

# A Solution to the Allocation-Distribution Dilemma

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## 1. Introduction

For almost two decades it has been widely recognized that most western economies suffer from stagflation, in the sense that unemployment cannot be permanently reduced through keynesian type policies like fiscal or monetary expansion. Despite this fact a general accepted type of policy to deal with the problem of stagflation is yet to be found.

In the mid eighties the idea of introducing profit sharing to deal effectively with stagflation was put forward by M. Weitzman (1983,1985).<sup>1</sup> Although the idea was generally accepted as potentially forceful, it was/is criticized that the labour market is too poorly modelled in the mentioned articles. This led to a "second generation" of models analyzing profit sharing arrangements. The models were general equilibrium models with decentralized wage bargaining between a firm and a union. Models of this type are Weitzman (1987), Jackman (1988) and Holmlund (1990). Jacobsen & Schultz (1989) is a danish contribution to this literature. Stephensen (1992) considers both decentralized and centralized wage bargaining within the same model. The results of the second generation models were/are that the positive effect on employment from profit sharing is subject to qualifications, and even if these are met, there is in general no tendency for the long run unemployment to vanish. Therefore it is probably not too pessimistic to conclude that these results implied that the profit sharing proposal lost its flavour of "miracle cure".

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The present paper seeks to revive some of the hopes attached to profit sharing. We do this by introducing a "new" institution: The equalization fund (abbreviated the eq. fund). The fund works in the following way: In stead of paying the profit related payment directly to the workers, the firms pay this amount into the fund (which one also might call a clearing house). From the fund each worker receives the *average* profit related payment per worker no matter in which firm he or she works.<sup>2</sup> In a symmetric equilibrium, which is the equilibrium concept considered in this paper and in the papers mentioned above, the fund would not affect the total payment to the workers if the behavior of the agents remained the same after the introduction of the fund. However, the point to be made in this paper is that the fund does change the behavior of the agents. In fact we will show that the eq. fund is an institution by which the allocation effect and the distribution effect of the real wage may be separated. To put it another way: With this institution one may increase the workers share of production without altering the size of the production, i.e. without creating unemployment. In the paper we report results of introducing profit sharing with an eq. fund in the case of competitive labor market and in the case of a labor market with centralized wage bargaining. In the last case we argue that profit sharing *with* an eq. fund is a cure against stagflation even though pure profit sharing is not.

## 2. Results in a model with a competitive labor market

Following Weitzman (1985) we assume that imperfect competition prevails in the goods market and that the number of goods produced is  $n$ . These goods cannot be stored. In addition there exists a non produced good (money), which may be stored. Money is provided by the public sector, which has only this activity. The consumers are assumed to have a compound CES – Cobb-Douglas utility function of the Dixit & Stiglitz type. Given these assumptions the objective demand of a single firm,  $j$ , is given by the following standard expression

$$y_j = \left[ \frac{P_j}{P} \right]^{-E} \left[ \frac{\delta M}{P} \right], \quad \delta > 0, E > 1 \quad (1)$$

where  $y_j$ ,  $P_j$  is the production respectively the price of firm  $j$ .  $P$  is the general price index of the economy,  $M$  is the money stock and  $E$  is the price elasticity of demand, assumed to be constant. A detailed derivation of (1) is given in Pedersen (1989b). Without profit sharing the maximization problem of a specific firm is given by

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2. To maintain the positive incentive effects of profit sharing – effects which are ignored both in this paper and in the mentioned literature – one could construct the arrangement such that only a part of the profit related payment is paid into the eq. fund. For simplicity this split is ignored in the present paper. See Pedersen (1990) for some results.

$$\text{Max}_{\ell_j} R(\ell_j) - w\ell_j = P_j y_j - w\ell_j = P \ell_j^{\alpha\mu} \left[ \frac{\delta M}{P} \right]^{(1-\mu)} - w\ell_j \quad (2)$$

