The Simple Economics of Profit-Sharing Schemes

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Abstract

This paper proposes a very simple structure to reach the heart of the issues concerning profit- sharing schemes. It shows that a framework which assumes that there is no uncertainty is hardly appropriate and that when uncertainty is introduced the claim that profit-sharing can create jobs becomes an ambiguous one. An appealing and intuitive rationale for this ambiguity is given. This represents a middle ground between Weitzman who claims profit sharing is employment creating and his critics who argue that there are no positive effects. The paper argues that the only hard core justification for profit sharing is to enable mutually profitable trades in risk to occur. Any employment consequence should be seen as incidental and if there is 'disequilibrium' unemployment then there are alternative and more robust ways of generating more employment.

1. Introduction

In a series of articles, pamphlets and books, Weitzman has popularised the idea of profit sharing as an employment creating device. His 'big idea' has met with an equally hostile and sceptical response claiming there is no positive employment creating effect.[2] The idea of profit sharing acting as a type of gigantic vacuum cleaner voraciously mopping up excess labour whenever it should appear is a virtue self-evident to Weitzman alone, according to his critics. It is suggested here

that the only reasonable answer to the question concerning employment is, 'I do not know.' Weitzman is too dogmatic to claim a positive effect and his critics are equally dogmatic when asserting the contrary. The note gives a rationale for this ambiguity, which is well-grounded in economic theory. A simple pedagogical device which assumes quadratic preferences, similar to the well known Tobin (1958) portfolio choice model, is seen to generate a profit sharing scheme whereby wages are a linear function of profits — the most commonly observed type of profit sharing scheme.

2. Weitzmann and his critics

The basis of Weitzman's idea is easily seen. Let there be a linear profit-sharing scheme of the following type:

$$w = w_0 + \frac{\gamma \pi}{N}, \quad ...(1)$$

where w = earnings per worker including profit share, w_0 = the basic wage, γ = a fraction $(0 < \gamma < 1)$, π are profits and N are the numbers employed. This linear scheme is usually asserted as being representative of actual schemes and is not derived as the optimal outcome of some underlying bargain between management and workers. Later it will be shown how such a scheme can represent the best possible contract with the workforce. It is also implicitly understood that the wage can never fall below w_0. If there are negative profits the workers are not penalised as would be the case on a strict

interpretation of equation (1). Profits are given by

$$\pi = \bar{\theta}f(N) - w_0N, \quad ...(2)$$

where $\bar{\theta}f(N)$ are revenues and where $\bar{\theta}$ can be thought of as an exogenously given price term. Later risk is explicitly introduced by making this price term a random variable with decisions about employment are required to be made before the state of nature concerning the price is revealed. The firm wishes to maximise net revenue which is

$$\pi - \gamma\pi = (1 - \gamma)(\bar{\theta}f(N) - w_0N). \quad ...(3)$$

Given unlimited supplies of labour, the firm will employ labour to the point where the marginal product equals the base wage rate, w_0. The employment creation effect arises from the fact that the marginal product must necessarily lie below worker remuneration which includes the profit share $\gamma\pi/N$. This contrasts with a traditional payment system where marginal product equals worker remuneration. In order to focus most clearly on the key issues involved the level of effort is assumed to be unaffected by the profit-sharing contract. Some argue that improved effort is central to profit sharing, but the free-rider problem does not make this free lunch aspect of profit sharing immediately apparent.

Several flaws in this idea have been pointed out, but they really reduce to one central issue. Under profit sharing, as can readily be seen from equation (1), additional employment means declining remuneration at the margin. Why should workers agree to an employment generating scheme which means lower wages in return for additional employment? Estrin and Wadhwani (1990) demonstrate the *reductio ad absurdum* of this point. Suppose that wage cutting is not

permitted with any additional workers being paid the same as existing employees. In this case equation (3) is maximised subject to the constraint

$$w = w_0 + \frac{\gamma\pi}{N} \quad ...(4).$$

By substituting out the constraint, it is trivial to see that this then reduces to a traditional wage payment system, whereby the firm chooses a value for N to maximise

$$\pi = \bar{\theta}f(N) - wN \quad ...(5).$$

The conclusion is that profit sharing in the form that Weitzman suggests is just the classical prescription for employment generation once more, albeit heavily disguised. Like the classicals, Weitzman says that if you want more jobs then cut wages. If wage cutting is off the political agenda then there is no employment creating effect from profit sharing, as equation (5) shows.

