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Wage Centralization, Union Bargaining, and Macroeconomic Performance

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Wage Centralization, Union Bargaining, and Macroeconomic Performance

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Abstract

This paper addresses two questions. First, under what circumstances will a centralized wage-bargaining system offer higher output and employment than a decentralized system? Second, what is the relationship between the degree of wage centralization and inflation? The paper argues that centralized wage setting may offer worse outcomes, despite the existence of a negative coordination externality in decentralized wage setting. This is more likely to occur when the legal and institutional environment strengthens the bargaining position of the union in the centralized regime compared with unions operating in a more decentralized regime. Furthermore, as product markets become more competitive, the macroeconomic outcomes in both regimes converge, and the degree of wage centralization becomes irrelevant.

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I. INTRODUCTION

This paper seeks to address two questions. First, under what circumstances will a centralized wage-bargaining system offer higher output and employment than a decentralized system? Second, what is the relationship between the degree of wage centralization and inflation?

The first question has long been a subject of interest for economists. In general, theoretical models claim that economic performance is "U" shaped in the degree of wage centralization, where the degree of centralization is defined as the number of independent participants in the wage-bargaining process (Newell and Symons, 1987; Calmfors and Driffill, 1988; Bruno and Sachs, 1985)[2]. Highly centralized systems, such as national level bargaining, internalize many of the negative externalities present in the wage-bargaining process. In contrast, intermediate levels of centralization, for example, where industry level unions dominate the bargaining process, fail to internalize these externalities. In economies with highly competitive labor markets, unions have little monopoly power and they have little impact on macroeconomic outcomes.

These externalities may arise in a number of ways,[3] but the coordination externality is the most often cited (Strand, 1987; Layard and others, 1991; Moene, Wallerstein, and Hoel, 1993). Decentralized wage setters push for higher wages without considering the impact upon aggregate variables. This coordination failure leads to an increase in the price level, a fall in aggregate demand, and a rise in unemployment. In contrast, centralized bargaining is supposed to eliminate all relative wage considerations by determining a single, national wage increase that applies to all workers.

The second question has only recently started to receive serious attention. Several economists have modeled the issue in terms of a strategic game between the monetary authorities and monopoly trade unions (Cubitt, 1992; Lawlor, 2000). These models generally assume that trade unions dislike inflation and will limit their wage claims, both raising output and limiting the incentives for the monetary authorities to create inflation. However, the assumption that unions care about inflation is rather ad hoc and it has rather poor micro-theoretic foundations. Others have examined the relationship between bargaining structures and inflation in the context of central bank independence (Cukierman and Lippi, 1999; Hall and

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[2] Soskice and Iverson (2000) argue that for the major OECD countries there is a consensus among industrial relations specialists that Canada, France, New Zealand, the United Kingdom, and the United States are highly decentralized wage-setting regimes. Austria, Denmark, Finland, Norway, and Sweden are regarded as being highly centralized regimes. The remainder—Australia, Belgium, Germany, Italy, Japan, Netherlands, and Switzerland—are regarded as intermediate cases.

[3] Calmfors (1993) provides a comprehensive survey of the types of negative externalities present in decentralized wage-setting arrangements.

Franzese, 1998; Iversen, 1998; Guzzo and Velasco 1999; Berger, Hefeker and Schöb, 2002). These authors have argued that centralized wage setters recognize the strategic implications of a conservative central bank, and adjust their wage-setting behavior accordingly. In contrast, wage setters in uncoordinated systems, that is, decentralized bargaining systems, fail to recognize their mutual interdependence. Therefore, these types of models claim that independent central banks, coupled with decentralized bargaining, should be associated with higher unemployment.

This paper examines these questions with a taxonomy of wage-setting regimes within the context of an imperfectly competitive macro model. The model has three types of agents: workers, capitalists, and a government. The first regime is a competitive labor market, where the real wage is determined by the interaction of labor supply and labor demand. This regime gives the benchmark to compare the relative of merits of other wage-setting regimes. The second regime is a decentralized firm-based bargaining system, where local trade unions negotiate with local management to determine a firm based nominal wage. Finally, the paper presents a centralized wage-setting regime, where all firms and unions delegate bargaining authority to national representative organizations. These organizations bargain over a single, nominal wage that applies to all firms. In all three regimes, an optimizing government determines monetary policy. Thus, the paper explicitly examines the relationship between inflation, policy credibility, and the degree of wage centralization. However, this paper provides a more equivocal answer to both questions. There are circumstances in which centralized bargaining offers worse marcroeconomic outcomes than decentralized bargaining, despite the existance of a negative externality. This outcome is more likely when the legal and institutional environment gives the centralized union significant privileges that strengthens its position in the bargaining process relative to firms. This is likely to occur to the extent that centralized unions can act as an effective interest group. This is more likely to be the case where centralized unions have stronger connections with political parties and have greater financial resources than their decentralized counterparts.

Blanchard and Giavazzi (2000) take up this theme in the context of product and labor market deregulation. They outline a similar model of monopolistic competition, but with "efficient" wage bargaining and barriers to entry for firms. They also point to union bargaining strength as an important determinant of macroeconomic outcomes. However, they do not consider the issue of the degree of wage centralization. Although the paper is not primarily focused upon the issue of product market reform, the paper does produce one result which contrasts with Blanchard and Giavazzi (2000). In the model presented here, increased product market competitiveness leads to better macroeconomic outcomes. In the limit, as product market competitiveness approaches perfect competition, the question of wage centralization becomes irrelevant; both regimes deliver the same outcomes. In the Blanchard and Giavazzi model, product market reform, has no long-run effects on macroeconomic outcomes.

II. WAGE-SETTING ARRANGEMENTS

In a centralized bargaining regime, wage setters recognize the implications of their behavior upon other macroeconomic variables such as inflation and aggregate demand. Coordination at a national level eliminates any relative wage and price effects in the bargaining process. However, agents in a decentralized regime cannot coordinate their wage bargains. Each

agent believes that it is so "small" that the impact of its wage-setting behavior upon macroeconomic variables is minimal. Therefore, they treat such variables as aggregate demand and the price level as fixed during their local negotiations.

In order to clarify the implications of this coordination failure, suppose that an individual firm f were to raise the nominal wage paid to its workers, while all other F-1 firms left their nominal wages and prices unchanged. The real wage offered by firm f would rise, and labor demand in firm f would fall. However, the impact on aggregate demand from this increase in real wages would be negligible, since wages in all the other F-1 firms have not changed. In such circumstances, agents in firm f would be right to treat aggregate demand and all other prices as fixed.