To get the last expression we have used that the production function is assumed to be Cobb-Douglas,  $y_j = \ell_j^\alpha$  where,  $\alpha < 1$ , and substituted for  $P_j$  using (1). The optimal employment rule of firm  $j$ , given this problem is:

$$\frac{W}{P} = \alpha\mu \ell_j^{\alpha\mu-1} \left[ \frac{\delta M}{P} \right]^{(1-\mu)}, \text{ where } \mu = 1 - (1/E) \quad (3)$$

(3) is the standard optimal employment rule stating that workers should be employed until the real marginal revenue product of labor equals the real wage. Assuming that there exists an exogenous labor supply,  $N$ , and that all firms have identical productions functions,  $y_j = \ell_j^\alpha = \ell^\alpha \forall j$ , and finally that the labor market is competitive, implies that the (symmetric) equilibrium real wage becomes

$$\frac{W}{P} = \alpha\mu \left[ \frac{N}{n} \right]^{(\alpha\mu-1)} \left[ \frac{\delta M}{P} \right]^{(1-\mu)} \quad (4)$$

Our first experiment is to introduce profit sharing without an eq. fund into this economy, that is, we will consider a remuneration scheme of the following form

$$W_j = \lambda_j \left[ \frac{R(\ell_j)}{\ell_j} \right] + (1 - \lambda_j) \omega_j \quad (5)$$

where  $\lambda_j$ ,  $\omega_j$  is the share parameter respectively the base wage of firm  $j$ .

Defining voluntary profit sharing as a remuneration scheme where the firm chooses the level of the share parameter,  $\lambda_j$  in (5), we get the following result:

**PROPOSITION 1:** *The equilibrium of the economy given a voluntary profit sharing scheme is identical to the equilibrium of the economy given a standard wage scheme if the labor market is competitive.*

**PROOF:** See Weitzman (1985) or Pedersen (1989a)

Defining a legislated profit sharing scheme as a remuneration scheme where the level of the share parameter,  $\lambda_j$ , is set by legislation, we have found the following Corollary:

*COROLLARY: The equilibrium of the economy does not change if the profit sharing scheme is legislated in stead of voluntary.*

PROOF: See Pedersen (1989a)

PROPOSITION 1 states that introduction of profit sharing into an economy with a competitive labor market affects neither the allocation of labor nor the distribution of income in the economy. This is the famous neutrality result first reported in Weitzman (1983,1985). In the following we will give the intuition behind this result: Consider the equilibrium with profit sharing, that is with  $\lambda_j > 0$ . PROPOSITION 1 implies that  $\omega_j < W$ . Therefore the marginal revenue product of labor is greater than the direct marginal cost of labor ( $= \omega_j$ ) How can this be an equilibrium? To see this, assume contrary that the marginal revenue product of labor is identical to the direct marginal cost of labor. Starting from this position we consider a single firm which reduces the base wages marginally. This implies that the workers of this firm is paid less than in other firms. Therefore there will be quits. Given that the firm in question is small (as we assume in the model) the quitting workers will be employed in other firms without affecting the market payment to the workers. Thus the quitters will be better off. However, the quitting will stop when a sufficient number of workers have quitted. This is so, because for given parameters  $(\lambda_j, \omega_j)$  profits per worker in a single firm is a decreasing function of the number of workers in the firm. Therefore the quits imply that the total payment to the remaining workers increases and eventually the total payment to the remaining workers reaches the market level. The profits of the firm in question is increased by this operation since originally the total payment to the marginal worker exceeded the marginal revenue product of labor. This implies that the original position cannot be an equilibrium. Therefore the firm will decrease the base wage for a given positive share parameter and it will do so until the total payment per worker equals the marginal revenue product of labour. Of course this is exactly the optimal employment rule for a firm in an economy without profit sharing as well.

