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CLASS CONFLICT AS A DYNAMIC GAME

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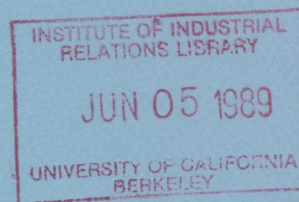
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Introduction

Capitalism is a market system in which the suppliers of labor are paid by the hour (or by the piece) while the suppliers of capital receive the residual after the costs of production have been paid. Since both labor and capital are essential for production, both workers and investors stand to gain from combining their assets. But there is no commonality of interest over how to distribute their joint gains. And since the consequences of the agreements or conflicts between wage-earners and capital owners affect the material well-being of the entire society, governments frequently seek to influence the bargains that are struck.

The purpose of this essay is to review work in economics and political science that has modelled the interaction of unions and firms in capitalist democracies as a dynamic game. The dynamic game approach is distinguished by two features. First, workers are assumed to be organized in unions strong enough to control wages, but not the level of investment. This is a conventional assumption in models of trade union behavior (Oswald 1985, Malcomson 1987). Nevertheless, unions rarely have the power to set wages as they choose. To endow unions with such powers in a formal model is to study the limiting case where unions' control over wages reaches its logical maximum. An enormous amount of work has been premised on the opposite limiting case of perfect competition in the labor market. Since reality often lies somewhere in between, both extremes merit attention.

The second distinctive feature of the dynamic game approach is its focus on the intertemporal trade-offs inherent in the strategies adopted by unions and firms. Unlike most models of union behavior that emphasize the

impact of union wages on unemployment, the work reviewed here highlights the effect of wages on investment and growth (as well as the influence of investment and growth on wages). All societies contain some mechanism for determining how resources are to be allocated between consumption and investment and how consumption is to be distributed among social groups. The central concern of this literature is how these two allocative decisions intertwine in a society where one group determines how much it will consume while another group determines how much of the remaining output will be invested.

The dynamic game framework thus combines a microeconomic mode of analysis with social democratic institutional assumptions. The approach is neoclassical,in the sense that all agents are assumed to be rational actors. At the same time the approach is social democratic in that wages and investment are determined in the strategic interaction of unions and owners of firms rather than in competitive markets for labor and capital. If the general equilibrium model is a theory of a competitive economy, the dynamic game model is a theory of a capitalist economy with strong trade unions.

Although unions and firms are generally the only explicit actors in the models that follow, the questions being asked have important political implications regarding workers, unions and governments. If relations between organized workers and firms are inherently unstable, as Marx believed, then the evident stability of capitalist countries with strong unions indicates either that workers do not pursue their material interests with full rationality or that workers are continually betrayed by the leaders they choose. If workers always want more, as Samuel Gompers asserted, then unions that voluntarily participate in policies of wage

restraint cannot be internally democratic. The question of workers' limited militancy in capitalist democracies is addressed in the next section.

A second set of questions centers on corporatist systems of interest representation. The corporatist countries in Western Europe have experienced relatively low strike rates throughout the postwar period and comparatively low growth rates of real and nominal wages since the 1960s. In turn, corporatism and wage restraint are related to successful economic performance: lower rates of both inflation and unemployment, less pronounced slowdown of growth following the oil crises, and higher rates of investment. Yet, as many have noted (Shalev 1983, Cameron 1984), the criteria used to define a corporatist pattern of interest representation for workers--a centralized,,united and encompassing union movement accepted as a legitimate and powerful player by both business and the government--are indistinguishable from the criteria used to assess union strength. The impact of corporatist or centralized bargaining on wage demands is discussed in the third section.

A third set of questions concern the economic constraints on government policies. Can governments alter the distribution of income between wage earners and owners of capital through taxes and welfare expenditures? The answer is obviously positive only if the behavior of workers and owners of firms is not altered by taxes and transfers. But the choices of workers and capital owners generally depend on the tax and transfer schedule. Thus, government attempts to modify the distribution of income in favor of their constituents may be completely ineffective when anticipated by unions and firms. Whether political outcomes matter for the distribution of income - between workers and owners of firms is addressed in the fourth section.

The paper concludes with a discussion of the feasibility of extending the model to encompass direct investment by workers and the addition of the government as a third actor.

Capitalism as a Dynamic Game

Kelvin Lancaster (1973) was the first to formulate class conflict as a dynamic game. Lancaster observed that workers may, through trade unions or political parties, achieve a large say in the distribution of income but the owners of capital continue to be the primary source of investment. In Lancaster's words, this places workers in the following dilemma:

Should they forego present consumption by handing over part of

total income to the capitalists? If they do not, they will obtain

no higher consumption in the future. If they do, they have no

guarantee that the capitalists will actually invest sufficient of

this income to bring about the desired level of increase (1095).

Capitalists, on the other hand, have no assurance that future wage demands will not confiscate the increased output that new investment makes possible. Thus owners of capital face a dilemma that mirrors that of workers:

Should [capitalists] spend now, or accumulate in order to spend

more later? If they spend now, they know what they have

available. If they accumulate, they may fail to obtain their

expected share of the increased output when they come to spend

(1096).

Lancaster proceeded to model the choices of workers and capitalists by dividing output at time t, $Y(t)$, into wages, $W(t) = m(t)Y(t)$, and profits, $P(t) = [1 - m(t)]Y(t)$, where $m(t)$ is the share of output that workers

receive as wages.[1] Workers consume all of their income. All investment

I(t), therefore, comes from savings out of profits, I(t) =

s(t)[1 — m(t)]Y(t), where s(t) denotes the rate of savings by firms or their

owners. Lancaster assumed that the productivity of capital v (the amount of

output that can be produced with each unit of capital) is constant. This

implies that economic growth Y'(t) equals the product of investment and the

productivity of capital, or Y'(t) = vI(t) = vs(t)[1 — m(t)]Y(t). Employment

is also implicitly assumed to be a fixed multiple of the capital stock.[2]

The supply of labor is never binding. The output produced, or,

equivalently, the total income received by firms and workers, depends

entirely on the supply of capital.

