increases. In Velasco–Guzzo, CC also shifts BC-unemployment relations upward, but a standard Calmfors–Driffill hump never emerges. Rather, if substitution elasticity across worker types is low enough, employment monotonically falls (rises) in  $n$  (BC); employment *peaks* at intermediate BC otherwise: an inverse Calmfors–Driffill curve (see Figure 1). These differences arise from the high symmetry in Velasco–Guzzo, which, by inducing equal equilibrium wages, flattens Calmfors–Driffill curves. Also, Velasco–Guzzo allows competition-effects to increase as  $n$  rises, but toward a fixed parameter of the production function rather than toward

infinity as in Cukierman–Lippi and Calmfors–Driffill. Thus, as  $n \rightarrow \infty$ , BC's competition-reducing effects remain limited in Velasco–Guzzo whereas they become infinite in other models; so, again, the crucial parametric assumptions regard labor substitutability across unions,  $\sigma$ , and its relation to BC.

Despite these differences, Velasco–Guzzo also finds nominal and CC and BC real effects interactive, highly non-linear, and dependent on key parameter values. They graph several simulations that illustrate the core comparative statics (see Figure 1). In this model, CC always has positive real costs,  $R$ , which depend on substitution elasticity of worker types,  $\sigma$ , scale returns,  $\alpha$ , BC, and CC itself:  $\frac{dR}{dCC} = f(\sigma, BC, CC) > 0$ . CC generally has diminishing marginal real costs:  $\frac{d^2R}{dCC^2} < 0$ . With  $\sigma(1 - \alpha) < 1$ ,  $\frac{dR}{dCC}$  also diminishes in BC; with  $\sigma(1 - \alpha) > 1$ , BC raises  $\frac{dR}{dCC}$  but only noticeably so for  $n < 3 \pm$ . Thus,  $\frac{d^2R}{dCCdn^{-1}} \equiv \frac{df}{dn^{-1}} < > 0$  as  $\sigma(1 - \alpha) < > 1$ . This last indeterminacy notwithstanding, the model's implications for a move toward common, conservative European monetary policy are one-sided. For most members, the move effectively decentralizes bargaining, but, even if  $\sigma(1 - \alpha) > 1$ , so that the lower BC would reduce the real costs of ECB conservatism, Europe would be in the flat range of that curve ( $n > 3$ ). If, contrarily,  $\sigma(1 - \alpha) < 1$ , the bargaining decentralization induced by raising monetary policy to the European level would increase the real costs of ECB conservatism appreciably.

#### 4.4. ADDING STRATEGIC, DIFFERENTIATED BARGAINERS

Two last approaches emphasize differences among strategic bargainers additionally to their degree of coordination. Franzese (1999a) stresses the different impact of CC on traded, non-traded, and public-sectors. Iversen (1998a, b) stresses strategic unions that dislike wage disparity in addition to standard real-wage and employment goals, underscoring differences in productivity (growth) across and among bargaining units.<sup>36</sup>

Franzese (1999a) argues that, since monetary policymakers do not directly control prices, they must control inflation via monetary- policy responses to wage/price bargains sufficient to induce non- inflationary settlements from monopolistic bargainers. Policymakers essentially announce *threats*,  $\frac{dM}{dP}$ , that shift power-balances in union-firm Nash bargains toward acceptable nominal growth. As elsewhere, the threats required to induce non-inflationary settlements become less severe as BC rises because bargainers perceive only  $n^{-1}$  of threats directly. He also stresses, though, that monetary policy impacts heterogeneous bargainers differently. Enacted threats (real contractions) hinder domestic real-demand and so injure all actors dependent thereupon, including all private-sector but excluding public-sector bargainers. Monetary contractions also raise export relative to import prices, thereby especially injuring traded-sector bargainers. Because policymakers induce restraint by creating or threatening real slack sufficient to induce non- inflationary settlements, the rest of the economy must suffer disproportionately less when

traded-, more when public-, and intermediately when non-traded-sector bargainers dominate the aggregate of wage/price settlements. If, as he argues, policymakers must occasionally enact threats, then monetary *conservatism* offers nominal benefits only at some real cost. The terms of this familiar tradeoff generally improve with BC and are best (worst, intermediate) when traded- (public-, non-traded-) sector bargainers lead (see Figure 1).<sup>37</sup> However, for any given degree of *conservatism*, greater *credibility* remains unambiguously beneficial because it reduces required degrees of threat enactment.