While it might be true that a wage increase in a single firm may have a negligible impact on macroeconomic aggregates, it is not true when all decentralized wage setters push for higher wages. Suppose all other wage setters in the F-1 firms follow the wage setters in firm f and raise nominal wages. Product prices in all firms would rise, and for a given level of money supply, aggregate demand would fall. This leads to an additional fall in employment for all firms including firm f. This negative externality is a coordination failure because the decentralized agents cannot coordinate their wage-setting behavior.

III. IMPERFECTLY COMPETITIVE MACROECONOMIC MODEL

Consider an economy with F firms, indexed by $f=1,..,F$ with each firm producing a differentiated product. The total number of firms and products are fixed, thus eliminating any entry or exit considerations from the model. There are two types of individuals in this economy; workers and capitalists. Capitalists own the firms and derive their income solely from the profits generated by firms, whilst workers derive their income only from employment. Each firm employs one worker, so that the labor force comprises of F workers indexed with the subscript $i=1,...F$. There are three labor market regimes; competitive, decentralized union bargaining and centralized union bargaining. They are denoted by the subscript $k=m,l,n$ respectively.

A. Households

Each worker has the following utility function:

$$U_{ki} = v_{ki}\left(Y_{ki}\right)^{\mu}\left(\frac{M_{ki}}{P_k}\right)^{(1-\mu)} - N_{ki}^{\sigma} \tag{1}$$

$$v_{ki}\left(Y_{ki}\right) = F^{\frac{1}{1-\theta}}\left[\sum_{f=1}^{F} Y_{kfi}^{(\theta-1)/\theta}\right]^{\frac{\theta}{\theta-1}} \tag{2}$$

The first term in equation (1) says that worker i's utility depends positively upon the consumption of a basket of goods Y_{ki} and real money balances with the parameter μ $(0 < \mu < 1)$ measuring the relative importance of these two factors in overall utility. The sub-utility function for the consumption of goods takes a CES function form, with the parameter θ

measuring the elasticity of substitution between goods. The variable Y_{kfi} denotes the quantity of good f consumed by worker i in the wage-setting regime k. The second term in the utility function represents the disutility of working. Worker i works for N_{ki} hours with the parameter σ measuring the worker's disutility of labor. It is assumed that $1 < \sigma < \infty$. Workers maximize equation (1) subject to the following budget constraint:

$$\sum_{f=1}^{F} P_{kf} Y_{kfi} + M_{ki} = W_{ki} N_{kf} \tag{3}$$

The price of each good produced by firm f is given by P_{kf} with the general price level given by P_k. The nominal wage received by worker i for working for firm f is given by W_{kf}. Nominal money holdings of worker i at the end of the period is given by M_{ki}.

There are H capitalists indexed by $h=1,...H$. Their income is derived from their claim on the profits of each firm. Their utility function and budget constraints are given by:

$$U_{kh} = v_{hk} (Y_{hk})^{\mu} \left(\frac{M_{kh}}{P_k} \right)^{(1-\mu)} \tag{4}$$

$$v_{hk} (Y_{hk}) = F^{\frac{1}{1-\theta}} \left[\sum_{f=1}^{F} Y_{kfh}^{(\theta-1)/\theta} \right]^{\frac{\theta}{\theta-1}} \tag{5}$$

$$\sum_{f=1}^{F} P_{kh} Y_{kfh} + M_{kh} = \sum_{f=1}^{F} \chi_{hf} \Pi_f \tag{6}$$

$$\sum_{h=1}^{H} \chi_{hf} = 1 \qquad \sum_{f=1}^{F} \sum_{h=1}^{H} \chi_{hf} = F \tag{7}$$

The parameter χ_{hf} measures the holdings of shares by capitalist h in firm f. The variable Y_{kfh} denotes the quantity of good f consumed by capitalist h in the wage-setting regime k. Solutions to the maximization problems for both workers and capitalists give individual demand functions for each good according to the type of household. Aggregating across all households gives the demand function for product f:

$$Y_{kf}^d = \left(\frac{P_{kf}}{P_k} \right)^{-\theta} \frac{Y_k^d}{F} \tag{8}$$

Total aggregate demand is given by:

$$Y_k^d = \frac{M_k}{P_k} \tag{9}$$

From the solution to the representative worker's maximization problem, the worker's utility function can be expressed in terms of real wages and employment.

$$U_{ki} = \delta \frac{W_{kf} N_{ki}}{P_k} - N_{ki}^{\sigma}$$

(10)

The parameter δ is given by $\delta = \left[\mu^{\mu} (1 - \mu)^{(1-\mu)} \right]$. Note that $0 < \delta < 1$ since $0 < \mu < 1$.

Equation (10) forms the key objective function for all trade unions, whether negotiating nationally or locally. In contrast to much of the previous literature, the union's objective function is derived directly from the individual's utility function. As such, the union is only concerned with real wages and employment and has no interest in the level of inflation.

B. Firms

The production function for firm f takes a Cobb Douglas functional form.

$$Y_{kf} = N_{kf}^{\alpha}$$

(11)

The profit function of firm f can be written as:

$$\Pi_{kf} = \left(\frac{Y_k^d}{F} \right)^{1/\theta} Y_{kf}^{\left(1 - \frac{1}{\theta}\right)} - \frac{W_{kf}}{P_k} N_{kf}$$

(12)

By optimizing the firm's profit function with respect to employment subject to the constraint given by the production function, an employment relationship in terms of the real wages in firm f and aggregate demand can be derived:

$$N_{kf} = \Phi^{\psi_1} \left(\frac{W_{kf}}{P_k} \right)^{-\psi_1} \left(\frac{Y_k^d}{F} \right)^{\psi_2}$$

(13)

where $\Phi = \alpha \left(1 - \frac{1}{\theta} \right)$, $\psi_1 = \dfrac{\theta}{\theta(1-\alpha)+\alpha}$, and $\psi_2 = \dfrac{1}{\theta(1-\alpha)+\alpha}$.