Perhaps the most basic flaw with this type of analysis is a modelling framework which considers workers and firms to be operating in an environment of certainty. This misses out the central point of profit-sharing schemes, namely that the workers are not supposed to know precisely in advance what their remuneration will be. Profit sharing is all about mutual sharing of risks, yet the framework adopted by Weitzman and others ignores this central facet of profit sharing. All that Weitzman's critics show is that there is nothing of very much interest to say about profit sharing in a certainty framework. Blanchflower and Oswald (1987) recognize this most basic of points when they state,

> The implicit contract literature makes an interesting contrast. The principal *raison d'etre* of that literature has been

that workers' aversion to risk makes fixed contracts optimal. It is curious that Weitzman and other proponents of profit sharing have disregarded all this influential work.[3]

Assuming away risk is just to reduce profit sharing to a wage payment system but with a different set of labels. Since all parties know in advance what profits will turn out to be, nothing substantive can emerge from these arbitrary games of musical chairs of labelling one bit of the wage the profit share and the other the base wage.

The contrasting conclusions of Weitzman, and his critics such as Estrin and Wadhwani must therefore be considered as answers to a somewhat artificial problem. The employment consequences of profit sharing can only properly be answered in a risk-taking framework. The next section develops the appropriate framework.

3. The employment consequences of profit sharing

The simplest possible implicit contract framework is developed to see why the employment consequences of a profit-sharing scheme are bound to be ambiguous when the problem is properly specified in a risk-taking environment.[4] It is possible to elucidate more elaborate structures, but all these more complex designs are bound to face exactly the same issue to be considered here. It is a good pedagogical principle to use the least elaborate structure possible in order to make the point at issue.

Implicit contracts are all about making the best possible decisions in an environment of uncertainty and are the ideal framework to consider profit-sharing schemes. As a by-product of the discussion, the optimal profit-sharing contract is derived, rather than imposing an *ad hoc* structure, as must occur in the certainty framework considered in

section 1.

A risk-averse firm must negotiate a contract with its risk-averse workforce. Each employee will receive a wage $w(\theta)$, where θ represents some realized state of nature. This embodies profit sharing in a very general way since the wage is now no longer assumed to be constant; it can vary up and down depending on how successful the firm is. The contract must ensure each employee a level of expected utility of at least $U(\overline{w})$. Consequently, the following constraint must hold exactly (it always turns out that it is never sensible to pay more than $U(\overline{w})$):

$$E\{ U[w(\theta)] \} = U(\overline{w}) \quad ...(6)$$

where $U[w(\theta)]$ is a Von Neumann Morgenstern utility indicator with $U' > 0$ and $U'' < 0$ to reflect risk aversion and assumed to be the same for each worker. E is the expectational operator. A possible contract might set $w(\theta) = \overline{w}$ for all possible values of θ. This would be the non-profit-sharing contract with the wage constant at $\overline{w}$ irrespective of the performance of the firm. A profit-sharing contract would be one where the wage varied with the realized state of nature. Because of risk aversion any profit-sharing contract will have the property[5]

$$E\{w(\theta)\} > \overline{w} \quad ...(7)$$

This result will prove to be useful later.

The firm must maximise the expected utility of net profits subject to the utility constraint equation (6). The expected utility of net profits are

$$E\{ V[\pi(\theta)] \} - E\{ V[\theta f(N) - w(\theta)N] \} \quad ...(8)$$

where $V' > 0$ and $V'' < 0$, to reflect risk

aversion once more. N are the numbers employed and θ is the uncertainty or state of nature parameter, which is here taken to be the continuous density $g(\theta)$ defined over the interval $[\theta_L, \theta^U]$ with known mean $\bar{\theta}$ The firm must choose N before the state of nature is revealed, but can offer its workers a state-contingent wage contract, $w(\theta)$, specifying in advance the wage to be paid for each state of nature. Notice that equation (8) and equation (3) are consistent with each other because $w(\theta)$ embodies the profit share and hence the objective is to maximise net profits as before. The fact that N must be chosen in advance of the realization of θ gives the opportunity for mutually beneficial trades in risk — it is what Dreze and Modigliani (1972) refer to as a delayed uncertain prospect.

