SOME MACROECONOMIC IMPLICATIONS OF ALTERNATIVE COMPENSATION SYSTEMS*

Martin L. Weitzman

A basic theme of this paper is the idea that some structural reform of employee compensation arrangements is necessary to make reasonable price stability compatible with reasonably full employment. In this view even the best designed macroeconomic policies are much too aggregative to get at the heart of the stagflation problem. The ultimate solution involves going inside the workings of a modern capitalist economy and correcting the underlying structural flaw directly on the level of the individual firm.

Stagflation represents an especially intractable policy dilemma for macro-economics. Without a decisive tendency of the economic system to remain near full employment, there is a strong *prima facie* case for fighting recessions by exogenously stimulating aggregate demand. But the usual Keynesian expansionary policies tend to impart an inflationary inertia that is difficult to choke off. And of course the basic strategy for fighting inflation is to cool down the economy by restrictive monetary and fiscal policy – thereby increasing unemployment and closing the viscous circle.

Because the practical macroeconomic policies for dealing with unemployment and inflation are so diametrically opposed, stagflation is a pervasive structural problem when, for whatever reason, there is basically an unfavourable short run tradeoff between unemployment and inflation. Economic policy tends to vacillate between expansion of demand to fight unemployment and restriction of demand to fight inflation, polarising the electorate and distracting society from dealing effectively with its underlying 'real' economic problems. Even the difficulty of attaining 'external balance' in foreign accounts is largely a spillover into the international payments arena of an inability to achieve an acceptable 'internal balance' between full employment and price stability.[1]

This paper takes what might be called a *comparative systems approach* to the problem of stagflation. At the heart of modern industrial capitalism is an incredibly complicated system of overlapping monopolistic competitors.[2] A starting point for the paper is the realisation that the coordination difficulty which can cause some systems to suffer involuntary unemployment is not inherent in laissez faire private enterprise *per se*. It is closely tied to one particular property of a conventional wage payment system: namely, compensation of each firm's employees is stuck to an outside numeraire (whether money, or a cost of

    [1] The case that the battle over stagflation dominates the current economic agenda has been forcefully stated by Meade (1978; 1982).
    [2] These views are elaborated in Weitzman (1982).

living index, or other companies' products, or whatever else) whose value is immune from anything the firm does. An alternative labour participation system where it is considered perfectly normal for a worker's remuneration to be tied to an appropriate performance index of his or her firm, by contrast, puts in place exactly the right incentives to automatically resist stagflation.

An Example

The following hypothetical example may help to convey what this paper is about, and perhaps even to motivate it.

Suppose that wages plus benefits of the average General Motors automobile worker come to $24 per hour. This means the cost to GM of hiring one additional hour of labour is $24. If GM is trying to maximise profits, it will hire (or lay off) workers to the point where the additional revenue created by the extra hour of labour is no more nor less than the cost, in this case $24. The average revenue per hour of labour will naturally be higher, say $36, to cover overhead, capital, profits, and the like.

So far the story is rather standard. Now imagine that the United Automobile Workers Union decides to try a somewhat unorthodox form of labour contract. Instead of having each employed member receive a wage of $24 per hour, the UAW agrees that every worker will accept as compensation a $\frac{2}{3}$ 'share' of GM's (average) revenue per worker. In effect, GM's revenue pie is sliced into two pieces, two-thirds going to labour and one-third to management. At first glance it might appear there is no difference: in both cases the employed worker is compensated $24 per hour while management receives $12 per hour to cover other costs and obligations.

But how does GM now see things? Under the old contract, the company had no incentive to expand employment because the cost of an extra worker equalled the additional revenue which that worker brought in: $24 per hour. Under the new contract, if GM hires an extra worker its total revenue pie goes up by $24 per hour (as before) but its total labour cost (the slice going to labour) now increases by only $\frac{2}{3}$ of $24, or $16 per hour. If the company can find an extra worker to hire, it now stands to clear a profit of $8 per hour. Under the new contract GM has an incentive to resist lay-offs and, with available unemployed labour, to expand production. When production is expanded, GM automobile prices must come down because more GM cars can be sold only if their price is lowered relative to Fords, Toyotas, and the rest.

Next suppose that not only GM, but all of the Fortune 500 companies are put on the new contract system. Now as each firm expands, its new workers spend their wages on the products of other firms, creating new demand for cars, increasing the size of GM's revenue pie, and encouraging further expansion.

The expansion ends when everyone in the economy seeking work has a job. In each industry the invisible hand of competition and the visible hand of collective bargaining determine compensation and employment levels just as they have always been determined. The only difference is that now there is full employment, and labour and management are negotiating about the 'sharing ratio' ($\frac{2}{3}$ in the example) instead of the money wage ($24). The average worker,

as well as the economy as a whole, is better off under a revenue-sharing system because of its built in bias towards eliminating unemployment, expanding output, and lowering prices.

The remainder of the paper is devoted to placing this kind of parable in a general context and to analysing it more carefully.

COMPENSATION SYSTEMS

Consider a typical monopolistically competitive firm operating under a more general labour compensation formula than is ordinarily treated in conventional theory.

Let Z_i be some economic indicator pertinent to firm i. Typical candidates might include price of output, profit per worker, or revenue per worker. (Other interpretations, including economy wide variables, are not excluded.)

Let λ_i stand for a contract parameter, whose value is treated as parameterising a quasi-fixed compensation contract in the short run, although it is ultimately determined by the long run forces of bargaining in a competitive labour market.

For expository simplicity λ_i and Z_i are both treated as scalars; the extension to a vector formulation is routine.

The compensation function

$$W_i = F_i(\lambda_i, Z_i) \tag{1}$$

is a formula describing the monetary remuneration of a worker as a function of the slow-moving contract parameter λ_i and the fast moving current performance indicator Z_i. Throughout this paper the *form* of the contract $F_i(\lambda_i, Z_i)$ is treated as exogenously given for each firm i, while contract parameter *values* λ_i are endogenously fixed by long term competitive forces. In other words, $F_i(\lambda_i, Z_i)$ represents a *class* of admissible contracts, with λ_i parameterising a specific member of the class. That the $\{F_i(\lambda_i, Z_i)\}$ are treated as given reflects the purpose of this paper: to explore the economic ramifications of postulating various contract forms. I do not have a formal theory which would explain why a particular firm should behaviourally limit itself to one class or another of admissible contracts; presumably, though, the analysis of this paper is necessary anyway as a preliminary step toward addressing that larger issue.

For analytic convenience and without much loss of generality, it is assumed that:

$$\frac{\partial F_i}{\partial \lambda_i} > 0, \tag{2}$$

$$\frac{\partial F_i}{\partial Z_i} \geqslant 0. \tag{3}$$

(All functions in this paper are presumed smooth.)