CC, BC, and traded-relative-to-public-sector-dominance thus complement in producing real benefits but substitute (see (1)) in producing nominal benefits. The argument suggests that the strong nominal and real performance of postwar Germany derived partly from especially beneficial interactions between its high-CC *Bundesbank* and its moderately high-BC led by *IG Metall* and *Gesamptmetall* (traded-sector confederations). ECB *European* monetary policy, contrarily, faces lower *European* BC with relatively weaker traded- and stronger public-sectors, a less beneficial arrangement. As Soskice-Iversen conclude also, some pattern-setting among member-countries' bargaining organizations might improve matters, here especially if traded-sector bargainers lead as in Germany. Franzese (1999a), however, merely describes marginal (dis-)utilities to unions (firms) of nominal increases given  $\frac{dP}{dW_j}$ , which depend on BC, and threat schedules  $\frac{dM}{dP}$ , which depend on CC, to illustrate and guide the argument. Distinguishing conservatism from credibility, modeling union-firm *bargaining* directly, and allowing differentiated bargainers strategic relation to policymakers all seem to promise important advances, but full formal implementation in a closed equilibrium model remains.

Iversen (1998a, b) also studies differences among bargainers but stresses strategic unions that, beyond standard real-wage and employment goals, dislike wage disparity. Highly centralized bargaining compresses the nominal-wage distribution, which induces *wage creep* wherein high-skill and other market-empowered workers wring supplementary raises from employers, which requires lax monetary policy to accommodate and to erode the implied real-wage disparity. Aggregate real efficiency will require more such nominal laxity as the wages of more-disparate-productivity workers are compressed within encompassed bargaining units. In this context, monetary conservatism will have adverse real effects at very-high BC. At perfect competition, contrarily, marginal-value productivity, not bargaining, determines wages and disparity, so CC is neutral. At intermediate centralization, bargains allow wage-disparity to reflect productivity differentials, and monetary conservatism is actually required to enforce cooperative lead-bargain coordination on aggregate restraint.<sup>38</sup>

Again, CC has equilibrium real effects that depend on BC and, here, also on productivity (growth) differences in and across bargaining units (see Figure 1). The model, however, seems to rely on differential money illusion among bargainers as high-productivity-growth workers tolerate the erosion of their relative gains from wage creep. Also under-explicated is why centralized settlements

cannot include productivity-scheduled deviations from restrained average wage-increases.<sup>39</sup> Still, the model clearly illustrates preference differences across low- and high-productivity-growth workers, both intrinsically and vis-à-vis their strategic interaction with monetary authorities,<sup>40</sup> and its substantive implications are clear. Pattern-setting in European bargaining would be optimal, nominally and really; very-high coordination is undesirable; and deregulatory moves might be beneficial if very large but would still be dominated by moderate coordination by pattern setting. However, the ECB's impact would also depend on how disparate the productivity growth of those in any European lead-bargaining scheme. The radically different productivity levels and growth rates across Europe may make an appropriate balance between the benefits of pattern-setting BC and the costs of wage compression without nominal laxity difficult. Unfortunately, the historical parallel may be absorption of the East into the West German bargaining system, rather than the postwar success of the West German system.

## V. The Accumulating Empirical Support

Rapidly amassing evidence supports many of these claims. Hall (1994) first charted postwar-average inflation and unemployment by CC and BC,<sup>41</sup> revealing an interactive pattern. Hall and Franzese (1998) show that pattern tabularly, finding postwar-average (a) inflation falls in CC and in BC and (b) unemployment falls in BC and rises in CC. (c) The unemployment fall per unit BC (rise per unit CC) is larger (smaller) at higher CC (BC), suggesting a real complementarity. (d) The inflation reduction per unit CC and BC each diminishes as the other rises, suggesting a nominal substitutability. Their regression analyses, using postwar-average, *decade*,<sup>42</sup> and annual data in 18 OECD countries 1950-90, reinforce these conclusions (but (d) only weakly).