The firm maximises equation (8) subject to the constraint given by equation (6). The choice variables are N and $w(\theta)$. Form the Langrangian

$$L = E\{V[\theta f(N) - w(\theta)N]\}$$
$$+ \lambda[E\{U[w(\theta)]\} - U(\bar{w})] \quad ...(9)$$

The first order conditions require that

$$E\{[\theta f' - w(\theta)]V'\} = 0 \quad ...(10)$$

$$-NV' + \lambda U' = 0$$

The second of these two conditions shows the potential gains from profit sharing. To see the relationship between the wage and the state of nature variable θ, totally differentiate this second equation to obtain (note that N and λ are fixed and independent of θ)

$$-Nf(N)V''d\theta + N^2V''dw(\theta)$$
$$+ \lambda U''dw(\theta) = 0 \quad ...(11)$$

Hence

$$\frac{dw(\theta)}{d\theta} = \frac{Nf(N)V''}{N^2V'' + \lambda U''} > 0 \quad ...(12)$$

Thus better states of nature are, in general, associated with higher wages. This is the primary hard core justification for profit-sharing schemes, which certainty models are bound to ignore. Where a risk-averse firm comes face to face with a risk-averse workforce there are potential gains from trading in risk. Only in the special case of a risk-neutral firm would it be optimal not to have profit sharing. With a risk-neutral firm V' is constant, hence U' must also constant in every state of nature and the optimal wage contract wage specifies a constant wage $\bar{w}$.[6] In all other cases profit sharing is optimal.

A higher wage means a lower value for U'. From equation (10) it can be seen this must mean a lower value for V'. Consequently, higher wages must be associated with higher net profits. This coheres with commonsense; better states of nature are associated with higher net profits and higher wages. Perverse contracts on the lines of 'you do worse, if I do better' are ruled out in this framework.[7]

Several other comments are appropriate at this juncture. Notice that the optimal profit-sharing contract is derived unlike the imposed structures of the certainty case. For example, let U and V both be quadratic functions with $U[w(\theta)] = aw(\theta) - \frac{1}{2}b[w(\theta)]^2$ and $V[\pi(\theta)] = c\pi(\theta) - \frac{1}{2}e[\pi(\theta)]^2$, with a, b, c and e all positive constants. In this case it can be seen from equation (10) that the optimal profit-sharing contract is given by

$$-N[c - e\pi(\theta)] + \lambda[a - bw(\theta)] = 0 \quad ...(13)$$

or

$$w(\theta) = \alpha + \beta\pi(\theta) \quad ...(14)$$

where $\alpha = (b\lambda)^{-1}(\lambda a - Nc)$ is a constant and $\beta = (b\lambda)^{-1}(Ne)$ is also a constant. Notice that this is just the linear profit-sharing scheme once more, as described by equation (1).

The crucial differences are that this has been shown to be the optimal contract for quadratic preferences and directly embodies risk sharing. In Section I, π is known *ex ante*; here profits and the wage, which includes the profit share $\beta\pi(\theta)$, will only be revealed after a delay when θ is revealed. Equation (14) gets to the heart of the matter, not equation (1), despite the fact that both equations look the same.

No significance should be attached to the fact that it is the firm that appears to reap all the benefits from profit sharing. There is no comfort for anti-capitalist conspiracy theorists contained here! Maximising the expected utility of wages subject to a profit constraint could equally well be considered. In this case the gains would appear to accrue entirely to labour. All that the optimisation seeks to show is that there are potential gains from trade in risk sharing; how these gains are to be shared is a secondary issue which other modelling frameworks can consider.[9]

The issue of the employment consequences of profit sharing is now considered and for this the first condition of equation (10) will now becomes the focus of attention. The relevant comparison to make is employment under the optimal profit-sharing contract with employment when workers are paid the state invariant wage $\bar{w}$. Under non-profit sharing, employment is determined by

$$E\{(\theta f' - \bar{w})V'\} - 0 \quad ...(15)$$

Let employment in this case be N^* and under profit sharing let employment be N^{**}. Sandmo (1971) has shown that $N^* < N^{***}$ where N^{***} is the employment decision when there is no uncertainty and θ takes its mean value $\bar{\theta}$ always (this is the value of N which satisfies $\bar{\theta}f' - \bar{w} = 0$). This result is not immediately useful here because the relevant

comparison is between N^* and N^{**} and not with N^{***}.

Consider first of all two extreme cases. Let the firm be risk neutral and the workers be risk averse. Since V' can be treated as a constant and the optimal profit-sharing contract shifts all the risk to the firm with $w(\theta) = \bar{w}$, both the first condition of equation (10) and equation (15) reduce to

$$\bar{\theta}f' - \bar{w} - 0 \quad ...(16)$$

In this case $N^* = N^{**} = N^{***}$.