If an eq. fund is considered along with the profit sharing scheme and we still focus upon a competitive labor market we get the following results:

*PROPOSITION 2: If the profit related payment to the workers is paid into an eq. fund which pays the average profit related payment to each employed worker, then no voluntary profit sharing arrangement exists in an economy with a competitive labor market.*

PROOF: See appendix

*PROPOSITION 3A: With a competitive labor market the equilibrium allocation of labor (and therefore of production) given a legislated sharing scheme with an eq. fund is identical to the equilibrium allocation of labor given a standard wage scheme.*

PROOF: See appendix

**PROPOSITION 3B:** *With a competitive labour market and a legislated profit sharing scheme with an eq. fund the total payment to the workers is increased with the amount that the workers receive from the eq. fund when comparing to the payment of the workers given a standard wage scheme.*

**PROOF:** See appendix

The content of PROPOSITION 3B explains PROPOSITION 2: It is simply more expensive to attract workers using a profit sharing scheme given an eq. fund than using a standard wage scheme. To see the intuition behind the result we consider the equilibrium of the economy with profit sharing and an eq. fund. In this equilibrium we have that the direct marginal cost of labor ( $= \omega_j$ ) is equal to the marginal revenue product of labor. Why is this an equilibrium? Above we saw that without the eq. fund this was not an equilibrium – What has changed? To see this, we again consider a firm which reduces the base wage marginally from the equilibrium value. As before this implies that there will be quits from the firm. However, contrary to the case without the eq. fund the quitting will not be limited. This is the case since each (employed) worker receives the same profit related payment (= the average) from the eq. fund no matter where he or she is employed. Thus in a competitive labor market with profit sharing and an eq. fund firms cannot use the profit related payment to attract workers. Workers simply allocate their labor where the base wage is highest. This implies that the firm which reduces the base wage will end up having a work force of zero, which of course is not optimal. The result is that the firms compete for workers using the base wage, therefore the base wage plays the same role given a profit sharing scheme with an eq. fund as does the wage given a standard wage scheme. The profit related payment simply works as a lump sum transfer from the firms to the workers.

### **3. Results in a model with centralized wage bargaining**

In this section we will make a standard analysis of an economy with wage bargaining and profit sharing *without* an eq. fund. We assume that institutions are, that all workers are organized in a single union which bargains over the wage with the employers' union, which organizes all firms. When the remuneration scheme is a profit sharing scheme, we assume that the level of the share parameter is mandated by law and that the organizations bargain over the base wage. In the bargaining both parties are assumed to have perfect information about the economy and especially they know how the choice of a specific wage will affect their object functions. To find the consequences of a specific choice of  $w$ , the organizations calculate the symmetric equilibrium of the model given this  $w$ . Focusing upon wages for which the firms are not rationed in their demand for labor this can be done in the following way: Given a standard wage scheme each firm maximizes the profits as given in (2) taken the wages as given. Thus the

optimal employment rule of a single firm is still given by (3) for any  $w$  for which the firm is not rationed in its demand for labor. The symmetric version of (1) is  $y = (\delta M/P)$ . Inserting this into the market clearing condition,  $y = \ell^\alpha$  yields the following relation for  $P$

$$P = \delta M \ell^{-\alpha} \quad (6)$$

Inserting  $P$  from (6) into the optimal employment rule (3) yields the following symmetric equilibrium relation between the wage and the employment for a given money stock.

$$W = (\delta M)^\alpha \mu \ell^{-1} \quad (7)$$

Thus for a given money stock there is a functional relation between the nominal wage and the employment. In case of a legislated profit sharing scheme (7) becomes a relation between the base wage and employment. This is so, because both employers and workers are assumed to accept the outcome of the wage bargaining and take this outcome for given. Therefore the firms maximize profits taken the parameters  $\lambda$ ,  $\omega$  as given. The solution to this problem is to employ labor until the direct marginal cost ( $= \omega$ ) is equal to the marginal revenue product of labor. Therefore the wage in (3) – and thus in (7) – is replaced by the base wage when legislated profit sharing is considered. Notice the difference between this behavior and the behavior given a competitive market. In the latter case a legislated profit sharing scheme implies that the firm has to take the share parameter  $\lambda$ , and the *total remuneration* as given when maximizing profits. Since the total remuneration depends upon the level of employment as well as the share parameter and the base wage, the firm has the freedom to set both the level of employment *and the base wage* subject to constraint on the total remuneration.