Franzese (1994, 1996, ch. 4) explored interactive real effects of CC, BC, and sectoral structure in *decade* data from 21 OECD countries. Beyond CC-BC interactions (results consistent with and statistically stronger than Hall and Franzese (1998)), he included traded-sector and government employment-shares and their interactions with CC. Strong evidence of detrimental public-employment and CC interactions emerged. At high (low) CC, higher public employment-shares spurred (reduced) unemployment; also, though less strongly statistically, traded-sector employment-share improved unemployment outcomes, more so the greater CC.

Garrett and Way (1995a) criticize the use of subjective indices of BC in these studies. Replacing BC with union strength (union concentration plus coverage rates), a procedure others (e.g., Swenson, 1989; Soskice, 1990) argue against, they nonetheless find similar institutional interactions as in Hall and Franzese (1998). In postwar quinquennial data from 13 OECD countries, they find evidence of beneficial CC and BC interactions in regulating inflation (weakly), unemployment (moderately), and real-growth (strongly).

Garrett and Way (1995b) give evidence, more-direct than in Franzese (1994), of the deleterious effect of public-sector weight within bargaining on BC propensity to deliver wage/price restraint. They estimate a curvilinear relation between *union strength* and unemployment, allowing *public-sector strength* within unions (public-sector share of total members) to alter that relation. In quinquennial data from 13 OECD countries, they find a standard Calmfors–Driffill hump between union strength and unemployment at low public-sector strength, but that union strength becomes increasingly a monotonic real detriment as public-sector strength rises.

Cukierman and Lippi (1999) regress unemployment and inflation averages in 1978–82, 1988–92, and 1992–96 in 19 OECD countries on (a) high, medium, low BC dummies (from OECD 1997); (b) Cukierman’s (1992) LVAU index of CC; and interactions of (b) with (a). At low BC, they find CC raises unemployment as they predict, but CC reduces unemployment at intermediate BC and also, insignificantly slightly less so, at high BC, contrary to their predictions.<sup>43</sup> Their inflation findings are similarly mixed. Still, the Cukierman–Lippi results agree with previous findings and their arguments in that  $\frac{dR}{dCC} > 0$  at low BC and that  $\frac{dR^2}{dCCdBC}$  is generally negative. I.e., CC has real costs at low BC, and these costs decline as BC increases, here becoming benefits.

Iversen (1998a, b) also find real effects for CC that depend on BC and vice versa. He argues, and finds in quinquennial 1973–93 data in 15 OECD countries, that CC reduces unemployment at moderate bargaining *concentration*, increases it at high, and has little effect at low. His sample and measurement of CC<sup>44</sup> and BC<sup>45</sup> all differ from others’, so the differences are less surprising. Disturbingly, though, his results imply CC has real benefits over most of BC’s sample-range, and real costs *only* at very high BC whereas others argue and find almost oppositely. Franzese (1999a) offers arguments and evidence that may resolve these differences (see below), but note here the continuing agreement that going from low to mid BC reduces real costs (raises real benefits) of CC. I.e., Iversen too finds that  $\frac{dR}{dCC}$  slopes downward from low to moderately high BC.

Franzese (1999a) considers real and nominal outcomes in yearly 1974–90 data in 21 OECD countries, relating them to CC, BC, G/T, and  $(G/T)^2$ , where G is government- and T is traded-sector employment-share. He finds that BC is more beneficial in real and nominal terms the more traded sectors dominate government sectors in bargaining; indeed, BC becomes detrimental with sufficient government-sector dominance. CC has nominal benefits that diminish as traded-sector-led BC rises and increase as BC falls or becomes increasingly public-sector led. CC has real costs that diminish as traded-sector-led BC rises but that rise as public-sectors increasingly lead or BC falls. I.e., the impact of BC, both per se and in strategic interaction with CC, depends critically on the competitive exposure of the bargain-ers being coordinated, and, specifically, CC and traded-sector-led BC are strategic complements (substitutes) in determining real (nominal) outcomes.