In Lancaster's model, workers unilaterally control the wage share m(t).

Since there is no substitution of labor for capital, choosing the share of

wages in output is equivalent to choosing the wage rate. Capitalists, in

turn, unilaterally choose the rate of saving out of profits, s(t). Private

ownership of capital implies that capitalists are free to allocate profits

as they choose.

Lancaster assumed that both classes sought to maximize their

consumption over a fixed time horizon. These assumptions permitted, in

Lancasters' words: "that rarest of all prizes in differential game models—a

full explicit solution" (1098).[3] Nevertheless, the cost was high in terms

of plausibility. The combination of a linear production, linear utility

function and a fixed time horizon produced a bang-bang solution: Both

classes consume at their minimal level during an initial phase and then

switch to maximal consumption in a second and final phase. Note that a   -

fixed time horizon is not the same thing as a finite time horizon.

Lancaster's results depend on the assumption that the time horizon of the actors actually shrinks over time, as if unions and firms behaved like individuals with no heirs approaching the end of their life. As the terminal date comes near, both classes consume what they can in the present and growth comes to a halt.

Lancaster conjectured in a footnote that "it ought to be possible to build a smooth-trajectory, infinite-time version of the basic model" by assuming a utility function with diminishing marginal utility of consumption (1973: 1109). This was approach taken by Matti Pohjola (1985b), Michael Wallerstein and Adam Przeworski (1988) and Przeworski and Wallerstein (1988).[4] In the formulation of Przeworski and Wallerstein, both classes are assumed to maximize their utility of present and future consumption. Let the intertemporal preferences of both classes be written as the present value of utility at each moment in time where U(•) is the instantaneous utility function and ρ, $\rho > 0$, is the rate at which workers and owners of firms discount the future. Then, in mathematical notation, workers choose m(t) to maximize

$$W^* = \int_0^\infty e^{-\rho t}\, U\{m(t)Y(t)\}\, dt \qquad (1)$$

and owners of capital choose s(t) to maximize

$$P^* = \int_0^\infty e^{-\rho t}\, U\{[1 - s(t)][1 - m(t)]Y(t)\}\, dt \qquad (2)$$

such that

$$Y'(t) = \nu I(t) = \nu s(t)[1 - m(t)]Y(t). \qquad (3)$$

If the instantaneous utility functions happen to have the property that a measure of risk aversion, the coefficient of relative risk aversion, $\gamma = - xU''(x)/U'(x)$, is independent of consumption, the optimal strategies of workers and capitalists do not depend upon time (Wallerstein 1988a, 1988b). Moreover, the case where γ does not depend on consumption is substantively important, as empirical tests of household asset holdings have found γ to be roughly constant (Friend and Blume 1975). To insure convergence of the integrals in (1) and (2) for all feasible strategies, it is necessary to assume that $\gamma > 1 - (\rho/\nu)$. In fact, empirical estimates of γ range from one (Hansen and Singleton 1983) to two (Friend and Blume 1975).

There are two fundamental similarities between wage-earners and owners of capital in this model. The first is the assumption that capitalists do not maximize profits but, like workers, maximize their utility of present and future consumption. Mehrling (1986) argues that dynamic models of class conflict should have capitalists maximizing accumulation to stay within the Marxian spirit. It can be argued that the assumption of intrinsic psychological differences between owners of capital and wage-earners is even farther from the spirit of Marx's analysis. More importantly, if capitalists maximize accumulation, there is no source of conflict once workers control wages. Accumulation is maximized by investing all income from capital. If everything that workers did not consume was invested, and if workers controlled the wage rate, capitalism would be the best of all possible worlds for workers.[5]

In fact, there is no conflict between the assumption that firms invest to maximize the utility of consumption out of profits and profit   - maximization in the neoclassical tradition. Profit is the appropriate

maximand in models where the cost of capital to the firm is exogenous. The utility of consumption out of profit is the appropriate maximand when the quantity of capital available for investment is endogenous. We may distinguish between owners and firms and assume that owners save to maximize utility while firms invest the savings to maximize profits. Or we may simply assume that firms invest to maximize their owners' utility. The two formulations are equivalent (Hirshleifer 1970).

The second and more unusual similarity consists of the treatment of organized workers as implicit investors. If owners of capital expect workers to choose a constant wage share, their best response is to save at the rate:[6]

$$s(m) = \frac{1}{\gamma} \left[1 - \frac{\rho/\nu}{1 - m} \right]. \tag{4}$$

At the same time, if workers' expect firms to save at a constant rate, their best response is to allow firms to receive a profit share equal to:

$$1 - m(s) = \frac{1}{\gamma} \left[1 - \frac{\rho/\nu}{s} \right]. \tag{5}$$

Workers balance present and future consumption in the same manner as owners of firms. A higher wage share means greater consumption now but less investment and lower consumption in the future. When workers choose an a wage share less than one, they are investing indirectly. The catch is that the return on workers' investment depends on how capitalists' frugality. The social rate of return on investment is ν, the productivity of capital. The rate of return workers receive, however, is only νs since $\nu(1 - s)$ is consumed by owners of firms. As far as workers are concerned, the proportion of profits which owners consume is lost. In parallel fashion,

the return owners of firms receive on their investment is $v(1 - m)$ since vm goes to workers as higher wages. In fact, equations (4) and (5) reveal that the rate of saving for both classes depends in the same way on their respective rates of return. Greater (relative) risk aversion, γ, or a higher discount rate, ρ, reduces investment by both classes. A rise in the productivity of capital, v, and a higher rate of investment by the other class increases the investment of both.