The utility function of the employers' union is given by  $\Pi = n (1-\lambda) P^{-1}(R(\ell) - \omega \ell)$  which is the sum of the real profits to the owners in the economy with profit sharing. In the case of a standard wage scheme we simply let  $\lambda = 0$ . The utility function of the labor union is given by  $U = n [\lambda R(\ell) + (1-\lambda)\omega \ell]P^{-1} - C\ell$ , which is the sum of the real total payment to the workers minus a minimum level of the real total payment per employed,  $C > 0$ , times the number of employed. The latter term,  $C\ell n$ , is a measure of insider power in the decision making of the union. We assume that the solution to the wage bargaining can be found by applying the asymmetric Nash bargaining solution, where the outcome in case of a conflict is assumed to be  $(U, \Pi) = (0,0)$ . Thus the outcome of the wage bargaining is the solution to the following problem

$$\begin{aligned}
& \text{Max}_{\omega} \beta \log (n[(\lambda R(\ell) + (1-\lambda)\omega\ell)P^{-1} - C\ell]) + \\
& (1-\beta) \log [n(1-\lambda)P^{-1}(R(\ell) - \omega\ell)] \\
& \text{Subject to (a) } \omega = (\delta M) \alpha \mu \ell^{-1} \\
& \quad \quad \quad (b) R(\ell) = P \ell^{\alpha\mu} \left[ \frac{\delta M}{P} \right]^{(1-\mu)} \\
& \quad \quad \quad (c) P = \delta M \ell^{-\alpha}
\end{aligned} \tag{8}$$

Solving problem (8) implies that we have the following results in the economy with centralized wage bargaining:

PROPOSITION 4: For  $\beta > 0$  there is unemployment in the economy if the levels of the parameters  $(\lambda, \beta, \alpha, \mu, C, n, N)$  are such that

$$\ell = \left[ \frac{\alpha(\alpha\mu(1-\lambda) + \lambda)}{C(\beta + (1-\beta)\alpha)} \right]^{1/(1-\alpha)} < \frac{N}{n} \tag{9}$$

PROOF: Follows directly from solving problem (8).  $\square$

COROLLARY 2: Money is neutral in the economy.

PROOF: It follows from (9) that the money stock does not affect the level of employment and therefore it does not affect production.  $\square$

From PROPOSITION 4 we have that there exists parameters of the model for which there is unemployment irrespectively of the level of the share parameter,  $\lambda$ . Using COROLLARY 2, we have that for these parameter values the economy suffers from stagflation in the sense that there is unemployment and monetary policy is powerless. Thus for the parameter values fulfilling PROPOSITION 4 for any value of  $\lambda \leq 1$ , we have that *profit sharing is not a cure for stagflation*. On the other hand profit sharing is not a powerless instrument if increased employment is the object. In fact we have the following proposition:

PROPOSITION 5: Given that the parameters  $(\beta, \alpha, \mu, C, n, N)$  are such that (9) is fulfilled for  $\lambda = \bar{\lambda}$ , where  $\bar{\lambda} \in ]0, 1[$ , then increasing the share parameter will increase employment.

PROOF: Differentiating (9) with respect to  $\lambda$  yields:

$$\frac{\partial \ell}{\partial \lambda} = \ell^{-1} \left[ \frac{\alpha(1-\mu)}{(1-\alpha)C(\beta + (1-\beta)\alpha)} \right] > 0. \square$$



PROPOSITION 5 states that unemployment is less in an economy with profit sharing than in an economy with standard wage scheme, if there is unemployment in the latter. This result is similar to the results obtained in the mentioned "second generation" of model analyzing profit sharing. Due to the assumption of a Cobb-Douglas production function it turns out that in our case the total real payment to the workers is unaffected by the changes in the share parameter, such that the whole effect becomes an increase in employment. A similar result is found in Hoel & Moene (1988) in case of a decentralized wage bargaining.