In equilibrium, aggregate supply can be written as:

$$Y_k^s = \frac{\sum_{f=1}^{F} P_{kf} Y_{kf}^s}{P_k} = \frac{\sum_{f=1}^{F} P_{kf} N_{kf}^{\alpha}}{P_k}$$

(14)

In symmetric equilibrium, all firms charge the same prices and all workers receive the same wage, so $W_{kf} = W_k$ and $P_{kf} = P_k$. Substituting the employment relationship given by equation (13) into equation (14) and applying the condition for symmetric equilibrium gives the following aggregate supply relationship in terms of monetary policy, prices, and wages:

$$Y_k^s = F \Phi^{\alpha \psi_1} \left(\frac{W_k}{P_k} \right)^{-\alpha \psi_1} \left(\frac{M_k}{P_k F} \right)^{\alpha \psi_2}$$

(15)

Setting aggregate demand equal to aggregate supply and solving for the aggregate price level gives:

$$P_k = \left(\frac{M_k}{F}\right)^{(1-\alpha)} \left(\frac{W_k}{\Phi}\right)^{\alpha} \tag{16}$$

Using this expression for the aggregate price level, we may obtain the following reduced form expressions for aggregate output, employment in firm f, and real wages:

$$Y_k = \left(\frac{\Phi M_k}{W_k}\right)^{\alpha} F^{(1-\alpha)} \tag{17}$$

$$N_{kf} = \left(\frac{\Phi M_k}{F W_k}\right)\left(\frac{W_{kf}}{W_k}\right)^{-\psi_1} \tag{18}$$

These reduced form equations for prices, output, and employment are the key constraints facing the government, firms, and workers when they optimize their objective functions.

C. The Government

The government's objective function is given by:

$$G_k = -\Omega \ln\left(\Delta P_k\right)^2 - \ln\left(\frac{Y_k}{\hat{Y}}\right)^2 \tag{19}$$

This function is a quadratic and it is typical of the type used in much of the literature concerning macroeconomic policymaking (Barro and Gordon, 1983). The government has two policy targets. The first is inflation—the government hopes to achieve a zero inflation target, where ΔP_K is the inflation rate. Secondly, the government tries to minimize the deviation of output around a target level, denoted by $\hat{Y}$. Output is always assumed to be below its target level i.e. $\hat{Y} > Y_k$. The government's inflation aversion parameter is given by Ω. Larger values of Ω indicate that the government places a greater weight on its inflation target rather than its output target. For simplicity, prices in the previous period are normalized to one.

The government's optimization problem is solved by maximizing equation (19) with respect to the nominal money supply, subject to constraints given by equations (16) and (17). Rearranging the first order condition gives:

$$M_k = \left(\frac{W_k}{\Phi}\right)^{-\alpha\eta_1} F^{-(1-\alpha)\eta_1} \hat{Y}^{\eta_2} \tag{20}$$

where $\eta_1 = \dfrac{\Omega(1-\alpha)-\alpha}{\alpha^2 + \Omega(1-\alpha)^2}$, $\eta_2 = \dfrac{\alpha}{\alpha^2 + \Omega(1-\alpha)^2}$,

Equation (20) is the government's monetary policy reaction function relating the money supply to the nominal wage.

IV. COMPETITIVE LABOR MARKET

In the competitive labor market worker i, employed by firm f maximizes his utility function, given by equation (10), with respect to employment. Solving the first-order condition for employment gives the labor supply function for worker i.

$$N_{mi}^s = \left(\frac{\delta}{\sigma}\right)^{\frac{1}{\sigma-1}} \left(\frac{W_{mf}}{P_m}\right)^{\frac{1}{\sigma-1}} \tag{21}$$

The competitive labor market wage in terms of monetary policy is derived by first substituting out the price level from the labor supply function using equation (16). This new equation is then equated with the employment relationship given equation (18) and the condition $W_{mo} = W$ is then applied. This gives the following wage equation :

$$W_m = \frac{M_m}{F} \Theta_m^{1/(\sigma-\alpha)} \Phi^{1-1/(\sigma-\alpha)} \tag{22}$$

where $\Theta_m = \left(\dfrac{\sigma}{\delta}\right)$

We now consider wage-setting arrangements where workers are represented by trade unions.

V. DECENTRALIZED BARGAINING

When firms and unions negotiate at a firm level, both players treat aggregate macroeconomic variables such as monetary policy and aggregate wages as fixed. As far as the local union and firm are concerned, all relevant strategic relationships are found only within the firm.

Equation (10) defines the utility function of the representative worker i, employed by firm f, in terms of employment and real wages. The local union, which bargains on behalf of worker i, takes this function as its objective function. The employment constraint, given by equation (18), along with the price equation given by equation (16) are substituted into equation (10). This gives the union's objective function in terms of monetary policy and relative wages:

$$U_{if}\left(W_{if}, W_l, M_l\right) = \delta\Phi\left(\frac{W_{if}}{W_l}\right)^{1-\psi_l}\left(\frac{\Phi M_l}{F W_l}\right)^{\alpha} - \left(\frac{W_{if}}{W_l}\right)^{-\sigma\psi_l}\left(\frac{\Phi M_l}{F W_l}\right)^{\sigma} \tag{23}$$

By using equations (16) and (18), the profit function can also be expressed in terms of monetary policy and relative wages:

$$\Pi_{if}\left(W_{if}, W_l, M_l\right) = \left(\frac{W_{if}}{W_l}\right)^{1-\psi_l}\left(\frac{\Phi M_l}{F W_l}\right)^{\alpha}(1-\Phi) \tag{24}$$

The bargaining process is modeled using a standard "right to manage" Nash bargain (Nickell and Andrews, 1983), where it is assumed that unions and firms bargain over nominal wages but the firm retains the right to determine the level of employment. Thus, the firm is always on its labor demand function. The decentralized "right to manage" Nash bargaining problem is:

$$\underset{W_{if}}{Max}\ B_{if} = \left[U_{if}\left(W_{if}, W_l, M_l\right)\right]^{\beta_l} \left[\Pi_{if}\left(W_{if}, W_l, M_l\right)\right]^{1-\beta_l} \tag{25}$$

The parameter β_l measures the relative bargaining strength of each party, with increasing values of β_l representing increasing union bargaining power. When $\beta_l = 1$ this problem reduces to the special case of the monopoly union model in which the union maximizes its utility with respect to the level of wages subject to the constraint given by the labor demand function (McDonald and Solow, 1981; Oswald, 1982). When $\beta_l = 0$ the firm decides both employment and nominal wages.

In bargaining theory, this parameter is either regarded as exogenous or a function of the discount factors of each player. However, in collective bargaining situations, it is reasonable to assume that this parameter is determined by two additional factors. The first is the legal framework under which bargains take place. If labor legislation offers trade unions legal immunity from such activities as strikes and secondary picketing and gives trade unions the right to enforce union membership upon nonunion firms, then the trade unions bargaining position will be strong. The second factor that will affect union bargaining strength is the probability of being fired. Typically, this probability is positively related to economic cycle, with periods of high unemployment being associated with low union bargaining strength.