Figure One About Here

The best responses of workers and capitalists (equations 4 and 5) are illustrated in Figure One. The Cournot-Nash equilibria are all pairs of strategies where both classes are simultaneously doing the best they can given the choice of the other. In the picture the Cournot-Nash equilibria are the points where the two best response curves intersect. There is a third Cournot-Nash equilibrium: the point of maximal consumption by both classes. If workers demand wages that eliminate profits, capitalists will disinvest as rapidly as possible and, if investment approaches zero or becomes negative, workers will demand the entire product and more. Thus open conflict with both sides attempting to consume as much as possible is also an equilibrium.[7]

The Cournot-Nash equilibria are analogous to the solutions originally obtained by Lancaster (1973) and explored by Michael Hoel (1978), Pohjola (1983a, 1984a, 1984b), Schott (1984a, 1984b) and Mehrling (1986). The Cournot-Nash equilibrium concept, however, is subject to well-known objections in models with few players. Why would workers, for example,

assume a fixed rate of investment when choosing their wages? If the rate of

investment depends on wages in a predictable way, wage-earners should take

that into account when deciding what to demand in collective bargaining. In

duopoly models, the name given to asymmetric solutions where once actor

anticipates the best response of the other is Stackelberg equilibria.

Przeworski and Wallerstein (1982), Pohjola (1983b) and Tamer Basar, Alain

Haurie and Gianni Ricci (1985) introduced Stackelberg solutions as

alternatives to the Cournot-Nash equilibria in the dynamic game framework.

Workers as Stackelberg leaders will seek the point on capitalists' best

response curve that maximizes their welfare. Mathematically, instead of

choosing m to maximize $W^*[m,s]$ for a fixed s, workers choose m to maximize

$W^*[m,s(m)]$. Again writing the solution in terms of the profit share,

workers' optimal choice given $s = s(m)$ from equation (4) is:

$$1 - m = (1/\gamma)[1 - (\rho/\nu)]. \qquad (6)$$

As can be seen by comparing equation (6) with equation (5), workers as

Stackelberg leader act as if all profits were invested, or $s = 1$, even

though capitalists' best response is always to invest at a rate less than

one.

In Figure One, the Stackelberg solution with workers as the leader can

be found by drawing workers' indifference curves and finding the point of

tangency with capitalists' best response curve.[8] Workers' indifference

curves are flat where they cross workers' best response curve (since by

definition the best response curve is optimal for a fixed savings rate).

Thus workers at any Cournot-Nash equilibrium can reach a higher indifference

curve, or attain a higher level of welfare, by reducing their wage demands

in exchange for a higher rate of investment along capitalists' best response

curve. Workers are induced to moderate their wage demands by their anticipation of capitalists' reaction. Moreover, as Pohjola (1983b) emphasized, the Stackelberg solution is Pareto superior to the Cournot-Nash solutions: both workers and owners of firms are better off. Workers' welfare increases since as Stackelberg leader they choose their optimal point on capitalists' best response curve. Capitalists are better off because workers' choice as Stackelberg leader is at a lower level of wage militancy.

In theory, there is another Stackelberg equilibrium with firms as the leader (Przeworski and Wallerstein 1982; Pohjola 1983b; Basar, Haurie and Ricci 1985). But there is an asymmetry between wages, on the one hand, and savings and investment on the other. In labor negotiations, wages are determined collectively. Thus, workers can coordinate wage demands to take into account the impact of aggregate wages on investment. The rate of saving, in contrast, is not determined collectively. To act the part of Stackelberg leader, owners of firms would have to collectively save more than is individually optimal. While workers as followers would reduce wage demands in response to an increase in the aggregate rate of savings, wages would not respond to the saving decision of any individual shareholder. There is, therefore, a collective action problem inherent in owners of firms assuming the role of Stackelberg leader. Without coordinated saving decisions, capitalists cannot deliver a higher rate of investment than is individually optimal.

Maximal militancy is not a dominant strategy for workers. Workers, as Stackelberg leaders who can set wages as they choose, will not confiscate - profits as long as the rate of discount is less than the productivity of

investment, or $\rho < \nu$. This is not a stringent condition since the cessation of investment is socially optimal if the discount rate equals or exceeds the productivity of investment. Allowing the owners of firms to consume some of the output is the price that union members must pay for future increases in wages and employment. Even when no longer constrained by competition in the labor market, workers whose future depends on investment will limit their wage demands.

The political issues at stake concern the relationship of organized workers to their unions and the government. Arthur Ross (1948), in an early and influential study of unions as political institutions, argued that the simple demand of the rank and file was always "more". Democratic unions, according to Ross, are militant unions. More recently, Leo Panitch (1977, 1981) has argued that union cooperation with incomes policies and other forms of wage moderation is possible only where union leaders are no longer accountable to their members. (See, also, Sabel [1981].) In contrast, if some measure of wage restraint is in workers' interest, then unions who cooperate with incomes policies are not necessarily betraying the rank and file (Lange 1984a). Indeed, the evidence gathered by Peter Lange (1984b) indicates little relationship between the ability of the rank and file to influence union policy and the adoption of policies of wage restraint.