#### 4. Changing the rules of the game

We will now show how it is possible to improve upon the results obtained in the last section by introducing the eq. fund into the considerations. To do this consider an alternative bargaining institution where the employers' union and the labor union bargain over the level of the share parameter whereas the level of the base wage is determined by competitive forces in the labor market.

First we will consider this institution in the absence of the eq. fund. This is easy, since the result follows immediately from PROPOSITION 1: the total remuneration of the worker is equal to the competitive total remuneration of the workers. The result is due to the fact that if the base wage is determined by competitive forces, then the neutrality result of PROPOSITION 1 holds no matter how the share parameter is determined. Clearly this implies that bargaining over the share parameter alone would be unacceptable to the labor union, since it would have the effect that this union would be without any effective bargaining power.

Turning to the case of profit sharing *with* an eq. fund, we know from PROPOSITION 3A & 3B that an increase in the share parameter will affect the distribution of income, even if the base wage is determined by competitive forces in the labor market. Therefore bargaining over the share parameter will not leave the labor union without effective bargaining power.

*At the same time the fact that the base wage is determined by competitive forces in the labor market guarantees that full employment prevails. In this way the struggle over the distribution of income leaves the allocation of labor unaffected and the economy is cured for stagflation.*

To find the effects on the distribution of the new institution we derive the share parameter, which is the outcome of the bargaining. It is the solution to a maximization problem, which only differs from (8) by the following two characteristics: First, the bargaining is over the share parameter,  $\lambda$ , where the base wage,  $\omega$ , is taken as given, and second, the level of employment is given such that there is full employment ( $\ell = N/n$ ). One result of this maximization problem is that

$$\frac{\beta}{1-\beta} = \frac{U(\lambda; (N/n))}{\Pi(\lambda; (N/n))} \quad (10)$$

The content of (10) is that the relative utilities of the two parties are equal to the relative strength in the bargaining. Solving the equation for  $\lambda$  yields:

$$\lambda = \frac{\beta + (1-\beta)C \left[ \frac{N}{n} \right]^{(1-\alpha)} - \alpha\mu}{1 - \alpha\mu} \quad (11)$$

Using (11) we find that given the new institution the real total payment per worker and the real profit are as given by (12) and (13) respectively.

$$\frac{W}{P} = \beta \left[ \frac{N}{n} \right]^{(\alpha-1)} + (1-\beta)C \quad (12)$$

$$\Pi = (1-\beta) \left( \left[ \frac{N}{n} \right]^\alpha - C \left[ \frac{N}{n} \right] \right) \quad (13)$$

We see that labor's share of the total real income ( $y = \left[ \frac{N}{n} \right]^\alpha$ ) is equal to the labor union's weight in the bargaining plus a term which depends upon  $C$ , the minimum real wage of the union, which we use as a measure of insider power in the unions utility function. At a first glance this last term may seem to be an unsatisfactory feature of the new institution. However, one should bear in mind, that the measure of insider power also plays a crucial role in the determination of the distribution of income given alternative institutions. Therefore it may be most instructive to see the effects of changing the institutions in some specific cases. To make things simple, we define the real wage minimum as some fraction,  $v < 1$ , of the potential production per employed:

$$C = v \left[ \frac{N}{n} \right]^{(\alpha-1)} \quad (14)$$

*Case 1: A very high minimum real wage*

In this case the real wage is defined such that the economy with centralized bargaining over the base wage suffers from unemployment irrespective of the level of  $\lambda$ . From (9) and (14) this implies that  $1 > v > [(\beta/\alpha) + (1-\beta)]^{-1}$ . Bargaining over the share parameter given an eq. fund implies that there is full employment and that the total real payment per worker is lower than in the case of bargaining over the base