A set of compensation contracts $\{F_i(\lambda_i, Z_i)\}$, one for each firm i in the economy, defines a *compensation system*. It is easiest at first to think of the system as exogenously determined by the given functional forms (1). Then, later, a focal point of the analysis will be to compare the macroeconomic behaviour of alternative

compensation systems by examining the consequences of assuming different compensation functions. This seems the appropriate methodology for a paper whose aim is limited to describing the implications of alternative contract forms without yet attempting the grand historical synthesis of explaining why they actually evolved.

One particular case of a compensation function is the *traditional money wage*, which is independent of firm performance and can therefore be written in the special form

$$F_i(\lambda_i, Z_i) = \lambda_i. \tag{4}$$

In the general case a compensation function may typically depend on Z_i, so that

$$\frac{\partial F_i}{\partial Z_i} > 0. \tag{5}$$

For the *product wage*, Z_i in (1) represents the price of the firm's output, or more generally some price index of its outputs. The 'sliding scale' of the early iron and steel industry is a good example of a product wage. Throughout history, output prices have been sporadically included in wage formulas for coal miners, textile workers, and workers in other industries.[1] In this paper the pure product wage of the form

$$F_i(\lambda_i, Z_i) = \lambda_i Z_i, \tag{6}$$

with Z_i the price of output, can serve as a simple prototype example of a non-wage compensation function.

For the case of *profit sharing*, Z_i would represent some measure of profits per worker. In good years many Japanese firms may pay up to five months or more of blue collar compensation in the form of a semi-annual profit sharing bonus. As will be shown, it is no coincidence that such a system goes along with job security and low unemployment.[2]

Under *revenue sharing*, Z_i would stand for the value of output per worker. Various commission systems pay employees by this formula, as do sharecropping arrangements. Many industrial gain-sharing plans (Scanlon, Rucker, Improshare) augment wages by some fraction of the value of plant shipments per unit of labour. Some form of revenue sharing by the firm is arguably the most practical scheme for linking wages to current performance in a modern capitalist economy.

Many other examples of compensation functions could be given. (Note, for instance, that any weighted average of compensation functions is also a compensation function.) While various labour remuneration shemes may superficially appear to be non-comparable with each other, this paper will emphasise a generic dichotomy (into 'wages' and 'shares') based on common abstract properties.

[1] See, for example, Schloss (1892).

[2] Of course, I do not mean to imply that the bonus system alone is responsible for Japan's stellar economic performance. The opposite extreme, that profit sharing has nothing to do with the low Japanese unemployment rate, strikes me as equally implausible. Okuno (1982) contains a good description of the basic features of what he calls the 'output-related wage system', by which he means 'income of corporate employees does (or at least is believed to, in worker's perception) depend upon corporate performance'.

It is important to realise that there is nothing sacrosanct about the functional form (4). A traditional money wage system is a particularly simple example of (1) which happens to have historically evolved in certain places at certain times, but does not cry out with compelling logical or theoretical claims to priority.[1] Actually, as will be shown, a money wage system has comparatively *bad* macro-economic properties. By contrast, a system based on (5) can possess good stag-flation resisting qualities.

In this paper all uncertainty is embodied in a vector of shift parameters **A**, representing various exogenously specified economic states.[2] Some components might be specific to the firm while others could pertain to the general economy. For the time being **A** is treated as a fixed constant. Later it will be suddenly changed to model the effects of unanticipated shocks.

Labour is treated as a uniform, homogeneous, freely substitutable factor.

It is important to realise that, given the state of the world, the amount of labour L_i which firm i chooses to hire determines, indirectly, the performance indicator Z_i by some transformation function

$$Z_i = G_i(L_i; \mathbf{A}). \tag{7}$$

For example, in a product wage system where Z_i represents the price of com-modity i, L_i is transformed into Z_i via production and demand functions. The reader should be able to see that an analogous argument applies to the other examples of compensation systems which have been discussed.

Substituting (7) into (1), in effect λ_i and L_i determine W_i through the *reduced form compensation function*

$$W_i = W_i(\lambda_i, L_i; \mathbf{A}) \tag{8}$$

$$\equiv F_i[\lambda_i, G_i(L_i; \mathbf{A})]. \tag{9}$$

It is formula (8) which describes the basic underlying short term relation between compensation and employment in the firm, given quasi-fixed values of the contract parameter and the shift parameters. If not for an interest in moti-vating the reader by providing concrete examples, the analysis could just as well

---

[1] As will become apparent, I do not subscribe to the (tautological) philosophy that every existing economic convention, institution, or contract must have a *raison d'être* in terms of economic theory. To explain everything this way is to turn economic theory into a game which explains nothing. When it comes to system wide socio-economic conventions, good economic theory can sometimes be used to provide legitimate ahistorical explanations, but the pure inertia of social tradition is a strong inde-pendent force which discourages tampering with any institution that 'works'. As a general rule, structural change is possible in such situations only when it becomes unavoidably obvious that the system is *not* performing very well and an experimental attitude has been actuated by the appearance of a more promising alternative. Here is a·contemporary example. Granting some exceptions, it is a fair generalisation that the predominant mortgage contract form in the United States is the fixed rate, while the variable rate mortgage is standard in the United Kingdom and Canada. Differences in risk aversion, moral hazard, adverse selection, asymmetric information, transaction costs, or the like do not adequately explain the stubborn persistence over many centuries of different mortgage forms between two such similar countries as the United States and Canada. The explanation lies not in new buzzwords of economic theory, but rather in history, tradition, and inertia. It is only after the onslaught of historically unprecedented levels of interest rates that some few U.S. banks even begin to experiment with variable rate mortgages.

[2] In the terminology of Knight (1921), **A** stands for *uncertainty*, as opposed to *risk*. See also Shackle (1949). Unlike much of the recent literature on implicit contract theory, I do not think it particularly appropriate for macroeconomic modelling to regard **A** as symbolising a recurrent risk-state with a well defined probability distribution.

have been started at this point with the presentation of an abstract compensation function in the reduced form (8).

So long as demand and marginal revenue product curves are declining in the relevant operating range, revenue per unit of output and revenue per worker both decrease as more labour is hired. It follows for the product wage, profit sharing, and revenue sharing systems previously described that

$$\frac{\partial Z_i}{\partial L_i} < 0, \tag{10}$$

and hence

$$\frac{\partial W_i}{\partial L_i} < 0 \tag{11}$$

(from (9), (10) and (5)).

A *share contract* is defined to be any compensation function satisfying (11). There are many other examples of share contracts than the three already given. For instance a fixed wage-fund, once taken by certain classical economists as a prototype labour payment mode, is a share formula of the reduced form $W_i = \lambda_i/L_i$. An appealing generalisation of this idea is the deterministic (because **A** is not involved) share contract of the form

$$W_i = \lambda_i (L_i/\bar{L}_i)^{-\epsilon_i}, \tag{12}$$

where λ_i is the negotiated remuneration at employment level $\bar{L}_i$ and $\epsilon_i \geqslant 0$ represents the elasticity of worker compensation with respect to changes in hired labour.