There are similar implications for the relationship between workers and governments, particularly labor governments. A central thesis in much of the Marxist literature on the state is that capitalism is always threatened by the potential power of organized workers. The state is to be understood by the function if fulfills as "the first and last defender of the old order" in Ralph Miliband's phrase (1977: 65). Yet workers in capitalist

economies, no matter how strongly organized in the labor market, are

disciplined by their dependence on private investment.[9] Active intervention

by the government to coopt, disorganize or repress unions is not essential

for the stability of capitalism (Przeworski and Wallerstein 1982).[10]

Whether working class parties are similarly disciplined when they win

elections is discussed below.

Note the difference with the arguments of Michael Burawoy (1979, 1988,

this volume). Burawoy explains the general absence of revolutionary demands

among workers in capitalist societies by the ideological and political

effects of social relations on the shop floor. Przeworski and Wallerstein,

in contrast, locate the source of the restraint shown by organized workers

in workers' concern for their future.

Efficiency and Centralization

Kelvin Lancaster was not concerned with the issue of the stability of

capitalism. Lancaster, along with most others who have extended his model,

simply assumed that workers' wage demands are bounded by exogenous upper and

lower limits. The primary question for economists who have studied dynamic

game models of capitalism concerns efficiency.

Lancaster's central conclusion was given in his title: capitalism is

dynamically inefficient. The outcome of the strategic interaction between

workers and capitalists in Lancaster's model is a consumption path which is

inferior for both classes than other feasible paths. In the model

represented in Figure One, neither the Nash nor the Stackelberg solutions

are Pareto optimal. Both workers and capitalists would be better off if -

they could move in a northeasterly direction, trading a higher rate of

investment for a lower wage share.

The set of efficient points, or the Pareto frontier, is found by maximizing workers' welfare (W* in equation 1) with respect to the wage share $\underline{m}$ and the rate of saving out of profits $\underline{s}$ such that capital owners' welfare does not fall below an arbitrary threshold (P* $\geq$ P_0 in equation 2 where P_0 is a positive constant). Written in terms of the profit share, the first order condition for an efficient solution is:

$$1 - m = (1/\gamma s)[1 - (\rho/\nu)]. \tag{7}$$

By comparing equation (7) with equation (5), one can see immediately that the efficient profit share is greater than workers' best response unless s = 1. Similarly, equation (7) can be rewritten in terms of $\underline{s}$ to show that, given some wage share, the efficient rate of saving exceeds capitalists' best response except where (1 — m) = 1. In fact, the Pareto frontier slopes downward from workers' ideal point where s = 1 to capitalists' ideal point where m = 0 as illustrated in Figure One.

Trade unions enable workers to obtain a share of the future gains in income that investment makes possible. At either the Stackelberg or Cournot-Nash equilibria, neither class receives the full return on its savings: workers lose (1 — s) of profits; owners of firms lose $\underline{m}$ of their investment. As is generally the case when the private rate of return is below the social rate of return, the resulting level of investment is less than socially optimal. Market equilibria are not necessarily Pareto optimal in the dynamic game framework.[11]

The large literature on corporatism in political science suggests that the inefficiency of collective bargaining is affected by the centralization of union and employers' federations. Numerous studies have found an

empirical association between indicators of centralized bargaining and real
and nominal wage restraint (Heady 1970, Blyth 1979, Cameron 1984, Bruno and
Sachs 1985, McCallum 1985, Marks 1986). Matti Pohjola (1984b) sought to
capture the impact of centralization by considering Lancaster's model with
multiple unions.[12] Pohjola's idea can be easily put in the framework of
this paper (Wallerstein 1988a). Suppose there are $\underline{n}$ unions, each of whom
receives the wage share m_i where $i = 1,2,...n$, bargaining independently with
the same employers' association. The total wage share is then Σm_i and the
share received by firms is $1 - \Sigma m_i$. Each union, acting independently as a
Stackelberg leader vis-a-vis their employer, would optimally set their share
such that:

$$1 - m_i = \frac{1 - \rho/\nu + (n - 1)(\gamma - 1)}{1 + n(\gamma - 1)}. \tag{8}$$

Note that equation (8) reduces to equation (6) when $n = 1$. In the case
where $\gamma > 1$, each union will demand a lower wage share as the number of
unions, $\underline{n}$, increases.

The aggregate wage share, however, increases as the number of
independent unions rises. With multiple unions, the profit share becomes:

$$1 - \Sigma m_i = \frac{1 - n\rho/\nu}{1 + n(\gamma - 1)}. \tag{9}$$

As the number of unions increases, the profit share declines. Since
capitalists' best response is a positive function of the profit share, the
rate of investment falls as $\underline{n}$ rises. Workers are collectively worse off
than before; otherwise the aggregate wage share in equation (9) would have
been chosen by one big union. Since the total wage share is higher, owners
of firms are also worse off. The larger the number of independent unions,

the larger the aggregate wage share demanded, the lower the level of investment, and the greater the inefficiency. When multiple unions set wages simultaneously, bargaining has the logical structure of an n-person prisoners' dilemma among unions. Both unions and owners of firms do better when bargaining is centralized, but separate bargaining is the dominant noncooperative strategy for individual unions.

Wallerstein (1988a) extends the model with multiple unions to consider wage leadership where one union sets its wages before the others. If the coefficient of relative risk aversion, γ, is greater than one, wage leadership transfers income shares from the wage followers to the wage leader and from profits to wages. (If $\gamma = 1$, wage leadership has no effect on the outcome.) The wage leader is better off but the other unions and the owners of firms are worse off than when all wages are set concurrently. Moreover, with wage leadership, it no longer follows that centralized bargaining is necessarily Pareto superior to decentralized bargaining. Centralized bargaining is better for all parties other than the wage leader, but the wage leader may prefer decentralization. Every union would always prefer to be the only union to opt out of centralized bargaining. A wage leader may prefer to opt out of centralized bargaining even when the consequence is decentralized bargaining by all.