wage. Given this result it is hardly surprising that one can construct examples where bargaining over the share parameter implies higher real profits than does bargaining over the wage, given a standard wage scheme. This will be the case if for example the parameter  $\mu$  is sufficiently small. A sufficiently small  $\mu$  will also imply that the utility of the labor union increases by shifting to bargaining over the share parameter. This is due to the fact that the union benefits from the resulting increase in employment. Comparing bargaining over the share parameter to bargaining over the base wage for a given positive share parameter yields the result that the possibility of increasing the utility of the labor union reduces with the level of the share parameter. This is so, since legislated profit sharing increases employment without reducing the total real payment per worker. To conclude: In the case where there is unemployment due to strong insider forces the bargaining over the share parameter achieves full employment primarily at the expense of the insiders.

*Case 2: An identical real wage in the two different bargaining institutions*

In this case  $C = \alpha \left[ \frac{N}{n} \right]^{(\alpha-1)}$ , and it is possible to achieve full employment with bargaining over the base wage. This is the case if the exogenous share parameter,  $\lambda$ , is equal to the  $\lambda$  given by (11). There is unemployment if bargaining over the wage, given a pure wage system, is considered. Labor union utility is higher given bargaining over the share parameter than given bargaining over the base wage if the exogenous  $\bar{\lambda}$  is less than  $\lambda$  given by (11). This is so because an increased  $\bar{\lambda}$  implies increased employment for a constant total real payment per worker. Further, there is a possibility that the utility of the employers' union is increasing in  $\lambda$  in the relevant region. For  $\alpha > 1/2$  this is possible for some parameter constellations. Thus it is possible that bargaining over the share parameter Pareto dominates bargaining over the base wage.

*Case 3: A very low minimum real wage*

In this case insider forces are small in the labor union and there is given full employment when bargaining over the standard wage is considered. With  $C$  given by (14) this amounts to  $v \leq (\alpha\mu)/[(\beta/\alpha) + 1 - \beta]$ . In this situation, the effect of replacing the traditional wage bargaining with the bargaining over the share parameter is that the real wage is increased, and thus that the distribution of income is shifted in favor of the workers without affecting the level of employment.

This concludes our analysis. We found that profit sharing with an eq. fund is a cure to stagflation in an economy with centralized wage bargaining, if the employers' union and the labor union bargain over the share parameter, whereas the base wage is determined by competitive forces in the labor market. Finally it was possible to give examples where this institution Pareto dominates the present institution of wage bargaining.

## Appendix

### PROOF OF PROPOSITION 2

With voluntary profit sharing with an eq. fund and a competitive labor market a firm has the following maximization problem:

$$\text{Max } \Pi_j = (1-\lambda_j)(R(\ell_j) - \omega_j \ell_j) \quad (\text{A})$$

$$w_j, \lambda_j, \ell_j$$

subject to  $\omega_j = \Omega$ , where  $\Omega$  is the market rate of the base wage.

It follows that if  $(R(\ell_j) - \omega_j \ell_j) > 0$  then  $\lambda_j = 0$  is optimal for  $\lambda_j \in [0, 1]$ .  $\square$

### PROOF OF PROPOSITION 3A

Follows immediately from the fact that with a competitive labor market, there is full employment combined with the fact that both equilibria are symmetric.  $\square$

### PROOF OF PROPOSITION 3B

From the maximization problem (A) we have the following first order condition

$$R'(\ell_j) = \omega \quad (\text{B})$$

In equilibrium (B) implies that the base wage is given by an expression like (4) in  $\omega$  in stead of  $w$ . Since  $P = (\delta M)(N/n)^{-\alpha}$  for any remuneration scheme, given which there is full employment, (B) implies that the base wage is equal to the wage given a standard wage scheme. The proposition follows immediately.  $\square$

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