Iversen (1998a, b) find real costs of CC at very high, benefits at moderate, and little effect at low BC; Cukierman and Lippi (1999) find real benefits at

mid, slightly lesser at high, and real costs at low BC. Others find real costs of CC that monotonically diminish in BC, although their specifications do not allow non-linear interactions. Franzese (1999a) suggests a reconciliation. He argues and finds CC interacts detrimentally with high *public-sector-led* BC and notes that the adverse sign of  $\frac{dR}{dCC}$  predicted by Iversen at high BC requires that workers of highly disparate productivity (growth) accede to common settlements. As traded-and-government-sector and high-and-low-productivity-growth workers are empirically much the same sets, this could explain the findings if this particular sectoral composition tends to occur at high BC. Franzese argues that, if high BC induces wage-compression, it would tend to price private sectors out of, and so public sectors into, the service sector, where much employment growth has occurred. Thus, the requisite composition will likely evolve at high BC. Because it does not always, and because some high-BC systems allow appreciable wage disparity (Austria), this could also explain the less-significantly beneficial CC-BC interaction Cukierman-Lippi find at high BC.

Such dispute notwithstanding, all the empirical work agrees on three core results. First, all find non-zero long-run, equilibrium, on-average real effects for CC. Money may be neutral, but the expected character of monetary policy, i.e. conservatism, is not. Second, all find wage/price-bargaining institutional-structural organization and the nature of monetary policymaking *interact* to determine both nominal and *real* outcomes. CC's effects depend on BC and *v.v.* Third, all find the real effects of CC less unpalatable or more palatable with mid-to-high BC than with low-to-mid BC; i.e., all find  $\frac{dR}{dCC}$  slopes downward ( $\frac{dR^2}{dCCdBC} < 0$ ) over the empirically intermediate BC-range. Discord regards the real effect of CC at high BC and the exact shape of  $\frac{dR}{dCC}$ ; i.e., whether this generally agreed non-zero and downward-sloping effect line lies above or below zero and at what level of BC it may cross. Nominal effects are also broadly agreed; CC reduces inflation and generally does so more the less anti-inflationary is wage/price-bargaining organization. Thus, the evidence is unanimous that conservative monetary policymaking and beneficial bargaining organization are substitutes in nominal and complements in real outcomes, at least in the low-to-moderately-high BC-range. For substantive example, all the results would seem to agree on both the German case and the likely effects of the move from *Bundesbank*-led German to ECB-led European monetary policy. That move is from moderately high BC, led by traded sectors, to relatively low BC of unknown, likely less, traded-sector leadership, with CC remaining high. By any of these analyses, German institutional-structural conditions effected relatively favorable long-run real-nominal tradeoffs, achieving equilibrium low inflation at moderate real cost or even at some benefit. European institutional-structural conditions promise much less favorable terms.

## VI. Conclusion

Important points of theoretical and empirical agreement have emerged. First, even standard, classical approaches agree that CC's nominal benefits depend on labor/goods-market organization. Political-economic general equilibrium then suffices to imply interactive real effects for CC. If governments enact real reform partly to reduce inflation bias, then their incentives to do so depend on the bias size and that depends, *inter alia*, on the degrees of CC, of BC, and their interaction. Second, every model agrees that strategic bargainer interaction with monetary authorities undermines the strong neutrality result of classic CBI theory. This is *a fortiori* true if any private-actors are inflation averse (and if no one is, then inflation is irrelevant). Moreover, all these approaches would agree with general statements that strategic bargainer reactions to the expected character of monetary policy shifts and reshapes the relation between BC and real outcomes. Such strategic non-neutralities arise because (a) another policymaker adjusts real policies to the nature of monetary policy, or (b) more coordinated inflation-averse bargainers moderate their wage demands more the less credibly conservative the monetary authority, or (c) credibly conservative monetary policy affects real- and relative-wage labor-demand elasticities differently, altering wage/price settlements in ways that depend on bargaining organization, or (d) conservative monetary policy affects differentiated bargainers differently, producing on-average real effects that depend on the shares of bargainer types in the aggregate of settlements. Discord regards the nature of this shifting and reshaping of Calmfors-Driffill curves induced by strategic interactions (b)–(d) and stem primarily from assumptions about real and relative wage (price) elasticities of labor (goods) demand, and how each changes with wage/price bargaining institutional-structure. The empirical findings also share core conclusions despite disagreeing disturbingly in some specifics. All found that CC is generally non-neutral in ways that depend on its interaction with BC and that the real effects of CC were more palatable at mid-to-high than at low-to-mid BC, though disagreement surrounds the effect at very high BC and the sign of CC's non-neutrality over the range of BC more generally (see Figure 1).<sup>46</sup>