The first-order condition is:

$$\beta_l \frac{\partial U_{if}}{\partial W_{if}} \frac{1}{U_{if}} = -\left(1 - \beta_l\right)\frac{\partial \Pi_{if}}{\partial W_{if}} \frac{1}{\Pi_{if}} \tag{26}$$

In symmetric equilibrium, all firms pay the same wages so $W_{if} = W_l$. Applying the first-order condition for the Nash bargaining solution and solving for the nominal wage gives:

$$W_l = \frac{M_l}{F}\ \Theta_l^{1/(\sigma-\alpha)}\ \Phi^{1-1/(\sigma-\alpha)} \tag{27}$$

where $\Theta_l = \beta_l \frac{1}{\Phi}\frac{\sigma}{\delta} + \left(1 - \beta_l\right)\frac{1}{\delta}$

VI. CENTRALIZED BARGAINING

Under a centralized regime, all firms and all workers throughout the economy co-ordinate so that they are represented by a single, national employers federation and a single, national trade union federation. Again, the objective function for each centralized agent takes the form of the objective functions for the representative firm f and the representative worker i

employed by firm f. Both these centralized agents bargain over a nominal wage that applies to all firms. Relative wages play no part in the optimization.

As in the decentralized case, the employment constraint equation (18) is imposed upon both the profit function and the union's objective function. Equation (16) is used to eliminate the price level. The relative wage terms are eliminated from the objective functions of each player by imposing the condition $W_{nf} = W_n$ before the Nash solution is calculated. The objective function of the representative firm and union become:

$$U_{nf}\left(W_n, M_n\right) = \delta\Phi\left(\frac{\Phi M_n}{F W_n}\right)^\alpha - \left(\frac{\Phi M_n}{F W_n}\right)^\sigma \qquad (28)$$

$$\Pi_{nf}\left(W_n, M_n\right) = \left(\frac{\Phi M_n}{F W_n}\right)^\alpha \left(1 - \Phi\right) \qquad (29)$$

The centralized wage setting Nash bargain is then written as:

$$\underset{W_n}{Max} B_{nf} = \left[U_{nf}\left(W_n, M_n\right)\right]^{\beta_n} \left[\Pi_{nf}\left(W_n, M_n\right)\right]^{1-\beta_n} \qquad (30)$$

Optimizing the Nash bargain with respect to the national nominal wage gives a wage equation in terms of monetary policy:

$$W_n = \frac{M_n}{F} \Theta_n^{1/(\sigma-\alpha)} \Phi^{1-1/(\sigma-\alpha)} \qquad (31)$$

where $\Theta_n = \beta_n \dfrac{1}{\Phi}\dfrac{\sigma}{\delta} + \left(1 - \beta_n\right)\dfrac{1}{\delta}$.

VII. MACROECONOMIC OUTCOMES

The wage equations and the government's reaction function are solved simultaneously to derive a unique money supply and nominal wage for each wage-setting regime, which are then used to derive solutions for all the key macroeconomic variables. These solutions are provided in Appendix I. The solutions in each wage-setting regime share the same basic structure, with the variable Θ_k playing a crucial role. As Θ_k increases, macroeconomic outcomes deteriorate.

A. The Relationship Between Output, Employment, and Wage Centralization

The expressions for output and employment are given by:

$$Y_k = \left(\frac{\Phi}{\Theta_k}\right)^{\frac{\alpha}{\sigma-\alpha}} F \qquad \frac{\partial Y_k}{\partial \Theta_k} < 0 \qquad\qquad (32)$$

$$N_{kf} = \left(\frac{\Phi}{\Theta_k}\right)^{\frac{1}{\sigma-\alpha}} \qquad \frac{\partial N_{kf}}{\partial \Theta_k} < 0 \qquad\qquad (33)$$

How does the choice of wage-setting regime affect output and employment? In order to answer that question, three propositions concerning Θ_k need to be stated.

Proposition 1:

(a)   If $\beta_l = \beta_n = \beta$, $0 < \beta \leq 1$, and $1 < \theta < \infty$ then $\Theta_l > \Theta_n$.

(b)   As $\theta \to \infty$ then $\Theta_l \to \Theta_n$.

(c) $\lim\limits_{\beta_l \to 0} \Theta_l = \lim\limits_{\beta_n \to \infty} \Theta_n$.

Proof: See Appendix II.

This proposition says three things. First, that for any given level of union bargaining strength $\Theta_l > \Theta_n$ and so the decentralized regime gives lower employment and output than the centralized regime. This is due to the greater willingness of local unions to try to extract more of the monopoly rents generated by the firm. It is the negative impact of the coordination externality implicit in decentralized bargaining.

The second part of the proposition indicates the relationship between product market competitiveness and Θ_k. As the parameter θ increases, the degree of product differentiation falls, and so the degree of product market competitiveness increases. As markets become more competitive, the amount of monopoly rents available to the firm falls. In the limit, when products are identical and the product market is perfectly competitive, monopoly rents are zero. Since the first part of the proposition says decentralized unions are more prepared to extract rents than centralized unions, it must follow that if there are no monopoly rents available (as in the case of perfect competition) then the two regimes give the same outcome. In other words, as product market competitiveness increases, macroeconomic outcomes in both regimes converge. The question of whether or not centralized bargaining offers better outcomes becomes irrelevant.

This relationship between product market competitiveness and labor market outcomes is somewhat different from Blanchard and Giavazzi (2000). Their model includes entry and exit

considerations. With entry costs, product market deregulation simply leads to a fall in profits and a decrease of firms over time. Since it is unprofitable to enter, old firms are not replaced and ultimately, product market regulation is self defeating. Blanchard and Giavazzi argue that a decrease in entry costs will have a more favorable effect in the long run. In the model presented in this paper, firms do not exit, and new firms do not enter. Instead, increased product market competitiveness increases product demand and employment, and reduces supernormal profits across all firms.

The final part of the proposition says that as unions become less powerful, the decentralized and centralized bargaining outcomes converge. In the limit, when $\beta_l = \beta_n = 0$, wages are totally determined by the firm. The outcomes are identical because it really does not matter whether unions are centralized or decentralized—they have no influence on wages.

Proposition 2:

(a)   If $\beta_l \leq \dfrac{(\sigma - 1)\Phi}{\sigma - \Phi}$ then $\Theta_m \geq \Theta_l$

(b)   If $\beta_n \leq \dfrac{(\sigma - 1)\alpha}{\sigma - \alpha}$ then $\Theta_m \geq \Theta_n$

Proof: See Appendix II.

The most important implication of this proposition is that when unions are extremely weak, the competitive wage is higher than the bargained wage or, to put it another way, the bargained wage is so low that firms would like to take on more workers than they could if wages were determined by the interaction of labor supply and labor demand. This is clearly not realistic since there would be insufficient workers prepared to work at these low bargained wages. So we need to define two participation constraints in terms of the union bargaining strengths.

$$\beta_l^* > \frac{(\sigma - 1)\Phi}{\sigma - \Phi} \qquad \beta_n^* > \frac{(\sigma - 1)\alpha}{\sigma - \alpha}$$

At bargaining strengths below these thresholds, workers do not join unions. Instead, they supply labor according to their individual labor demand functions.