Centralized bargaining has been attacked by both the Right and the Left. Liberals in the European sense reject centralized bargaining as being the greatest distance from the ideal of competitive labor markets. Militants on the Left condemn centralization as a means of coopting union bureaucrats and containing the working class. Yet the models of Pohjola (1984b), Wallerstein (1988a) and Rubin (1988) indicate that centralization

of bargaining can increase the welfare of most union members and owners of firms. This does not mean that centralized bargaining is stable. At best the situation is a prisoners' dilemma among unions. At worst there are unions who prefer mutual defection to mutual cooperation in bargaining. In practice centralized bargaining often depends on the willingness of employers or the government to help unions solve their collective action problem.[13]

Much of the empirical work on incomes polices or relative growth rates finds that the interaction of union centralization and Social Democratic control of government is more significant than either variable alone in explaining wage moderation (Heady 1970, Marks 1986, Lange and Garrett 1986, Garrett and Lange 1987, Hicks 1988). Przeworski and Wallerstein (1982) and Lange (1984a) suggest that pro-labor governments reduce the rate at which workers discount the future. Workers' future benefits from current wage restraint depend on multiple unknown factors such as the future demand for the industry's output and workers' future bargaining power. If Left governments provide unions with greater insurance against unfavorable surprises, unions would be more willing to accept sacrifices for future and uncertain benefits when the Left is in power.

Another interpretation of the evidence is that unions reduce wage demands in response to increases in welfare expenditures championed by social democratic governments. But this explanation demands an investigation of wages and investment in the presence of taxes and expenditures on welfare policies.

Redistributive Policies

Many have contended that the dependence of all on the willingness of firms to invest places severe restraints on redistributive policies. Whatever the political forces supporting the government, it is asserted, governments are compelled to maintain the income of owners of firms. Thus all reforms end up as redistributions among wage and salary earners. The wealth of the owners of capital remains sacrosanct.

In the Marxist literature, this claim has been named the structural dependence of the state on capital. Miliband presented the argument as follows:

> Given the degree of economic power which rests in the 'business
> community' and the decisive importance of its actions (or its
> nonactions) for major aspects of economic policy, any government
> with serious pretensions to radical reform must either seek to
> appropriate that power or find its room for radical action rigidly
> circumscribed by the requirements of 'business confidence' (1969:
> 152).

Claus Offe articulated the basic dilemma facing governments in capitalist economies as:

> The political system can only make offers to external, autonomous
> bodies responsible for decisions: either these offers are not
> accepted, thus making the attempts at direction in vain, or the
> offers are so attractive in order to be accepted that the
> political direction for its part loses its autonomy because it has
> to internalize the aims of the system to be directed (1975: 234).

Or, in the non-Marxist language of Charles Lindblom:

. . . because pubic functions in the market system rest in the

hands of businessmen, it follows that jobs, prices, production,

growth, the standard of living, and the economic security of

everyone else all rest in their hands. . . In the eyes of

government officials, therefore, businessmen do not appear simply

as representatives of a special interest. . . They appear as

functionaries performing functions that government officials

regard as indispensable' (1977: 172, 175).

Nor are these claims heard only from scholars on the Left. The Chicago
School argues that support-maximizing politicians are tempered in their zeal
for redistribution by the response of owners of assets who increasingly
withdraw their endowments from productive uses as taxes rise (Peltzman 1976,
Becker 1983). (See, also, Bates and Lien (1985].)

Wallerstein and Przeworski (1988) and Przeworski and Wallerstein (1988)
analyze the argument of structural dependence by introducing taxes and
transfers in the game between firms and unions. Government policies are
assumed to be purely redistributive. The government neither consumes nor
invests any of the tax revenues itself. In addition, it is assumed that the
government moves first. Wage-earners and owners of firms choose their
strategies in each period knowing the tax and transfer schedule. All groups
in society seek to maximize their utility of consumption after taxes have
been paid and transfers received.

The first tax Przeworski and Wallerstein considered was a simple flat
income tax on profits: $T = t_i(1 - m)Y$. Workers thus consume wages plus
transfer payments: $W + T = [m + t_i(1 - m)]Y$. Owners of firms consume what -
is left out of profits after investment and taxes have been subtracted:

$P - I - T = (1 - m)(1 - s - t_i)Y$. Note that if $t_i < 0$, it is wage earners who are being taxed and firms who receive the transfer payments. The tax should be interpreted as the net tax paid by owners of capital after transfers are subtracted from tax payments.

The question is whether the imposition of taxes and transfers can alter the post tax and transfer distribution of income between wage-earners and owners of firms. With a flat tax on profits, the answer is no. To start with owners of firms, the optimal rate of investment is now given by:

$$s(m,t_i) = \frac{1}{\gamma} \left[1 - t_i - \frac{\rho/\nu}{1 - m} \right]. \tag{10}$$

Thus, the rate of investment falls as the tax on profits increases provided workers' wage share $\underline{m}$ remains constant. A profit tax reduces both aggregate post-tax profits and the fraction of post-tax profits that is reinvested. If workers do not adjust their wage demands, the share of income going to investment falls while the share of income going to workers in wages and transfer payments increases.