Notwithstanding the wide diversity in sources of non-neutralities and specific disagreements in empirical and theoretical conclusions, the reviewed work has surprisingly uniform implications for the likely impact of member-country delegation to a common, credibly conservative, ECB-led European monetary policy. With the German (Swiss and Austrian) example(s), and with support of previous theory and evidence, the ECB's framers clearly intended to endow it with considerable conservatism and autonomy, expecting nominal benefits at little or no equilibrium real costs. This emerging literature suggests, however, that post-war Germany's success in combining low inflation and unemployment derived, not from the CC of the *Bundesbank* alone, but from its interaction with mid-to-highly coordinated bargaining with dominant traded- and dominated public-sector bargainers. European wage/price bargaining is instead characterized by smaller

(*relative to Europe*), more numerous, and less coordinated bargaining units, though still not even approaching perfect competition in most industries. Therefore, the ECB's autonomous conservatism is likely more costly (less beneficial) than the *Bundesbank's* had been in Germany.<sup>47</sup> (Obviously, other considerations, such as reduced exchange-rate uncertainty and other transaction costs, are also paramount. The reviewed works make no claim that its emphasized effects dominate, indeed the opposite could easily be true; rather, the work clarifies *one* set of previously missed effects of delegation to an autonomous, conservative ECB.) Whether such tradeoffs are acceptable depends on the relative value given real and nominal outcomes, but tradeoffs *do* exist, in equilibrium, on average, and in the long run. Their terms depend on the institutional (CC, BC) and sectoral (G/T, etc.) structure that each member-country exchanges for Europe's political-economic structure in delegating to the ECB. Moreover, within countries, those constituencies more hurt by unemployment would tend to suffer while those more harmed by inflation would generally gain. And these aggregate and distributional tradeoffs are likely to be steeper for most polities than the popular historical examples suggest because the institutional and sectoral structure of Europe would interact much less favorably with the ECB than, for example, the institutional and sectoral structure of Germany has with the *Bundesbank* in the past.

## Notes

1. Conservative commitments also debar monetary stabilization, effective here given uncertainty or incomplete information (e.g., Cukierman, 1992), yet the core conclusion remains that CBI lowers inflation virtually costlessly, especially since evidence that CBI increases real variance is lacking (e.g., Alesina and Summers, 1993).
2. The relationship may be non-linear (see Calmfors and Driffill, 1988).
3. Distinguishing monetary-policymaker autonomy from conservatism and wage/price-bargaining unit concentration from coordination becomes important later.
4. Standard approaches build from Kydland and Prescott (1977), Bade and Parkin (1982), Barro and Gordon (1983a, b), Rogoff (1985), Grilli et al. (1991), Cukierman (1992), Lohmann (1992), Alesina and Summers (1993), Eijffinger and De Haan (1996).
5. Ball and Romer (1990) show that small nominal rigidities, Lucas-Rapping (1969) sticky wages or Mankiw (1985) menu costs, alone do not suffice to produce much real policy-effectiveness, but small real *and* nominal rigidities do. Akerloff-Yellen (1985) near-rationality or calculation costs, or bargaining power in labor/goods markets, would suffice.
6. Whether nominal and real rigidities stem from price-setting firms or wage-setting unions is irrelevant; henceforth, the text adopts the more familiar wage-setting language.
7. Eijffinger and De Haan (1996) review previous empirical studies, listing few with controls (to which add Al-Marhubi and Willett, 1995; and Havrilesky and Granato, 1993) and no interactive models.
8. Indeed, "incipient inflationary pressures" do not strictly exist in standard models since inflation is just money-supply growth, which banks fully control. Furthermore, financial-stability motives for counter-cyclical policy (see Cukierman, 1992, ch. 7) cannot explain the Fed's justification for its behavior even if they might explain the counter-cyclicality.