A *wage contract* is any compensation function obeying

$$\frac{\partial W_i}{\partial L_i} = 0. \tag{13}$$

An example of a compensation function satisfying (13) is the traditional money wage form (4), or any real wage variant featuring a cost-of-living adjustment that indexes the compensation paid by firm i to the price of a representative basket of goods in which the output of i constitutes a negligible proportion. It generally matters, of course, how a wage is indexed; automatic linking of wages to economic conditions will influence system performance.[1] But the really crucial distinction turns out to be whether or not the individual firm can, in effect, lower its unit labour costs by hiring more workers on a given contract. Dependence of W_i upon L_i is of higher order importance than dependence of W_i upon other variables like **A**.

A *wage system* is an economy where practically all firms pay wage contracts. In a *share system*, a significant proportion of firms have share contracts.

The net revenue product function

$$R_i(L_i; \mathbf{A}), \tag{14}$$

---

[1] On the macroeconomic properties of indexed wages, see Fischer (1977) or Gray (1976). Blinder (1977) contains an interesting account of a national inflation mutual fund.

describes the maximum net revenue attainable by firm i, before compensating its workers, as a function of a parametrically fixed amount of labour.[1]

The profit function for firm i is defined as

$$\Pi_i(\lambda_i, L_i; \mathbf{A}) = R_i(L_i; \mathbf{A}) - W_i(\lambda_i, L_i; \mathbf{A}) L_i. \tag{15}$$

SHORT RUN TEMPORARY EQUILIBRIUM

In this paper the short run is viewed as a state of less-than-full equilibrium where some incompletely adjusted variables are essentially treated as quasi-fixed parameters, while other variables are allowed to change freely. Of course this formulation exaggerates the real world. It is analytically useful because it captures sharply how disequilibrium behaviour depends in a fundamental way upon assumptions about relative speeds of adjustment.

In my opinion the relevant assumption is that λ_i is stickier than L_i even though both change gradually due to real world frictions and inertias. Compensation parameters are determined by long run competitive forces while the employer specifies the employment level in the short run, given the existing labour contract. I think of the firm as negotiating λ_i once a year, but selecting L_i once a month. In the short run almost any negotiated contract parameter is bound to stick to whatever defines it, while the firm first reacts to shocks by adjusting other variables. After all, by its very nature a compensation contract is a quasi-stable function (of L_i and $\mathbf{A}$) telling workers how they are to be paid throughout some protracted period. Since λ_i represents the contract itself (within a certain class), it is natural to think of λ_i as being fixed in the short run.

Leaving aside the important but separate issue of whether or not labour contract stickiness can be adequately explained on some deeper level, the remainder of the paper explores the implications of assuming, *ad hoc*, that compensation parameters are quasi-fixed in the short run.[2] From the perspective of this paper, the relevant issue is neither to justify nor to contest the fact of a sticky

[1] The net revenue product function is a partial equilibrium concept which depends, among other things, upon production functions, demand curves for outputs, supply curves of non-labour inputs, reactions of other firms, factor payment disbursements, etc. all taken as given at the full employment equilibrium position. The theory of monopolistic competition rests on an implicit postulate that the firm's market situation can be summarised by a well defined demand or revenue function. Although a complete, fully consistent, rigorous general equilibrium formulation is not yet available except for very special cases, I nevertheless believe the 'as if' monopolistic competition story is the best simple approximation to a usuable theory of real world markets currently available.

[2] So far as I can see, few basic economic principles are actually at stake in choosing relative adjustment speeds out of equilibrium. To me, implicit contract theory is an imaginative, even ingenious, way of construing what appears to be short run disequilibrium as part of a consistent long run stochastic equilibrium (see, e.g. Azariadis (1981), Baily (1974), Hart (1983), Azariadis and Stiglitz (1983), Akerlof and Miyazaki (1980)); but it does seem as if a purposeful use of it, along with the appropriate assumptions, can be made to rationalise almost any adjustment story. Despite some overlap, the spirit of this paper is quite different from the typical implicit contract approach. In conventional implicit contract theory all disturbances are forseen as risks and are incorporated into the equilibrium contract between the firm and its particular pool of workers. (It typically makes no sense, e.g. to inquire what would happen if the labour force unexpectedly increased and a new worker not covered by any contract showed up at the firm's doorstep looking for work.) This paper attempts to address the issue of how a system reacts to uncertain or unforseen shocks which take it *out* of a state of long run equilibrium.

labour contract, but to *use* it in choosing a compensation system with good disequilibrium properties.[1]

Suppose, then, that contract parameters are fixed in the short run but quantities and product prices are allowed to vary. Let S be the supply of labour. For expositional simplicity S is treated as an exogenously fixed constant, although it is not difficult to extend the analysis to cover the case of a more general supply function. In the more general case S would be written as a function $S(W, \{P_i\}; \mathbf{A})$ of labour income W and product prices $\{P_i\}$, as well as of $\mathbf{A}$.

Let the target demand for labour by firm i be denoted $\hat{L}_i$, assumed positive and unique. By definition, $\hat{L}_i$ satisfies

$$\Pi_i(\lambda_i, \hat{L}_i; \mathbf{A}) = \max_L \Pi_i(\lambda_i, L; \mathbf{A}). \tag{16}$$

(For notational convenience, henceforth functional dependence upon $\mathbf{A}$ will be suppressed unless explicitly needed.)

Suppose there are n firms in the economy, where n is a large number. Three employment regimes are possible

$$\text{I:} \sum_1^n \hat{L}_i > S, \tag{17}$$

$$\text{II:} \sum_1^n \hat{L}_i = S, \tag{18}$$

$$\text{III:} \sum_1^n \hat{L}_i < S. \tag{19}$$

Conditions (17), (18), (19) represent, respectively, states of positive, zero, and negative excess demand for labour.

At this point it remains to specify how labour is actually allocated in a fixed-contract temporary equilibrium. The following rules push to a logical extreme the notion that quantities and product prices are flexible relative to contract parameters in the short run.[2]

In regimes II and III, a short run equilibrium $\{L_i\}$ satisfies

$$L_i = \hat{L}_i. \tag{20}$$

That condition (20) represents the appropriate allocation of labour in an unemployment state should be obvious.

In regime I, any short run equilibrium $\{L_i\}$ satisfies

$$L_i \leqslant \hat{L}_i, \tag{21}$$

$$\Sigma L_i = S, \tag{22}$$

$$L_i = 0 \Rightarrow W_i(\lambda_i, L_i) \leqslant W, \tag{23}$$

$$0 < L_i < \hat{L}_i \Rightarrow W_i(\lambda_i, L_i) = W, \tag{24}$$

$$L_i = \hat{L}_i \Rightarrow W_i(\lambda_i, L_i) \geqslant W, \tag{25}$$

---

[1] Since I am going to argue that a share system is 'better' than a wage system when both compensation parameters are sticky, a share parameter which is more flexible than a wage parameter would only strengthen my case.