Proposition 3: *Let*

$$\kappa = \left(1 + \frac{\sigma}{(\theta-1)(\sigma-\alpha)} \right)$$

then if $\kappa \, \beta_l < \beta_n \leq 1$ *and* $1 < \theta < \infty$ *then* $\Theta_n > \Theta_l$.

Proof: See Appendix II.

This final proposition states that if the national union is sufficiently strong compared with a decentralized union, then centralized bargaining gives a lower level of output than decentralized bargaining. The parameter κ captures the extent to which bargaining power in centralized case has to be greater than compared to the decentralized case, in order that outcomes are poorer in This follows because if $\Theta_n > \Theta_l$, then $Y_n > Y_l$.

Figure 1 summarizes the relationship between Θ_n, Θ_l, and Θ_m outlined by these three propositions. For any given value of β greater than zero, the parameter Θ_l is always larger than Θ_n, indicating that decentralized bargaining gives poorer macroeconomic outcomes than centralized bargaining. For very low values of β[4], unions have insufficient bargaining power to raise wages beyond the level that they would have been if the labor market were competitive. Finally, if $\beta_n > \kappa \, \beta_l$, then $\Theta_n > \Theta_l$ and so national wage bargaining leads to poorer macroeconomic outcomes compared with the decentralized case.

Why are decentralized unions more prepared to push for a greater share of the firm's monopoly rents? Figure 2 illustrates the intuition behind these propositions. First, let us assume that initially, the labor market is competitive. Note that the competitive regime gives a real wage and a level of employment denoted by $(W/P)_m$ and N_m, respectively (point A). Also, note that if the bargained wage is lower than $(W/P)_m$, workers have no incentive to join unions and the labor market "defaults" to a competitive arrangement. This follows from the conditions given in proposition 2.

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[4] That is, when $\beta_l < \beta_l^*$ and $\beta_n < \beta_n^*$.

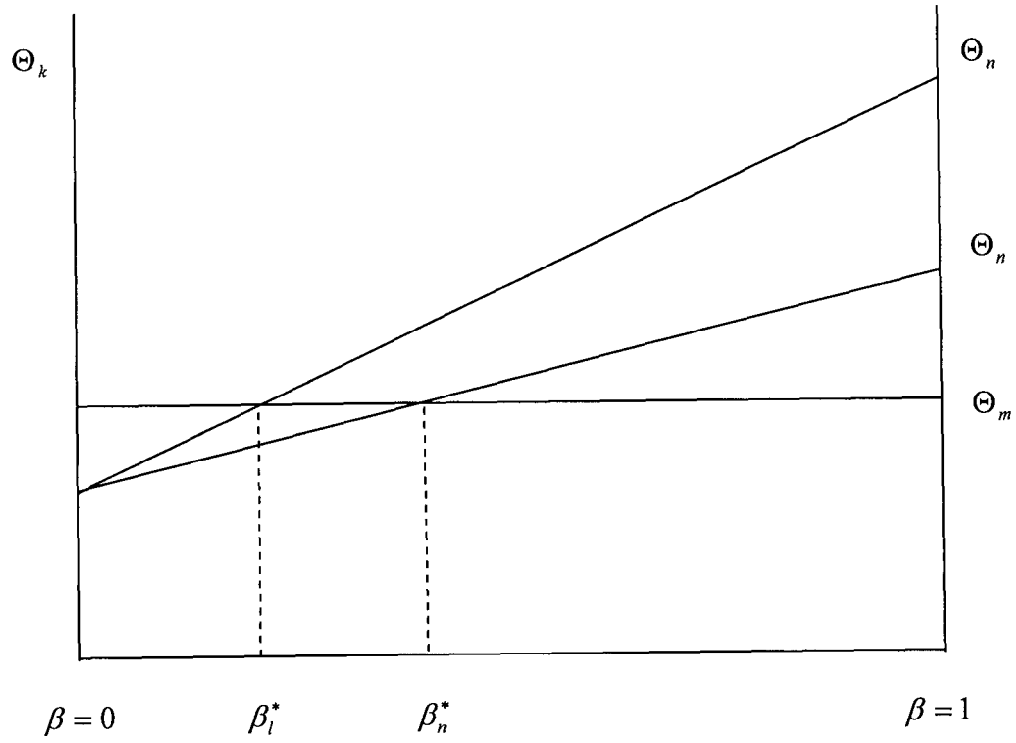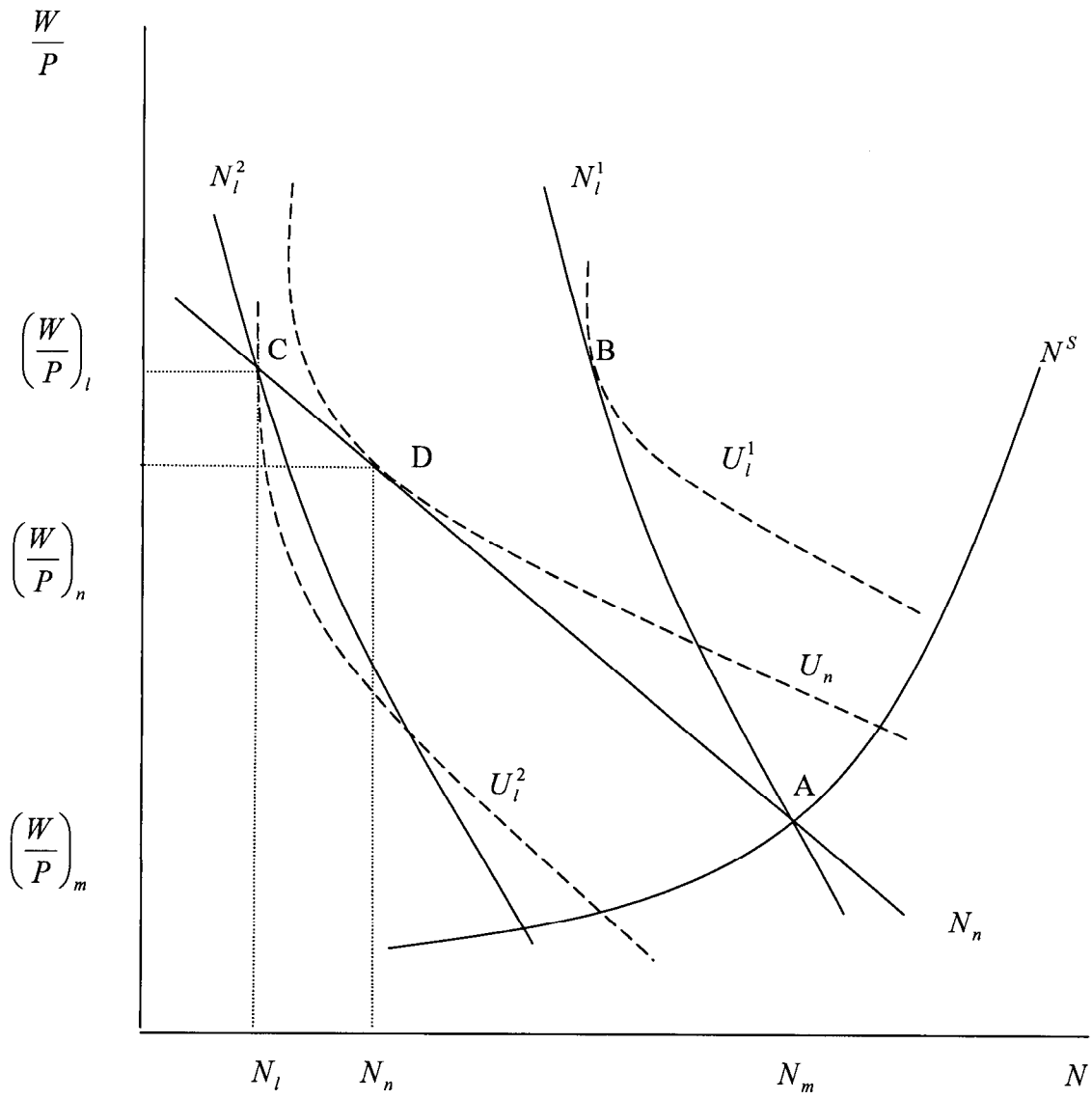Figure 1. The Relationship Between Θ_m, Θ_l, and Θ_n