9. The Fed rarely if ever mentions wage/price bargainers; examples of the *Bundesbank's* very different announcements are easily found: e.g., Kennedy (1991, 27–53); *Financial Times* 24/6/1993, 14.
10. Development follows Olson (1965), Headey (1970), Berger (1981), Lehmbruch and Schmitter (1982), Cameron (1984), Lange (1984), Lange and Garrett (1985), Bruno and Sachs (1987), Calmfors and Driffill (1988), Soskice (1990). Carlin and Soskice (1990) and Layard et al. (1991) are textbook treatments; Calmfors (1993) provides an excellent review.
11. Bargains are often modeled as prisoners' dilemmas with  $i$ 's most-preferred outcome that all  $\sim i$  exercise restraint, then all, then none, then only  $i$ . The ordering implicitly assumes considerable market power since only  $i$  raising wages would be most preferred only if employment is very wage inelastic. See below, Calmfors and Driffill (1988), Calmfors (1993).
12. The UK and Italy, e.g., scrambled briefly, mostly unsuccessfully, to institute CWB in their economies (Regini, 1984).
13. See Swenson (1989), Soskice (1990), and Layard et al. (1991) on the former and Calmfors and Driffill (1988), Layard et al. (1991), and Calmfors (1993) on the latter.
14. E.g., Soskice (1990) and Calmfors and Driffill (1988) dispute Japan and Switzerland.
15. Cf. Hall (1994), Garrett and Way (1995a, b), Iversen (1998a, b), Hall and Franzese (1998), and Franzese (1999a).
16. One can exclude zero and full BC, though. Bargaining implies some market power and so non-zero BC. Conversely, any international mobility in goods or labor precludes full coordination among all bargainers since some are foreign.
17. Arguments in, e.g., Golden (1993), Thelen (1994), Golden and Wallerstein (1995), Lange et al. (1995) suggest that union-membership structure will not suffice.
18. Curvature of relations between BC and restraint can be estimated directly (see, e.g., Iversen (1998a, b)), or competition-reducing and internalization-increasing features of wage/price-bargaining organization can be separated (see, e.g., Layard et al., 1991). Attempts at the latter rely on union density to represent the former and BC indices the latter.
19. Scharpf's (1984, 1987, 1991) work is exceptional (both senses) and partly foreshadowed the syntheses reviewed here.
20. (a) Bleaney (1996), Forteza (1998), Hall and Franzese (1998), Iversen (1999), and those reviewed below, and (b) Jonsson (1995), Simmons (1996), Clark et al. (1998), Oatley (1999), Way (2000) more thoroughly explore a subset of the implied interactions, regarding CBA interactions (a) with BC and (b) with government-partisanship and/or the electoral cycle.
21. Scale  $CBA$  to 0  $\equiv$  full dependence, 1  $\equiv$  full autonomy. Lohmann (1992) shows that, for similarly scaled costs of replacing bankers,  $r$ , equilibrium policy is  $r \cdot C + (1 - r) \cdot G$ , where  $C$  is banks' and  $G$  governments' desired policy, but she does not emphasize this result. Jonsson (1995) and Bleaney (1996) posit (1)'s first line but also ignore its general implications.
22. Bleaney (1996), Forteza (1998), Hall and Franzese (1998), Iversen (1999) analyze nominal effects of strategic interaction directly. Work reviewed below analyzes nominal *and* real effects of such interactions, so further discussion is deferred.
23. See De Haan (1999) and Berger et al. (1999) for reviews of these political-economic general-equilibrium approaches.
24. The text follows the simpler 1998 model; the 1999 article derives similar results in a Blanchard-Fisher (1989, p. 433) model: "Equilibrium output is neutral with respect to ... nominal scale [but with strategic bargainers] ... non-neutral with respect to degrees of accommodation in the monetary rule" (Soskice and Iversen, 1999).
25. Conversely, of course,  $n$  has real effects that depend on  $\beta$ .
26. Similar concerns may apply to the exogeneity of  $\alpha$ .