[2] Actually, complete labour substitutability is not really required in this paper. A more limited 'overlapping substitutability' between partially segmented labour markets is enough. It suffices to have labour perfectly substitutable only between 'neighbouring' firms i and $i+1$. The paper treats labour contracts as if synchronous. With 'overlapping substitutability' of labour, the same idea works for staggered contracts.

for some hypothetical shadow wage rate W, representing what the last incremental worker in the job market queue can expect to receive.

Conditions (21)–(25) are natural allocations for the over-full employment states of an economy whose workers can vote with their feet.[1] If a firm wants to hire more workers but cannot attract them, it must be because its compensation is lower, or at least no higher, than what could be earned in other firms.

An allocation satisfying (21)–(25) can be calculated from the following simple algorithm. Successively assign the next worker to that firm, among those with positive excess demand for labour, paying the highest compensation; do this until all available labour has been allocated. (The last worker in the job market queue receives W.)

When a firm j wants to hire more workers but cannot attract them, i.e. $L_j < \hat{L}_j$, we speak of the firm as having positive excess demand for labour.

LONG RUN STATIONARY EQUILIBRIUM

Consider a hypothetical benchmark state of long run stationary equilibrium. The shift parameter **A** has been fixed at the same value for a long time and, while no one expects it to remain there forever, the possible changes are too vague or uncertain to be seriously reckoned. People are projecting an existing, stable situation into the future. Each firm is optimising over its contract parameter, given the short run labour response described in the previous section.[2] The labour market is perfectly competitive and all workers are fully employed.

Of course no one believes that the classical stationary state is anything more than an abstraction. It is merely a useful way of describing the basic resource allocation patterns toward which an undisturbed market economy would tend in the very long run.

Perfect competition in the labour market of a long run stationary state must cause a law of one wage to prevail. The law of one wage is an abstraction of the idea that in the full employment equilibrium of an economy with many buyers and sellers of highly substitutable labour, no firm can get away with paying a compensation lower than the going rate.[3] Let the prevailing equilibrium compensation be W^*, which any single agent is too small to influence.

---

[1] Perhaps the most convenient interpretation involves a situation with high natural turnover relative to economic change in each period. Then only the new workers applying for jobs need to vote with their feet. It is important to note that the basic results of the paper do not depend upon perfect labour mobility; without that assumption labour would presumably be allocated in the short run by some 'sticky' version of (21)–(25) which is analytically more messy but would not change any fundamental conclusions.

[2] The underlying game theoretic description is the limiting Nash equilibrium with a very large number of firms, each of which follows an optimal compensation parameter strategy holding the strategies of the other firms constant.

[3] '...there are strong reasons why the market in which a firm *sells* should normally be imperfectly competitive (for some individuality in its product is one of the bases on which a firm can maintain its own individuality). There is, however, no such reason why there should be "monopsony" on the buying side; it may occur, but its occurrence (one would think) would be relatively exceptional...our standard picture of a firm should be such that it is a price-taker on the side of inputs, but a price-maker on the side of outputs.' J. R. Hicks, pp. 331–2, 'Commentary' in the second edition of *The Theory of Wages* (1964).

A long run equilibrium [1] is a set of labour allocations $\{L_i^*\}$ and contract parameter values (λ_i^*) such that each firm i obeys the profit maximising condition

$$\Pi_i(\lambda_i^*, L_i^*) = \max_\lambda \{ \underset{L:W_i(\lambda,\, L)\, \geqslant\, W^*}{\text{maximum}} \{\Pi_i(\lambda, L)\}\}, \tag{26}$$

and there is full employment

$$\Sigma L_i^* = S. \tag{27}$$

The condition

$$W_i(\lambda, L) \geqslant W^*, \tag{28}$$

which appears in (26) represents an important constraint on the equilibrium behaviour of the firm. Having determined λ_i, in a tight labour market firm i is effectively constrained to select values of L_i not yielding a compensation to its workers lower than the prevailing norm that could be earned by them elsewhere. The firm in long run equilibrium cannot think of itself as free to choose L_i independently of λ_i because, from (23)–(25), it cannot hold workers in the short run unless it pays them the going rate.

Equilibrium condition (26) means that firm i maximises profits over all values of λ_i and L_i, given that in equilibrium its workers must be compensated by as much as they could earn anywhere else. In principle, one could imagine a dynamic mechanism by which firm i gropes its way toward (λ_i^*, L_i^*) by experimenting with different values of λ_i in the long run, then observes what amounts of labour L_i can be retained in the short run, and finally discovers that $\lambda_i = \lambda_i^*$, $L_i = L_i^*$ yields the greatest feasible profit. If (whether by union pressure or in a short sighted attempt to lure more labour) the firm were to set its compensation parameter λ_i above λ_i^*, it would soon find itself attracting more workers but making less profits.

Note that any long run equilibrium is a short run equilibrium, but not *vice versa*.

It turns out that, for the same underlying economy, the long run equilibria of all compensation systems are isomorphic to each other in the sense that a solution to any one system is a solution to any other. In the stationary state nothing of substance depends upon the choice of compensation system, which

---

[1] Conditions (26)–(27) represent only a subset of long run general equilibrium conditions, not all of which are written out explicitly because they are not all relevant to the issues at hand. For example, the sum of wage income, rents, profits, etc. feeds back to constitute demand for products, a loop which is implicit in the definition of a revenue function but not stated explicitly. An unwritten condition (whether zero pure profits, or increasing returns, or some other barrier to entry) is preventing new firms from entering the market in equilibrium while simultaneously it is economical for existing firms to remain. The usual input-output relations are hidden behind demand and supply curves for intermediate materials. In principle the partial equilibrium demand for one firm's products includes the relevant reactions of other firms. It must be admitted that the present formulation sidesteps a number of unresolved, difficult, and even controversial issues involved in constructing a truly general equilibrium theory of monopolistic competition. In a sense the paper is concerned with the properties of a monopolistically competitive general equilibrium system *given* that it is meaningful to summarise the individual firm's market situation by a partial equilibrium net revenue product function. (Perhaps the simplest rigorous interpretation is of a country which exports everything it produces.) The reader who would like to verify that the conclusions of this paper are applicable to a complete closed-loop type model of a monopolistically competitive economy might try working out the details for the example presented in Weitzman (1982). The relevant propositions in that context are: (1) a wage system can be in a neutrally stable rest state consistent with any level of unemployment; (2) for a share system the only possible rest state is at full employment and it is dynamically stable.

merely veils the underlying real economy. If an economy suddenly switched from one compensation system to another, no outside observer could tell the difference from the prices or quantities prevailing in a full employment stationary equilibrium. The same long run forces determine the same long run resource allocation patterns independently of the compensation system.