Figure 2. Centralized Versus Decentralized Wage Setting

Now let us assume that the workers in firm f form a trade union, and negotiate the nominal wage at a firm level, that is, we have a decentralized bargaining regime. In order to simplify the analysis let us assume that the legal environment governing collective bargaining gives the union the right to determine the nominal wage, but that the firm retains the right to manage the level of employment. This special and extreme case is given by $\beta_n = \beta_l = 1$.[5] This assumption reduces the bargaining model to the monopoly union model of wage determination.[6] The function N_l^1 in Figure 2 represents the decentralized bargaining employment relationship when a single firm raises its real wage, while all other firms leave their wage unchanged. With union preferences given by U_l^1, the real wage in firm f will be $(W/P)_l$. We move to point B.

What would be the effect on employment from setting wages at $(W/P)_l$? Equation (13) spells out the relationship between employment, real wages, and aggregate demand. The higher nominal wage would raise the real wage, increase the firm's labor costs, and squeeze profits. The firm would respond by cutting back on employment and raising the product price. However, the negative effect on employment would be muted by the fact that there would be no external consequences to raising the real wage. A higher nominal wage in just one firm would have little impact upon the aggregate price level, nor upon aggregate demand. The local union and firm would be correct to treat both these variables as fixed during their negotiations. Therefore, the local union is more prepared to push for a higher nominal wage in order to capture more of the firm's monopoly rents.

Suppose that nominal wages in the other $F-1$ firms also increase. The product prices in all firms would rise, the aggregate price level would rise, and aggregate demand would fall. Thus, there would be two negative effects upon employment. The first effect would be the local effect due to a higher real wage, which was described, in the preceding paragraph. The second effect would be the aggregate demand effect. In Figure 2, the aggregate demand effect is represented by a leftward shift of the employment relationship from N_l^1 to N_l^2. We would move to point C.

Assuming that $\beta_n = \beta_l = 1$, what would the centralized wage bargaining outcome be? The perceived employment relationship would be flatter, since wage setters would incorporate the total effect of changes in wages on the overall price level. For a given level of union bargaining power, the real wage would be lower and employment would be higher under a centralized bargain relative to a decentralized bargain. In Figure 2, the centralized wage outcome is represented by the real wage $(W/P)_n$ and employment N_n. Under a centralized bargaining regime, the representative firm would be at point D. Note that utility for the
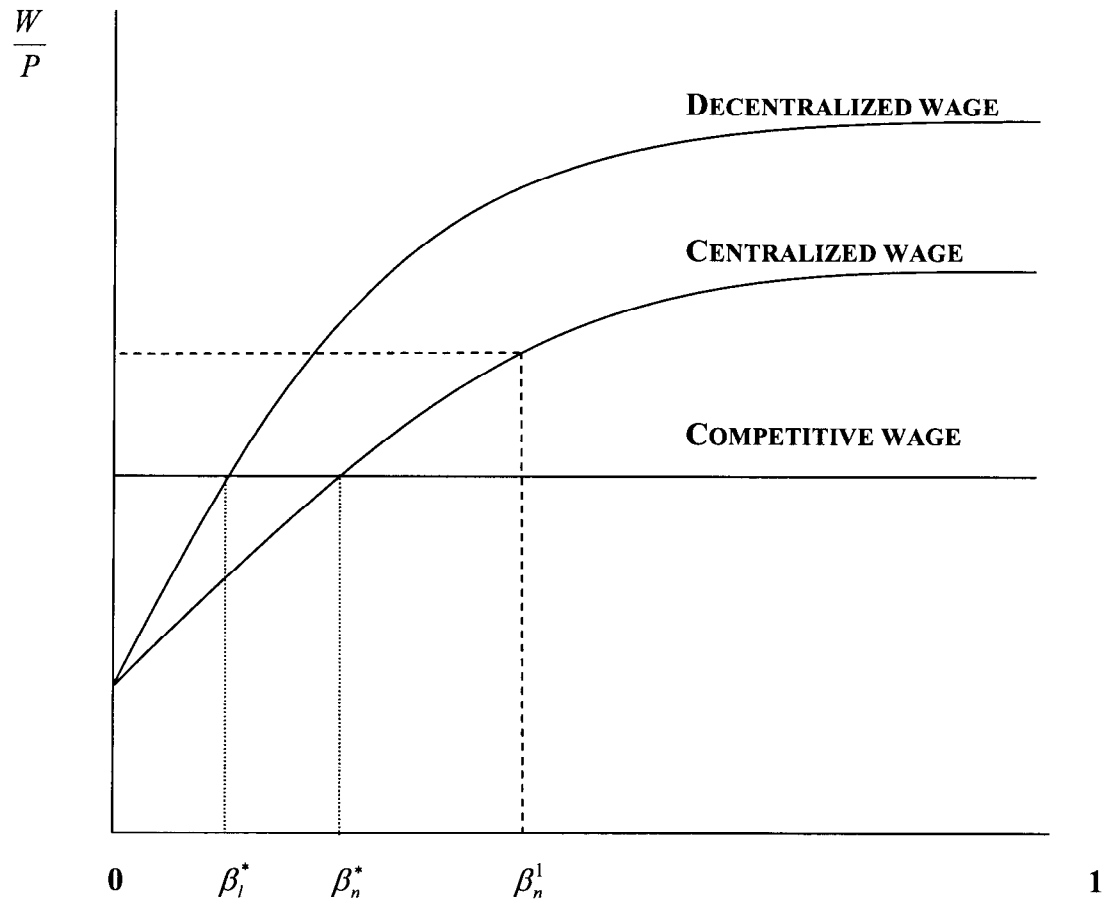
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[5] The reason for choosing this special case is only to simplify the exposition of the figure. A value $\beta_n = \beta_l < 1$ could also have been chosen but Figure 2 would have been more difficult to interpret.