27. Constant returns to scale also differentiate the approach from some others. Another problematic, technical issue is that, at union weight on real wages  $\alpha = \beta/(N - 1)$ , employment is undefined, and wages are 0. As  $\alpha$  approaches  $\beta/(N - 1)$  from below,  $e^*$  goes to  $\infty$ ; as it approaches from above  $e^*$  goes to  $-\infty$  (from 0 at  $\alpha = \infty$ ).
28. A thorough review would include Yashiv (1989), Cubitt (1989, 1992, 1995), Agell and Ysander (1993), Gylfason and Lindbeck (1994), Grüner and Hefeker (1997), Jensen (1997), Skott (1997), Zervoyianni (1997).
29. If not, then inflation is irrelevant. *Benevolent planners* also combine private-actor utilities, usually with equal weights.
30. Rama (1994), Grüner and Hefeker (1997), Zervoyianni (1997), and Franzese (1999a) emphasize this justification.
31. The authors note that standard CBI models are simpler even than this since output is at least endogenous here.
32. (10)  $W = w_2 + w_1M$  where  $w_2 \equiv \frac{2\omega_u^T - 2uY_u^T + 2qP_u^T}{1+u+q}$  and  $w_1 \equiv \frac{1+u+q}{1+u+q}$ , and (11)  $M = m_2 + m_1W$  where  $m_2 \equiv \frac{2Y_g^T + 2vP_g^T}{1+v}$  and  $m_1 \equiv \frac{1-v}{1+v}$ , where  $v$  is government weight on prices relative to output, and  $u, q$  are union weight on output and prices relative to real wages.
33. Cubitt (1992) considers games where union, government, both, or neither can pre-commit to  $M$  or  $W$ : Stackelberg Government-Leads, Stackelberg Union-Leads, and Nash with and without pre-commitment. Results differ with who leads; interestingly, government may prefer to follow. Cubitt (1995) explores three aspects of *corporatism* other than centralization: greater union-weight on inflation, higher union aggregate-output target, greater alignment of union and government output-targets, and cooperative union-government play. The results can be derived from the above.
34. Soskice and Iversen (1998), Hall and Franzese (1998), and Franzese (1999a) concur.
35. Cukierman–Lippi and Soskice–Iversen both assume  $\alpha$  and  $\gamma$  exogenous and independent of  $n$ .
36. 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). Hall (1994), Franzese (1996), Hall and Franzese (1998), Franzese and Hall (1999) make some of the same points as Franzese (1999a), less formally still.
37. More completely, CC interacts best (worst) with small traded (public) sectors leading large public (traded) sectors in coordinated bargaining, with non-traded sectors intermediate. Public-sector-led coordinated bargaining can under-perform non-coordinated bargaining intrinsically and in its interaction with monetary conservatism.
38. A similar coordination-enforcement mechanism operates in Soskice and Iversen (1998, 1999) and Franzese (1999a).
39. Such complicated contracts may be difficult to write at high levels of aggregation, for example.
40. The model also laid foundations for Soskice and Iversen (1998, 1999), and it is more fully-specified than Franzese (1999a).
41. Except as noted, in this section BC refers to some bargaining-coordination index, and CC to some index of “central bank independence” summarizing both autonomy and conservatism of the monetary authority.
42. Henceforth *decade* refers to Cukierman’s (1992) periodization of LVAU – the most frequently measured index available: 1950–9, 1960–72, 1973–9, 1980–9.
43. Examining the Cukierman–Lippi row of Figure 1 carefully, one sees that such results could emerge if CC/mid-to-high-BC interactions confer some benefit that their model misses. Iversen (1998a, b), Franzese (1994, 1996, 1999a), and Soskice and Iversen (1998, 1999) all suggest such a possibility, namely that higher CC may help enforce coordination on restrained settlements in non-centralized systems of “pattern-setting” coordinated bargaining.

44. Iversen (1998a, b) uses *actual* exchange-rate movements in addition to an average of standard CBI indices.
45. 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.
46. Since this writing, several additional models of these interactions have come to the author's attention. Notably, Adolph (2001) adds a strategic partisan government to Iversen's model, which induces CC-BC-interaction contingent partisan effects, and Holden (2001) endogenizes bargaining organization to the monetary stance, inducing quite different interactions than some of those considered here.
47. Hall (1994) and Hall and Franzese (1998) elaborate a similar argument. Soskice and Iversen (1998a, b) emphasize that Europe could evolve a pattern-setting system of bargaining, which would be more beneficial, and Franzese (1999a) would imply that traded-sector bargainers would be best to set such patterns.

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