With all compensation systems, the firm hires an equilibrium quantity of labour to the point where the marginal revenue product of an extra worker is equated to the prevailing wage W^*. The intuition behind this result is the idea that, in long run equilibrium, any firm in any system ends up paying a money compensation no less than W^* per worker. Therefore, the firm's reduced form equilibrium problem is just like the standard monopoly problem with money wage W^*.

Proposition 1. All compensation systems have the same long run equilibria.

Proof. It is implicitly being assumed that for any two compensation systems in general equilibrium the same pattern of labour incomes, rents, profits, etc., on the factor side would feed back to constitute the same spending patterns on the demand side, giving rise to identical revenue product functions for the firm. To prove that switching the compensation system will not alter an equilibrium state, therefore, it suffices to verify that a long run equilibrium is characterised by all firms hiring labour to the point where marginal revenue product equals the prevailing compensation irrespective of the ostensible form of the compensation function.

Under ordinary continuity conditions on demand and production, (26) is a well defined problem. Viewing Π_i defined by (15) as a partial function of λ_i *given* $L_i = L_i^*$, from (2) it is obvious that the profit maximising value of λ in (26) must obey

$$W_i(\lambda_i^*, L_i^*) = W^*. \tag{29}$$

Since (29) must hold at the optimum, without loss of generality (26) becomes:

$$\Pi_i(\lambda_i^*, L_i^*) = \underset{\lambda, L}{\text{maximum}} \{\Pi_i(\lambda, L)\} \quad \text{subject to:} \quad W_i(\lambda, L) = W^*. \tag{30}$$

Plugging (15) into (30) and substituting W^* for $W_i(\lambda, L)$

$$\Pi_i(\lambda_i^*, L_i^*) = \underset{L}{\max} \{R_i(L) - W^*L\}. \tag{31}$$

Assuming the first order conditions for an interior maximum are sufficient

$$R_i'|_* = W_i^* = W^*. \; \blacksquare \tag{32}$$

By Proposition 1, the stationary properties of all compensation systems are identical, so that one system is essentially the same as another in the long run. But the short run is another story altogether. The way in which factor payments are denominated can very much matter outside of long run equilibrium. There may be significant differences between the abilities of various systems to main- tain full employment when disturbed by a disequilibrating shock. Whether an

economy is anchored by sticky money wages or by sticky product wages can have critical implications for economic performance.

It turns out that the basic tendency of a firm's response to small disturbances can be inferred from the following result.

Proposition 2. In the long run, share firms equilibrate at positive excess demand for labour while wage firms equilibrate at zero excess demand for labour.

Proof. Differentiating (15)

$$\frac{\partial \Pi_i}{\partial L_i}\bigg|_* = R_i'\bigg|_* - W_i^* - L_i^*\frac{\partial W_i}{\partial L_i}\bigg|_*. \tag{33}$$

Now use (32) to cancel the first two terms of (33), yielding

$$\frac{\partial \Pi_i}{\partial L_i}\bigg|_* = - L_i^*\frac{\partial W_i}{\partial L_i}\bigg|_*. \tag{34}$$

The proposition follows from applying (11) and (13) to (34). ▮

Equation (34) means that the share firm would find it profitable to expand production and hire more workers at the existing share parameter, if only it could locate more labour and if the going compensation constraint (28) could be disregarded. This is because when (11) holds every additional worker lowers (marginally) the labour cost of the previously hired workers. In effect, the share firm can temporarily debase the currency in which its workers are paid by hiring more of them.

Proposition 2 implies that any share system in some sense equilibrates at strictly *positive* excess demand for labour. If the Walrasian auctioneer calls out equilibrium values of the compensation parameters $\{\lambda_i^*\}$ and asks the firms how much labour they wish to hire, total demand for labour exceeds supply.

Positive excess demand for labour (plus continuity) means that a share system is essentially immune from involuntary unemployment after small shocks leave the compensation parameters quasi-fixed at 'wrong' values, because the firms find it unprofitable to lay off workers in the short run. A wage system does *not* have this property, because where (13) holds the system equilibrates in the long run at exactly zero excess demand for labour; a wage system responds to deflationary shocks by laying off workers in the short run whenever compensation parameters are quasi-fixed 'too high' relative to demand.[1]

THE BASIC RESULT

Suppose a given compensation system is initially at complete rest in a hypothetical stationary state with the autonomous shift parameters semi-permanently fixed at some value **A**. Suddenly and unexpectedly **A** shifts slightly to a new value **A** + ε for some small ε. The compensation system is thrown into a temporary

---

[1] A system of worker co-operatives, not treated in this paper, also equilibrates at zero excess demand for labour. (The worker co-operative differs from an ordinary firm in maximising not profits, but profits per member. For macroeconomic implications see, e.g. Vanek (1970), and the perceptive article of Meade (1979).) Note that a monopsonistic labour market might superficially appear to have similar properties to a share system; one important difference is that a monopsonistic wage increases, whereas a share compensation decreases, as more labour is hired in partial equilibrium.

state of (long run) disequilibrium. The methodology for analysing disequilibrium responses in this paper is to determine the short run temporary equilibrium reactions to small shocks in the neighbourhood of a long run stationary equilibrium position.[1]

In effect, the performance of alternative compensation systems is compared over a three period approximation to a dynamic adjustment path: ('old' long run equilibrium – temporary short run equilibrium – 'new' long run equilibrium). Since at a very high level of abstraction (ignoring such issues as capital accumulation, multiple equilibria, and the like), all compensation systems can be regarded as starting from a common 'old' long run equilibrium and ending at a common 'new' long run equilibrium, at least as a crude approximation it suffices to focus on comparing short run properties.

Proposition 3. A share system maintains full employment while reacting to small disturbances. A wage system responds to deflationary shocks by creating unemployment in the short run.

Proof. Given that all functions appearing throughout the paper are assumed smooth, $\hat{L}_i(\mathbf{A})$, the unique interior solution to the optimisation problem (16), must be continuous in $\mathbf{A}$.

The distance function

$$\Phi(\mathbf{A}) \equiv \Sigma\hat{L}_i(\mathbf{A}) - S(\mathbf{A}), \tag{35}$$

is therefore continuous in $\mathbf{A}$.

From Proposition 2

$$\Phi(\mathbf{A}) > 0, \tag{36}$$

for a share system, whereas

$$\Phi(\mathbf{A}) = 0, \tag{37}$$

for a wage system.

A deflationary shock is a change in $\mathbf{A}$ which decreases $\Phi(\mathbf{A})$. From continuity, even the smallest deflationary shock will be enough to make Φ in (37) go negative. For Φ in (36), however, $\mathbf{A}$ is an interior point of the set

$$\{\mathbf{A}\,|\,\Phi(\mathbf{A}) \geqslant 0\}, \tag{38}$$

so that sufficiently small changes in $\mathbf{A}$ will not reverse the sign of Φ. |

Note that the excess demand function (35) is a direct measure of how much extra labour can be assimilated into a compensation system without causing unemployment. At least in principle, various compensation systems could be ranked by their short run abilities to absorb unemployed labour.