[6] This tends to be the assumption used in much of the previous literature examining the question of centralized versus decentralized wage setting.

representative union is higher in the centralized case compared with the decentralized one. Therefore, unions have an incentive to coordinate their wage-setting behavior.

Figure 2 illustrated the special monopoly union case where bargaining strengths are equal across wage-setting regimes. It showed that for any given bargaining parameter that centralized wage setting has a lower wage and a higher level of employment than decentralized wage setting. However, Figure 3 illustrates the relationship between the union bargaining strength parameter and the real wage. For any given level of bargaining strength, the decentralized real wage is greater than the centralized wage. For $\beta_l > \beta_l^*$ the decentralized wage is greater than the competitive real wage. Similarly, for $\beta_n > \beta_n^*$ the centralized wage is greater than the competitive real wage. These are the union participation constraints.

Figure 3. Real Wages According to Wage-Setting Regime

Assume that because decentralized unions are small, they cannot actively pressurize the government into granting a favorable legal environment that improves its bargaining position relative to the firm. This situation is represented by setting the decentralized bargaining parameter to $\beta_l = \beta_l^*$. In contrast, centralized unions can behave in such a strategic manner with national governments and may obtain a favorable legal environment that will strengthen the union's bargaining position relative to firms. To reflect this possibility, it is assumed that the centralized union bargaining parameter is given by β_n^l. This gives a level of real wages higher than those in the decentralized case, despite the existence of the negative wage-setting externality.

B. The Relationship Between Inflation and Wage Centralization

To see how the inflationary process is affected by the degree of wage centralization consider the solution for inflation:

$$\Delta P_k = \left(\frac{\Theta_k}{\Phi}\right)^{\frac{\alpha^2}{(\sigma-\alpha)(1-\alpha)\Omega}}\left(\frac{\hat{Y}}{F}\right)^{\frac{\alpha}{(1-\alpha)\Omega}} - 1 \qquad (34)$$

Higher values of Θ_k give higher levels of inflation. Therefore, all the propositions in the previous section that used Θ_k to rank output employment can also be applied to inflation.

The existence of a positive inflation rate is explained by the interaction of private sector expectations and government preferences. Without any precommitment technology, the government will have an incentive to engage in inflationary surprises. The farther actual output is from the government's target output, the greater is this incentive. Wage setters respond by increasing nominal wages up to the level where the marginal gain to the government from additional output generated by inflationary surprises is equal to the marginal cost to the government of higher inflation. The term $\hat{Y}/F$ represents the government's output target per firm. The higher the government's target, the higher the inflation rate. Increases in union bargaining strength move output farther away from the government's output target and so increase the incentive for the government to engage in inflationary surprises. This is simply the time inconsistency argument first developed by Kydland and Prescott (1977), Barro and Gordon (1983), and others.

VIII. CONCLUSION

The theoretical model presented in this paper suggests an ambiguous answer to the question of whether centralized wage setting leads to better macroeconomic outcomes relative to decentralized wage setting. The answer depends upon three factors: (a) the negative externality due to the coordination failure present in decentralized wage setting; (b) the extent of product market competitiveness; and (c) the relative bargaining strength of centralized and decentralized unions. The negative externality alone unambiguously gives worse macroeconomic outcomes in the decentralized wage setting compared to the centralized regime—a result that is well understood and documented in the previous theoretical literature.

However, the other two factors could potentially counteract this negative externality, and depending upon the relevant parameter values, the centralized regime could perform worse than the decentralized regime.

Increasing product market competitiveness makes the difference between the two regimes increasingly irrelevant. In the limit, as product markets tend toward perfect competition, the two bargaining regimes become identical in terms of macroeconomic outcomes. As competition increases, monopoly rents within the firm begin to disappear, and the bargaining process—whether centralized or decentralized—begins to reflect that development. This result contrasts with Blanchard and Giavazzi (2000), although their model examines this issue more explicitly than this paper.

Like Blanchard and Giavazzi (2000), this paper emphasizes the legal and institutional aspects of wage determination. If centralized unions have a high degree of bargaining power compared with their decentralized counterparts, then macroeconomic outcomes could be worse in the centralized case, despite the presence of the coordination failure. Although the degree of bargaining strength is an exogenous parameter in the model, the paper strongly hints that centralized unions are stronger than decentralized ones.

The model offers two policy recommendations. First, there is a need to be more skeptical about the merits of centralized wage-setting arrangements compared with decentralized ones. If centralized unions can gain a more favorable institutional and legal environment, then it is not obvious that centralized wage setting leads to better macroeconomic outcomes, despite the presence of an externality in decentralized wage setting. Second, product market reform will lead to better macroeconomic outcomes and ultimately renders the question whether a centralized regime is better than a decentralized regime irrelevant.