Now let the firm be risk averse and the workers be risk neutral. Because U' is now constant, it can be seen from the second condition of equation (10) that V' will be constant in every state of nature, that is net profits are fully insured with risk shifted entirely to the workers. Because the workers are risk neutral $E\{w(\theta)\} = \bar{w}$ and the second condition of equation (10) will reduce to equation (16) once more, unlike equation (15). Here $N^{**} = N^{***}$, and because $N^* < N^{***}$, profit sharing is employment creating in this case.

Unfortunately, life does not always consist of extreme cases. To see the general case, write the first term of equation (10) in an equivalent way as

$$E\{[\theta f' - \bar{w}]V'\} - E\{[w(\theta) - E\{w(\theta)\}]V'\} + [E\{w(\theta)\} - \bar{w}]E\{V'\} \quad ...(17)$$

It is easy to show that the first term in equation (17) is decreasing in N. Consequently, if the terms on the right hand side are overall zero then $N^{**} = N^*$ and if it is negative then $N^{**} > N^*$ and if positive then $N^{**} < N^*$. However, it is impossible to sign the right hand side. The first term is negative.[8] The second term is positive, since we know from equation (7) that $E\{w(\theta)\} > \bar{w}$ and $E\{V'\}$ is obviously positive. It is

impossible to say which effect will dominate, so the employment consequences of a profit-sharing scheme are bound to be ambiguous. The intuition behind this is quite easy to see, however. The first term tends to increase employment and might be termed the risk-diversification effect. Through profit sharing the firm reduces its exposure to risk and this will encourage it to hire more labour. This is, however, offset by the fact that by paying a varying wage the firm must raise the expected value of wage payments. This latter effect tends to be employment reducing. Overall, it is impossible to say whether the wage effect will dominate the risk-diversification effect.

4. Concluding comments

When it comes to the question of profit sharing, the well-known economic parable of associating one instrument with one objective should always be remembered. The objective of profit sharing is to enable profitable trade between employers and workers by a mutual sharing of risks. This is the primary hard core justification for the profit-sharing instrument and any employment consequences should be regarded as purely incidental. In Weitzman's framework, aggregate unemployment emerges by adopting a disequilibrium approach. Yet there is known to be a perfectly good instrument for dealing with unemployment in such situations, namely Keynesian demand management. No doubt proponents of profit-sharing schemes on the lines of Weitzman would claim that traditional demand management has been found to be wanting and that more elaborate and imaginative schemes are the order of the day. The view here is that a good case can be made for profit sharing in some circumstances, but employment creation should not figure as a justification. There

are better ways of creating jobs.

Endnotes

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2 See Weitzman (1983, 1984, 1985, 1986, 1987). For some of his critics see Blanchflower and Oswald (1988), Eaton (1985), Estrin and Wadhwani (1990), Nuti (1987) and Wadhwani (1986).

3 Oswald (1986) is also another notable exception, where the link between profit-sharing and the implicit contract literature is explicitly recognized.

4 See Rosen (1985) for a magnificent survey of this approach.

5 This requirement is intuitively obvious. A profit sharing contract with varying remuneration must offer a positive risk premium over and above $\bar{w}$ to compensate for uncertainty. A simple proof is, however, provided in Leslie (1993).

6 This is a well-known result in implicit-contract theory and serves to show that the extremely simple framework adopted here gets to the heart of the trading in risk problem.

7 Unfortunately, this is not always so. See the Rosen (1985) survey once again, especially when hours of work are introduced as an additional complication.

8 For example a Nash bargain analogue of the problem of the problem could be considered.

9 It is easy to see that $[w(\theta) - E\{w(\theta)\}]V'(\theta) < [w(\theta) - E\{w(\theta)\}]V'(E\{w(\theta)\})$ for all values of $w(\theta)$ (excepting when $w(\theta) = E\{w(\theta)\}$), where $V'(\theta)$ is marginal utility of profits evaluated at $w(\theta)$ and $V'(E\{w(\theta)\})$ is marginal utility evaluated at

the mean of $w(\theta)$. Now take expectations. Noting that $V'(E\{w(\theta)\}$ is non-stochastic and that $E\{[w(\theta) - E\{w(\theta)]\} = 0$, it follows that $E\{[w(\theta) - E\{w(\theta)]V'(\theta)\} < 0$, which is the first term of eq.(17).

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