But taxes and transfers affect the choices of workers as well. As Stackelberg leaders, unions would adopt wage demands such the share of income left for profits equals:

$$1 - m(t_i) = \frac{1}{\gamma} \left[\frac{1 - (\rho/\nu)}{1 - t_i} \right]. \tag{11}$$

The pre-tax profit share increases as the tax on profits rises. Workers respond to the increase in transfer payments and the decline in investment by reducing private wage demands. In fact, workers' choice of profit share in (11) implies that workers' post tax and transfer income share is unchanged. In terms of the share of income workers do not receive, one

quickly calculates from (11) that

$$1 - (\frac{W + T}{Y}) \;\; = \;\; (1 - t_i)(1 - m) \;\; = \;\; (1/\gamma)[1 - (\rho/\nu)] \tag{12}$$

which is the same as the profit share without taxes and transfers (equation 6).

After both owners of firms and unions have adjusted to the tax on profits, workers' share of income is unaltered. Since workers' preferred point on capitalists' best response curve has not changed, unions as Stackelberg leaders would modify their wage demands to return to the same income share as before. It is easily verified that the income shares of investment and consumption out of profits are also unchanged. With a tax on profits, the government faces the same trade-off as workers. The cost of increased tax revenues in terms of lower investment is identical to the cost of an equal increase in the wage bill. As long as workers and firms anticipate the tax when choosing their strategies, fiscal policy changes nothing except the share of income passing through the government's coffers.[14]

But this striking confirmation of the claims of structural dependence is very sensitive to the form of the tax schedule. In fact, governments in all advanced industrial societies tax profits which are reinvested at a different rate than profits which are consumed. Depreciation allowances which differ from actual depreciation, investment tax credits, investment grants, special treatment capital gains, double taxation of distributed profits are only some of the common deviations from a straight profit tax (Bracewell-Milnes and Huiskamp 1977, King and Fullerton 1984). Suppose the tax was levied instead on consumption out of profits: $T = t_c(1 - s)(1 - m)Y$.

Administratively, this tax could be imposed by allowing an immediate

deduction of the full value of investment from taxable profits.

Unlike the profit tax, a tax on consumption out of profits does not

directly alter capital owners' preferred level of investment:

$$s(m,t_c) = \frac{1}{\gamma} \left[1 - \frac{\rho/\nu}{1-m} \right] \qquad (13)$$

which is identical to (4). A tax on consumption out of profits does not

change firm owners' intertemporal trade-off since it taxes present and

future consumption at the same rate. Thus, if unions do not alter their

wage demands, governments can raise or lower the post-tax profit share

without affecting investment. With a tax on consumption out of profits, it

is only firm owners' consumption that declines as tax revenues and transfers

increase.

Unions, however, will not maintain their wage demands unchanged if they

are acting as Stackelberg leader. With a tax on consumption out of profits,

workers would set wages such that:

$$1 - m(t_c) = \frac{1}{\gamma} \left[\frac{1 - (\rho/\nu)}{1 - t_c(1-s)} \right]. \qquad (14)$$

Again the pre-tax profit share increases as the tax goes up. With a tax on

consumption out of profits, as with a tax on profits, workers' optimal post

tax and transfer income share remains the same. Equation (14) implies:

$$1 - (\frac{W+T}{Y}) = [1 - t_c(1-s)](1-m) = (1/\gamma)[1-(\rho/\nu)] \qquad (15)$$

which identical to the post-tax profit share with an income tax (equation

12) or the profit share without taxes and transfers (equation 6).

Unions, in this model, engage in the political exchange described by

Alessandro Pizzorno (1978), Douglas Hibbs (1978) and Walter Korpi and
Michael Shalev (1980) and verified empirically by Roger Friedland and Jimy
Sanders (1986): Private wage demands are reduced as welfare expenditures
increase. Moreover, since the consumption tax is neutral with respect to
investment, lower wage demands lead to greater investment when transfer
payments are financed by a tax on consumption out of profits. In fact, if
t_c is increased from zero until it approaches one, the outcome will move up
the vertical line in Figure One from the Stackelberg solution with no taxes
to just below workers' ideal point where workers' best response curve
intersects the top of the box. These are not Pareto-improvements: firm
owners' welfare declines as the tax on consumption out of profits rises. A
pro-worker government, however, could bring workers' welfare arbitrarily
close to the welfare workers would enjoy if they owned the capital stock
without disturbing private investment. With taxes on consumption out of
profits, private ownership of capital does not by itself limit the
distribution of consumption among classes.

The model with transfer payments to workers financed by a tax on
consumption out of profits can also be interpreted as a model of a union
that receives a wage share of $\underline{m}$ and a bonus equal to t_c of the firms' net
income after wages and investment have been subtracted. Increases in wages
reduce investment, but increases in the bonus leave investment unaffected.
Thus, the greater share of income workers receive as a bonus rather than a
wage, the more favorable the trade-off between workers' consumption and
investment.

This conclusion is subject to a number of caveats. Both workers and
owners of firms are assumed to care only about the utility of present and

future consumption. Workers are assumed to value private wages and transfer payments equally. Finally, it is assumed that the quality of investment is independent of the tax on consumption out of profits. This last assumption would not hold to the extent that owners of firms could escape the tax by disguising consumption as investment.

A common objection concerns the absence of international mobility of capital in the model. Suppose, for example, that firms can either invest at home and receive the return of $v(1 - m)$ or invest abroad and receive the return of $\underline{r}$ where $\underline{r}$ is exogenous. Without taxes, the intuition that firms will invest at home if and only if the domestic rate of return equals or exceeds the rate of return abroad, or $v(1 - m) \geq r$, is correct. Therefore, the wage demands of workers who care about investment are bounded by $m \leq 1 - (r/v)$. But does the existence of foreign opportunities for investment put additional constraints on redistributive policies? The answer, as shown in Wallerstein (1988b), is negative. If the government imposes a tax on consumption out of profits, firms will still invest at home as long as $m \leq 1 - (r/v)$. Firms' willingness to invest at home is not directly affected by the tax on consumption out of profits. Profits are reduced by the tax but so is the cost of investment by an equal amount. Moreover, if unions lower wage demands in response to increases in the tax on consumption out of profits, as described in equation (14), a tax on consumption will increase domestic investment. A reformist government can reduce the consumption of owners of firms and increase either investment or workers' consumption without controls on capital mobility. All that is necessary is a the tax system that taxes foreign investment and consumption out of profits equivalently.