[1] Note the underlying assumptions about timing. Employment decisions are made more frequently than contract revisions, and contracts are revised more often than the economy is hit by a major disturbance. It is important to bear in mind that the macroeconomic shocks treated in this paper represent uncertainty, not risk. Changes in $\mathbf{A}$ are caused by unanticipated, unforseen, unstable, non-recurrent, non-stationary disturbances for which it is infeasible or too expensive to write insurance contracts. I do not believe it would be difficult to incorporate genuine risk into the model, nor would it substantially change the analysis (at least under symmetric information). All that would be required is to introduce an equilibrium corresponding to every well defined state of the world. Each such equilibrium would have the same properties as the single equilibrium analysed in this paper, only now every variable would be indexed by the appropriate state of the world. The issue of how such an economy reacts to unforseen shocks which take it *out* of long run equilibrium would remain substantially the same.

Generally speaking, the size of deflationary shock which can be absorbed without causing unemployment is dependent upon the number of share firms and the strength of each share firm's feedback loop connecting higher employment back to lower labour costs. In that sense, a compensation function has more desirable macroeconomic properties when the wage component is small relative to the share component and there is a high degree of excess demand for labour by the firm. If the fraction of all monopolistically competitive firms covered by meaningful share contracts is in some sense sufficiently large relative to the unemployment rate, the share firms should be able to lead the rest of the economy out of a recession.

A wage system (13) has the weakest possible unemployment absorption capacity among feasible systems because the excess demand for labour is precisely zero in equilibrium. A compensation system based on a feedback mechanism slightly to the other side of (13) from (11), i.e.

$$\frac{\partial W_i}{\partial L_i} > 0, \tag{39}$$

could not exist in a state of long run equilibrium; any potential equilibrium is unstable because it would yield a negative excess demand for labour, causing firms to lay off workers and the economy to contract. Wage systems have borderline employment stability properties, being a razor's edge of boundary points between stable and unstable regimes.

A Special Case

A *deterministic contract* is one which does not depend upon the shift parameter **A**, i.e.

$$\frac{\partial W_i}{\partial \mathbf{A}} = 0. \tag{40}$$

An example is the compensation formula (12).

The case of deterministic share contracts is interesting to analyse because it permits an especially sharp characterisation of the disequilibrium behaviour of each firm. In this section (alone) I assume that all firms have deterministic share contracts and that the uncertain disturbances influence only the net revenue product functions.

Proposition 4. In the short term reaction of a deterministic share system to small disequilibrating demand disturbances, all firms retain their previous equilibrium levels of employment and compensation.

Proof. Let $\{\hat{L}_i(\mathbf{A})\}$ defined by (16) represent the equilibrium target demands for labour by the firms. The actual equilibrium labour allocations are $\{L_i\}$, defined by (21)–(25). From Proposition 2, in a share system $\hat{L}_i(\mathbf{A}) > L_i$, $\forall i$. The post-shock value of the shift parameter is $\mathbf{A} + \epsilon$ where, by continuity, for sufficiently small ϵ, $\hat{L}_i(\mathbf{A} + \epsilon) > L_i$, $\forall i$. Deterministic compensation functions are unaffected by shocks in the short run. Hence the short run temporary equilibrium pattern of employment and compensation (21)–(25) remains exactly the same as it was just before the shock. |

The contrast between deterministic share and wage systems, therefore, is

especially striking. Deflationary shocks cause money wage firms to shed labour immediately; the deterministic share firm, on the other hand, retains all its workers at their previous pay while a new equilibrium is becoming established.

UNEMPLOYMENT

This section offers an intuitive discussion of the unemployment absorbing features of a share system.

The prototype thought experiment for testing disequilibrium properties is to throw an extra worker on the market and observe how the system reacts to a pure positive shift in the supply of labour function. Strictly speaking, when a new person enters the labour market a disequilibrium situation is created.

By Proposition 2, the immediate profit maximising response of the share firm is to offer employment eagerly at the prevailing sticky compensation parameter.[1] After soaking up all involuntarily unemployed workers, a share system will eventually adjust compensation parameter values to re-establish long run equilibrium. The point is that the unemployed worker is immediately absorbed in the short run, without having to wait for the outcome of what may be a difficult long run adjustment process.

By contrast, in the stationary state of a wage system the net value of extra labour to the firm is negative. There is no automatic short run tendency to absorb unemployed workers into a system where compensation is rigidly indexed to money, to a representative basket of consumer goods, to other companies' products, or to any other numeraire beyond the control of the individual firm. Only a complicated, roundabout, and extremely problematical long term adjustment of parameter values which succeeds in lowering real labour costs relative to product demand revenues will cause a wage system to absorb unemployed workers.

A share system looks very much like a 'labour shortage' economy. Firms cruise around like vacuum cleaners on wheels, searching in nooks and crannies for extra workers to suck in at existing compensation parameter values. Such an economy is inherently recession resistant. Every share firm wants to hire more workers at the equilibrium parameter rates, making temporary additional profits by absorbing any incipient pockets of unemployment that arise or can be found. The profits from assimilating a new source of unemployed workers are temporary, because in the long run they will eventually be squeezed out by rising compensation parameter rates and by workers transferring to other firms. This kind of 'suction' equilibrium, in which all firms are actively seeking to employ more workers at existing compensation parameter rates, is strikingly different from the zero demand for unemployed labour which typifies a wage system.

Unlike perfect competition, modern industrial capitalism is a system characterised by a more or less permanent excess supply of goods.[2] Monopolistically

[1] This kind of behaviour is vividly illustrated by the example of a door to door (or telephone) sales company which pays its freelance sales people entirely on commission and is always keen to enlarge the staff.

[2] In unpublished work, colleagues R. L. Bishop and E. D. Domar have stressed the economic and social significance of a system where monopolistic firms are eager to supply more than is demanded at the equilibrium prices which they themselves set.

competitive firms are aggressive on product markets, forever eager to find new customers and to sell more output at existing prices. The thesis of this paper is that the ultimate solution to stagflationist tendencies involves redesigning incentives so that firms are equally aggressive on the factor market side in the analogous sense of permanently seeking to hire more labour at existing compensation parameter values.

The analysis of more complicated shocks is like the prototype example of a pure shift in labour supply. In each case the central feature is the same. A share economy equilibrates at *positive* excess demand for labour and, by continuity, remains at a level of positive excess demand even after undergoing a small disequilibrating shock. A wage economy equilibrates at *zero* excess demand for labour, and therefore does not exhibit any correspondingly strong short term tendency to absorb unemployed workers after a disturbance.