SOLUTIONS

Employment

$$N_{kf} = \left(\frac{\Phi}{\Theta_k} \right)^{\frac{1}{\sigma - \alpha}}$$

Output

$$Y_k = \left(\frac{\Phi}{\Theta_k} \right)^{\frac{\alpha}{\sigma - \alpha}} F$$

Price level

$$P_k = \left(\frac{\Theta_k}{\Phi} \right)^{\frac{\alpha^2}{(\sigma - \alpha)(1 - \alpha)\Omega}} \left(\frac{Y^*}{F} \right)^{\frac{\alpha}{(1 - \alpha)\Omega}}$$

Inflation

$$\Delta P_k = \left(\frac{\Theta_k}{\Phi} \right)^{\frac{\alpha^2}{(\sigma - \alpha)(1 - \alpha)\Omega}} \left(\frac{\hat{Y}}{F} \right)^{\frac{\alpha}{(1 - \alpha)\Omega}} - 1$$

Real wages

$$\frac{W_k}{P_k} = \left(\Theta_k \right)^{\frac{1 - \alpha}{\sigma - \alpha}} \Phi^{\frac{\sigma - 1}{\sigma - \alpha}}$$

Profits

$$\Pi_k = (1 - \Phi) \left(\frac{\Phi}{\Theta_k} \right)^{\frac{\sigma}{\sigma - \alpha}}$$

Government payoff

$$G_k = - \left(1 + \frac{\alpha^2}{\Omega(1 - \alpha)^2} \right) \mathrm{Ln} \left(\frac{Y_k}{\hat{Y}} \right)^2$$

Union payoff

$$U_k = \delta \, \Theta_k^{\alpha/(\sigma - \alpha)} - \left(\frac{\Phi}{\Theta_k} \right)^{\frac{\sigma}{\sigma - \alpha}}$$

PROOFS OF PROPOSITIONS

Proof of proposition 1

(a) Given that $\beta_l = \beta_n = \beta$, $0 < \beta \leq 1$, $1 < \theta < \infty$ suppose that $\Theta_l > \Theta_n$ is not true, and that $\Theta_l \leq \Theta_n$.

If $\Theta_l \leq \Theta_n$ is true then:

$$\beta \frac{\sigma}{\delta} \frac{1}{\Phi} + (1 - \beta) \frac{1}{\delta} \leq \beta \frac{\sigma}{\delta} \frac{1}{\alpha} + (1 - \beta) \frac{1}{\delta}$$

This expression can be rearranged:

$$\beta \frac{\sigma}{\delta} \left(\frac{1}{\Phi} - \frac{1}{\alpha} \right) \leq 0$$

However, by assumption $\sigma > 0, v > 0$ and $0 < \beta \leq 1$ and so $\beta(\sigma / v) > 0$. Thus for $\Theta_l \leq \Theta_n$ to be true, the expression in the brackets must be zero or negative. However $\alpha > \Phi$ and so

$$\left(\frac{1}{\Phi} - \frac{1}{\alpha} \right) > 0$$

so $\Theta_l \leq \Theta_n$ is false and $\Theta_l > \Theta_n$ must be true.

(b) Consider the claim that if $\beta_l = \beta_n = \beta$, then as $\theta \to \infty$ we have $\Theta_l \to \Theta_n$. First, note that

$$\lim_{\theta \to \infty} \left(\frac{1}{\Phi} \right) = \lim_{\theta \to \infty} \left(\frac{1}{\alpha \left(1 - \frac{1}{\theta} \right)} \right) = \frac{1}{\alpha}$$

Taking limits of Θ_l as $\theta \to \infty$:

$$\lim_{\theta \to \infty} \Theta_l = \beta \frac{\sigma}{\delta} \left(\lim_{\theta \to \infty} \left(\frac{1}{\Phi} \right) \right) + (1 - \beta) \frac{1}{\delta} = \beta \frac{\sigma}{\delta} \frac{1}{\alpha} + (1 - \beta) \frac{1}{\delta} = \Theta_n$$

(c) Now consider the claim that $\lim_{\beta_l \to 0} \Theta_l = \lim_{\beta_n \to 0} \Theta$:

$$\lim_{\beta_l \to 0} \Theta_l = \lim_{\beta_l \to 0} \beta \frac{\sigma}{\delta} \frac{1}{\Phi} + \lim_{\beta_l \to 0} (1 - \beta) \frac{1}{\delta} = \frac{1}{\delta}$$

$$\lim_{\beta_n \to 0} \Theta_n = \lim_{\beta_n \to 0} \beta \frac{\sigma}{\delta} \frac{1}{\alpha} + \lim_{\beta_n \to 0} (1 - \beta) \frac{1}{\delta} = \frac{1}{\delta}$$

Proof of proposition 2

(a) Given that

$$\beta_l \le \frac{(\sigma - 1)\Phi}{\sigma - \Phi}$$

suppose the contrary to the claim of the proposition that $\Theta_m < \Theta_l$. This implies that:

$$\frac{\sigma}{\delta} < \beta_l \frac{1}{\Phi} \frac{\sigma}{\delta} + (1 - \beta_l)\frac{1}{\delta}$$

Rearranging gives:

$$\frac{(\sigma - 1)\Phi}{\sigma - \Phi} < \beta_l$$

which contradicts $\beta_l \le \frac{(\sigma - 1)\Phi}{\sigma - \Phi}$ and therefore $\Theta_m \ge \Theta_l$

The proof of part b of the proposition is identical.

Proof of Proposition 3

First, note that for all $1 < \theta < \infty$ that:

$$\kappa = \left(1 + \frac{\sigma}{(\theta - 1)(\sigma - \alpha)}\right) > 1$$

Also, note that if $\beta_n \ge \kappa \beta_l$ and $\kappa > 1$, then $\beta_n \ge \beta_l$. If these conditions hold then we can write:

$$\frac{\beta_l}{\beta_n} < 1 \qquad\qquad\qquad A\,1$$

Consider the alternative statement, that is, that if $1 > \beta_n \ge \kappa \beta_l$ and $1 < \theta < \infty$ then $\Theta_n < \Theta_l$.

$$\beta_n \frac{\sigma}{\delta} \frac{1}{\alpha} + (1 - \beta_n)\frac{1}{\delta} < \kappa \beta_l \frac{\sigma}{\delta} \frac{1}{\Phi} + (1 - \kappa \beta_l)\frac{1}{\delta} \qquad\qquad A\,2$$

This implies that:

$$\frac{(\sigma - \alpha)}{\alpha\delta} \beta_n < \frac{(\sigma - \Phi)}{\Phi\delta} \kappa \beta_l$$

Rearranging (A2) gives:

$$\frac{(\theta - 1)(\sigma - \alpha)}{\theta(\sigma - \alpha) + \alpha} < \kappa \frac{\beta_l}{\beta_n} \qquad\qquad A\,3$$

The left-hand side of this expression simplifies to:

$$\frac{(\theta - 1)(\sigma - \alpha)}{\theta(\sigma - \alpha) + \alpha} = 1 + \frac{\sigma}{(\theta - 1)(\sigma - \alpha)} = \kappa$$

But dividing through by (A3) gives:

$$1 < \frac{\beta_l}{\beta_n} \qquad\qquad A\,4$$

But (A4) contradicts (A3), therefore if $1 > \beta_n \geq \kappa \beta_l$ and $1 < \theta < \infty$, then $\Theta_n \geq \Theta_l$.

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