A different objection concerns the static nature of the formulation.
The analysis of the imposition of taxes described above implicitly assumes
that the current tax schedule is seen by all groups as lasting forever. If,
however, owners of firms anticipate that the tax on consumption out of
profits will increase in the future, would they not consume more in the
present while the tax is still low? The answer given by Andrew Abel and
Olivier Blanchard (1983) is no as long as the coefficient of proportional
risk aversion γ is greater than or equal to one.[15] If $\gamma > 1$, owners of
firms who anticipate a reduction in consumption when the tax increase goes
into effect will seek to smooth their consumption path by raising their rate
of saving in the period before the tax increase. Thus the prospect of a
future tax on consumption out of profits will increase current investment.
(If $\gamma = 1$, equation 13 remains valid before and after the anticipated
increase in the tax on consumption out of profits.) Faced with a future
sudden drop in their consumption, owners of firms will reduce their
consumption prior to the tax increase thereby accumulating greater wealth
and mitigating the drop in their consumption after the tax increase.

Thus the conclusions of Przeworski and Wallerstein remain valid when
the model is expanded to include international capital mobility or the
transitional period between the time a tax increase is anticipated and the
time the tax is implemented. However, the conclusions may not be valid when
both extensions are considered simultaneously. My conjecture is that owners
of firms will invest abroad, not at home, in response to an anticipated tax
on consumption out of profits. But the question is not yet settled.

Conclusion

The model used here to illustrate the results of dynamic game models of capitalist economies with strong trade unions relies on the restrictive assumptions of a linear production function and utility functions with a constant coefficient of relative risk aversion to achieve explicit solutions. If these particular specifications are replaced by general production and utility functions, as in Hoel (1978) or Rubin (1988), the ability to solve the model explicitly is lost but many of the general conclusions remain.

More critical is the arbitrariness of the limits which must be imposed on the feasible strategies of the actors. In the Przeworski and Wallerstein framework, no exogenous upper and lower bounds on workers' wage demands are imposed. However, workers are limited to demanding wages. In particular, workers are assumed to be unable to save and invest directly. If workers could invest directly and receive the rate of return v, workers would never save through wage restraint where their return is only sv. Thus workers with control over wages would eliminate profits and replace the current owners as the investors.

The Histadrut, Israel's major union confederation, is unique among unions in advanced capitalist economies in owning a large number of enterprises. In the 1970s, however, proposals for investment funds whereby union members would collectively receive shares of stock in partial lieu of wage increases were advanced in several Western European countries, the most notable example being the Swedish Meidner Plan (Martin 1984). Pohjola (1983a) studies workers' investment funds in the context of Lancaster's model, where the wage share is assumed to have some upper bound less than

one. The outcome has workers immediately setting their wages at the upper bound. Thus wages are higher, but so is aggregate investment, since workers save more when they can save directly than when they must save indirectly through wage moderation. In practice, the idea of wage-earner funds antagonized business more than it mobilized union members. After bitter conflict, the Meidner Plan was eventually adopted by the Swedish government in 1982, but in a form so diluted as to be of little importance to either unions or firms.

The same issue arises when workers are allowed to bargain for a share of profits net of investment expenditures. Union demands for a share of net profits are not constrained in the same manner as wage demands: The unions' share of profits net of investment does not affect the firms' optimal level of investment. Yet the movement toward profit-sharing in North America and Western Europe, like the movement toward wage-earner funds, has been glacial. The explanation suggested by the literature on implicit contracts (reviewed by Rosen [1985]), is that current arrangements optimally allocate a large share of the variance in income to owners of firms who can diversify their portfolios. Another explanation is that profit-sharing conflicts with unions' universal desire to reduce wage differentials among members (Freeman and Medoff 1984, Hirsch and Addison 1986). The question of why union demands take the form they do is far from resolved.

A different possible extension is to introduce the government as a third actor. The government has been present all along as part of the environment. Left governments may reduce workers' uncertainty. Taxes and transfer payments affect the strategies adopted by unions and firms. But governments also play an active role in public and private sector

bargaining, whether directly participating in labor negotiations or indirectly affecting the outcome of bargaining by threatening to intervene in strikes and lockouts.

There are enough models of strategic interaction between unions and governments which focus on macroeconomic policy to warrant a separate survey (Calmfors and Horn 1985, Hersoug 1985, Driffill 1985, Soederstroem 1985, Scharpf 1988). These macroeconomic models are not easily reconciled with the dynamic games reviewed here, however. The dynamic game approach assumes fully rational behavior including, implicitly, rational expectations. But rational expectations generally render policies of demand management ineffective in Keynesian models. If anticipated expansionary policies cannot reduce unemployment without lowering real wages, the logic of the macroeconomic games collapses.

There are two difficulties that introducing the government as a third actor presents in the dynamic game. The first is inherent in the analysis of games with three actors. It is no accident that the macroeconomic models that bring the government in take firms out. The complexity of the game increases by an order of magnitude when the number of actors goes from two to three. Assuming that owners of firms always move last because of their collective action problem, there are six possible orderings of moves between workers, firms and the government, counting simultaneous moves. Case studies seem to indicate that the order of moves varies from country to country and even from bargaining round to bargaining round within the same country.