Consider, for example, how a share system automatically cushions first round deflationary demand shocks, even before existing compensation parameter rates can be changed. Suppose the demand for a firm's output declines. The share firm will react to a moderate leftward shift of the demand curve by trying to retain workers, maintain production, and lower prices. Workers may choose to quit if their pay is diminished below what could be obtained by them elsewhere (in the short run this could only happen under a non-deterministic contract), but they are never deliberately fired. Only if the decline in demand is sufficiently acute in one sector to reverse the positive excess demand for labour will firms there choose to lay off workers. But in principle any newly unemployed workers can find jobs in the less severely afflicted sectors of the economy which continue to want more labour. The basic point is that the positive excess demand for unemployed labour in the share system as a whole provides a safety margin for automatically reacting to changed conditions by maintaining full employment even out of equilibrium. The wage firm, on the other hand, reacts to a decline in demand by decreasing output and employment, with ambiguous effects on price (price is unchanged, for example, in the standard base case of constant marginal cost and a constant elasticity of demand). In both systems long run equilibrium is re-established only after a complicated adjustment of compensation parameters and a re-allocation of workers throughout the economy.

It is a common mistake to attribute the recession fighting qualities of a share system to a kind of surrogate wage flexibility which 'in effect' automatically maintains equilibrium. *Both* systems exhibit some friction or inflexibility of contract parameters. In principle a share system is no less disequilibrated by shocks than is a wage system. The point is rather that the *form* of disequilibrium response is different. Roughly speaking, the short term response of a share economy holds the *quantity* of hired labour (and output) at its full employment level, with the disequilibrium showing itself on the *price* (or value) side (workers are temporarily not paid their marginal revenue product). Wage economies, on the other hand, tend to respond to deflationary shocks by holding equilibrium *prices* (or values) in line (workers are always compensated their marginal revenue product) while the *quantities* of employment (and output) decline. In the long

run both systems converge to the same equilibrium, but their short run behaviour is quite different.[1]

SOME WELFARE IMPLICATIONS

A basic tenet of this paper is the idea that, while wage and share systems have pretty much the same properties in stationary environments, a share system is more robust at handling well uncertain or unforseen events. In what welfare sense is the disequilibrium adjustment of a share system 'better' than the disequilibrium adjustment of a wage system?

First of all, a share system tends to maintain full employment out of equilibrium. Low unemployment may legitimately be considered a *desideratum* in and of itself (even without the economist's pedantic summation of individual utility gains) because of its essential role in preserving the social fabric of a just democracy.

Full use of labour resources generally means more output.[2] To the extent that we are prepared to rely on the compensation principle, a share system would have to be judged better because, with a bigger output pie, the winners could bribe the losers and still come out ahead.

Full employment also means that labour income is distributed more evenly across the working class population. That tendency is bound to help raise the value of a conventional social welfare function, even without going to the extreme of a Rawlsian formulation.

There is also a tendency[3] for a share economy to pay out a higher total real income to labour than a wage economy after a recessionary shock. As Proposition 4 shows, this is clearly true for the case of deterministic contracts, since every worker in a depressed share economy is retained by his firm at the same pay while some of his counterparts in the wage economy are being laid off. As another example, consider the case of a pure product wage or revenue sharing with output proportional to labour. In a money wage system the employment level fluctuates while money pay per employed worker is constant. In a product wage or revenue sharing system, employment is steady while money pay varies. Since the monopolistically competitive firm must have an elasticity of demand greater than one in equilibrium, when demand is depressed the firms pay out more money to

---

[1] The situation is reminiscent of a 'prices vs. quantities' comparison (see Weitzman (1974), especially section V). If most uncertainty is in the form of independent firm-specific shocks, with the overall level of aggregate demand more or less stable, a wage system offers fine efficiency and welfare properties. But when the level of aggregate demand is the major source of uncertainty, so that shocks to the different firms are highly correlated, a system which stabilises quantities has the comparative advantage in performance. Viewed in this context, the primary contribution of the present paper lies in showing that a share system possesses strong quantity stabilising properties.

[2] I am leaving aside pathological cases of such unlikely inefficiency as to conceivably reverse this conclusion.

[3] Counter examples are possible, but the reader who wishes to try can verify that one has to strain to concoct them. Note that the present paper concentrates on the direct first order employment effects of alternative compensation systems, abstracting away from secondary or distributional aspects involving risk-bearing, effort, incentives, and the like. More comprehensive models are certainly possible, and should eventually be constructed, but I believe the present approach captures the most basic issues in a reasonably simple fashion.

labour (and note that profits are also higher) under a product wage system than under a money wage system.[1]

All of this begs an important question. If a share system possesses superior qualities, why don't we see more examples of it? A traditional answer might stress the powerful forces of history, custom, and inertia. A more theoretical answer is that share contracts exhibit strong externality effects. When a wage firm converts to a share contract most of the benefits accrue not to its own workers, but to the working class as a whole.

To see the argument most clearly, consider the case of deterministic contracts. As Proposition 4 vividly demonstrates, the driving force behind full employment in a share system is not the *actual* lowering of pay during a recessionary shock, but rather the *potential* lowering which *would* occur if more workers could be hired. So long as all firms use share contracts there will not be any free floating unemployed labour available for a particular share firm to hire at decreased pay, and in the short run no worker's compensation will actually be lowered by a deflationary shock.

That part changes when the share firms constitute a small minority. If one firm in a wage system goes over to a share contract, it will be guaranteeing full employment to its own workers *and* serving as the employer of last resort for all the others. In bad times the one share firm will be absorbing unemployed labour shed by the depressed wage firms (this is the externality), thereby lowering the pay of its original workers, possibly to the point where they might well prefer to keep a wage contract and take a chance on uncertain employment. If *all* wage firms go over to a share system, every worker benefits from the resulting tight labour market. But it is not clear (it depends on the particular case) whether or not the already employed workers of an existing wage firm benefit if that firm *alone* converts to a share contract. The essence of the externality is that in choosing a particular contract form, the firm and its workers do not take into account the macroeconomic implications.[2]

INFLATION

Because a share system offers lower unemployment, the reasonable presumption might be that it is inherently more inflationary than a wage system. Here I merely want to cast doubt on this presumption by suggesting some reasons for believing the reverse proposition: a share economy should have more of an anti-inflationary bias than the corresponding wage economy. Without money or financial claims

---

[1] This last example shows that because of a bigger output pie, higher total labour payments under a share system are not at all inconsistent with higher profits. The model of this paper lacks an explicit feedback loop connecting changes in factor payments back to changes in final demands. But I strongly suspect that if such a link were appropriately specified it would show (on average) that the higher income of a full employment share system tends systematically to generate greater demand and higher profits than the lower income of a wage system in the intermediate term adjustment to a deflationary shock.

[2] As usual, the existence of an externality argues for the intervention of an outside co-ordinator. Note that the government can encourage firms to choose a high share component by offering to tax share income at a more favourable rate than wage income.

there can be no pretence of offering a complete analysis; indeed, 'inflation' in this real context merely means higher output prices relative to the preceding period.

As a rule, economists are accustomed to thinking of recovery as a period of some upward pressure on prices because in a wage system expansion to get out of a recession is typically stimulated by increased aggregate demand. But in a share system the absorption of unemployed labour originates primarily on the supply side, which puts *downward* pressure on output prices. Share firms in equilibrium would like to reduce their prices further by producing more output and moving down their demand curve, but are held back because they cannot find any involuntarily unemployed labour to hire.

Consider the short run or first round effects of a pure supply side shock which exogenously increases the cost of some raw material complementary with labour (e.g. imported oil). For the sake of argument, assume strict complementarity. The wage firm will respond in the standard way by laying off workers, decreasing output, and raising prices. The share firm will react by trying to hold the same levels of employment, output, and price. The long run adjustment of both systems is identical, involving basic changes in compensation parameters, relative prices, and resource allocation patterns. But in the short run a share firm tries to absorb supply side shocks without raising prices or causing unemployment.

An economy of product wage firms, each of whose wages are linked to their own product prices, is inherently biased against inflation because it is costly to the firms. Other things being equal, there is less tendency for a producer to raise prices and more tendency to lower them in response to any given shock, since all price changes now show up also on the cost side.

As another matter, consider the effect of exogenously raising the compensation parameter λ_i above its equilibrium value λ_i^*. With a wage contract, if firm i is forced to pay a higher wage it will decrease employment and raise the price of output. With a share contract and (29) holding as a binding constraint, the profit maximising firm would offset any exogenously imposed increase in λ_i by hiring more labour, increasing output, and lowering price. Of course profits are also decreased if λ_i is raised above λ_i^*, so that the long term response of the firm may well be to go out of business. This consideration aside, however, a share firm does not pass through an artificial compensation parameter increase into higher prices, whereas a wage firm does.

Finally, to the extent that a share system helps to absorb unemployed labour in any way, it automatically gives the government more freedom to treat inflation without having to worry quite so much about the adverse effects on employment.

CONCLUSION

In this paper I have argued there are strong theoretical reasons for believing that were a share system in effect for large firms, the average worker, as well as the economy as a whole, would be better off because of a built-in bias toward eliminating unemployment, expanding production, and lowering prices. A share system for large scale firms represents a structural reform of capitalism that

eliminates the worst features of stagflation by, in effect, restoring the direct link between prices and wages characteristic of atomistic self-employed enterprises. If such an approach truly represents a way of getting a strong grip on stagflation, it would seem to be well worth consideration.[1]

Massachusetts Institute of Technology

Date of receipt of final typescript: May 1983

---

[1] In this age of computerised accounting, it would be a small technological matter to automate the calculation and printing of pay checks linked to some relatively well defined index of current company performance. An arrangement like the following might be envisioned. Labour and management, guided by the invisible hand of competition and the visible hand of collective bargaining, agree on a quasi-fixed *proportion* of gross revenues to be set aside in future periods as a wage payment fund. (An alternative, which frees the workers from all dependence on purely stochastic elements, is to fix the absolute size of the total wage payment fund or to base it on a deterministic formula like (12).) Each job category is then remunerated by a predetermined number of fund shares. The actual wage received by a given worker is the number of his or her fund shares times the size of the current wage payment fund divided by the total number of shares outstanding. (Workers in large corporations who want some protection against fund fluctuations could sell their firm's stock short, or an insurance company could offer a neatly packaged version of the same idea.) Such a scheme strikes me as eminently practical; but even if the opposite were held to be true, that charge would have to be weighed against the damage done by the present stagflationary alternative. Actually, it is not technological feasibility, so much as a change in attitudes, a 'cultural revolution', that is needed for a solution along the lines suggested here. There needs to be widespread social acceptance of the principle that important externalities make everyone benefit when labour shares more directly in the gains (and losses) of an enterprise.

REFERENCES

Akerlof, G. A. and Miyazaki, H. (1980). 'The implicit contract theory of unemployment meets the wage bill argument'. *Review of Economic Studies*, vol. 47, pp. 321–38.

Azariadis, C. (1981). 'Implicit contracts and related topics: a survey'. In *The Economics of the Labour Market* (eds Z. Hornstein, J. Grice and A. Webb). London: HMSO.

—— and J. Stiglitz (1983). 'Implicit contracts and fixed price equilibria.' *Quarterly Journal of Economics*.

Baily, M. N. (1974). 'Wages and employment under uncertain demand'. *Review of Economic Studies*, vol. 41, p. 37.

Blinder, A. A. (1977). Indexing the economy through financial intermediation'. In *Stabilization of the Domestic and International Economy*, vol. 5 in Carnegie-Rochester Public Policy Series. North Holland.

Fischer, S. (1977). 'Wage indexation and macroeconomic stability' In *Stabilization of the Domestic and International Economy*, vol. 5 in Carnegie-Rochester Public Policy Series. North Holland.

Galbraith, J. K. (1951). *A Theory of Price Control*. Harvard University Press.

Gray, J. A. (1976). 'Wage indexation: a macroeconomic approach.' *Journal of Monetary Economics*, vol. 2, no. 2, pp. 221–35.

Hart, O. D. (1983). 'Optimal labour contracts under asymmetric information: an introduction.' *Review of Economic Studies*, vol. 50 pp. 3–35.

Hicks, J. R. (1964). *The Theory of Wages*, 2nd ed. London: Macmillan.

—— (1965). *Capital and Growth*. New York: Oxford University Press.

Knight, F. H. (1921). *Risk, Uncertainty, and Profit*. New York: Kelley Reprint of Economic Classics (1964).

Kornai, J. (1971). *Anti-Equilibrium*. North Holland.

Meade, J. E. (1978). 'The meaning of "Internal Balance".' ECONOMIC JOURNAL, vol. 88, 423–35.

—— (1979). 'The adjustment process of labour co-operatives with constant returns to scale and perfect competition.' ECONOMIC JOURNAL, vol. 89, pp. 781–8.

—— (1982). *Wage Fixing*. London: George Allen and Unwin.

Okuno, M. (1982). 'Corporate loyalty and bonus payments: an analysis of work incentives in Japan.' Mimeographed. Yokohama National University.

Schloss, D. F. (1892). *Methods of Industrial Remuneration*. London: Williams and Norgate.

Shackle, G. L. S. (1949). *Expectation in Economics*. Cambridge: Cambridge University Press.

Solow, R. M. (1979). 'Alternative approaches to macroeconomic theory: a partial view.' *Canadian Journal of Economics*.

Vanek, J. (1970). *The General Theory of Labor Managed Market Economies*. Cornell University Press.

Weitzman, M. L. (1974). 'Prices vs. quantities.' *Review of Economic Studies*, vol. 41, pp. 477–91.

—— (1982). 'Increasing returns and the foundations of unemployment theory'. ECONOMIC JOURNAL, vol. 92, pp. 787–804.