The second difficulty is the problem of specifying the government's objectives. There are two conventional practices. The first, common in the

macroeconomic models, is to assume the government maximizes some social welfare function over outcomes, typically employment and inflation. The second is to assume the government maximizes some function of the welfare of various social groups, for example a weighted geometric average (Winden 1983, Przeworski and Wallerstein 1988). Both choices are generally justified in terms of governments' underlying objectives of securing reelection and helping their constituents, but the connection is loose.[16]

Yet the difficulty raised by the government is deeper than the question of appropriately defining the government's objective function. The government is not an actor but a set of institutions with prescribed powers. How those powers are to be used is the object of political struggles among political parties, interest groups such as unions and firms, and, perhaps, government bureaucrats (Moe, this volume). The state, like the market, is an arena of conflict and compromise. In a particular round of wage negotiations, the government may well enter as an actor with fixed preferences. But from a longer-term perspective, the government's goals are an outcome off political conflict. Ultimately, models of conflict over private wages and investment must be integrated with models of conflict over public policy in order to capture the full range of strategies and outcomes in capitalist economies with strong trade unions.

1. I have replaced Lancaster's notation with that used in Wallerstein and Przeworski (1988) and Przeworski and Wallerstein (1988).

2. A constant output-capital ratio implies a constant capital-labor ratio. In other words, Lancaster implicitly assumed the fixed coefficient production function: $Y(t) = \min[\nu K(t), \lambda L(t)]$. Firms will always set employment such that $L(t) = (\nu/\lambda)K(t)$.

3. For many years, Lancaster's model received more attention as an early application of dynamic game theory in economics than for its substantive argument. See Matti Pohjola (1985a) for a review of dynamic games in macroeconomics.

4. Przeworski and Wallerstein (1982) assumed that both classes maximized their discounted consumption over a finite (but not fixed) time horizon. Both classes were assumed to always look, say, thirty years into the future. With a finite horizon, simulations had to be employed to obtain solutions.

5. Mehrling's escapes this result by introducing an upper bound on workers' wage demands that is a function of the rate of unemployment. This gives capitalists who maximize accumulation an incentive not to invest at the maximal level, since investment decreases unemployment and allows maximally militant workers to increase their wages. In this way, Mehrling's argument is similar to Kalecki's (1943) famous analysis. But Mehrling's reasoning depends on a dubious assumption that capitalists invest collectively. If capitalists invest individually, profit maximization - implies $s^*(m) = 1$ for any $\underline{m}$ as long as the productivity of capital ν exceeds

the discount rate ρ.

6. See the appendix in Wallerstein and Przeworski (1988) or Przeworski and Wallerstein (1988) for the derivation of these results for the particular case with $\gamma = 1$. Wallerstein (1988a, 1988b) presents the general case.

7. The location of the curves depends on the parameters γ, ρ and ν. Specifically, as $(\gamma\rho/\nu)$ increases, the curves move away from each other. When $(\gamma\rho/\nu)$ exceeds 1/4, the curves no longer intersect and the only Nash equilibrium is maximal consumption.

8. Workers' indifference curves are defined to be all combinations of $\underline{s}$ and $\underline{m}$ which produce the same value of W^*. The higher the curve in Figure One, the higher workers' welfare.

9. In the models discussed in this paper, employment is strictly determined by investment. In more conventional static models with substitution between labor and capital, unions may be constrained by the threat of unemployment (Oswald 1982a, 1982b). It is necessary to say "may be" because efficient collective agreements would set employment independently of wages (McDonald and Solow 1981, Malcomson 1987). Note that workers' wage demands are constrained by the effect of wages on investment as long as savings or the cost of capital is endogenous, whether or not contracts cover employment.

10. This does not imply that government intervention to reduce wages would never occur. Owners of capital benefit from lower wages as long as firms can attract sufficient labor.

11. See Paul Grout (1984) or Frederick van der Ploeg (1987) for models of cooperative bargaining models of labor negotiations that yield the same conclusion. Not all equilibria of the dynamic game are inefficient. Jess Benhabib and Roy Radner (1988) demonstrate that Pareto optimal outcomes of the games discussed in this survey can be Nash equilibria of trigger strategies. (Trigger strategies are strategies where player one plays $\underline{x}$ as long as the player two plays $\underline{y}$, for some feasible $\underline{x}$ and $\underline{y}$. If player two deviates in any way from $\underline{y}$, player one adopts the policy of maximal militancy forever. As long player two's payoff from the pair of strategies (x,y) is superior to player two's payoff from maximal militancy on both sides, player two's best response is to choose $\underline{y}$.)

12. See Barnett Rubin (1988) for an alternative model of centralized and decentralized bargaining within the Lancaster framework.

13. One example: In the 1987/1988 bargaining round in Norway, the main union federation agreed to a wage freeze on the condition that Parliament pass a law freezing wages and salaries throughout the economy.

14. This result is similar to a common result in macroeconomic models with rational expectations that only unanticipated changes in the money supply or budget deficits influence employment (Lucas 1981, Barro 1981).

15. Przeworski and Wallerstein (1988) incorrectly give an affirmative answer to this question.

16. There are important questions about the objectives of trade unions as well. One is the principal-agent problem, also present in the firm, of the divergence of the interests of the leadership from their constituents.

Another is the general non-existence of well-defined objectives for majority-rule institutions when the issue space consists of two or more dimensions, say employment and wages in the union context (Blair and Crawford 1984). A third is the extent to which workers care about wages as opposed to unemployment (Oswald 1985, Pencavel 1985).

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FIGURE ONE

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