The Effects of Alternative Sharing Arrangements on Employment: Preliminary Evidence From Britain

by

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ABSTRACT

A sample of British firms with diverse sharing arrangements is used to investigate the effects of profit sharing on employment levels. Employment effects are sometimes significant but depend upon the measure of profit sharing, how the dynamics are modelled, and whether measures of employee participation in decision making are included in the estimating equation. Using a continuous measure of profit sharing, employment effects, which typically range from -6% to 6% are much more modest than those obtained by some other researchers. Most findings are not dramatically affected by estimating for separate time periods, individual industries or separately for larger firms.

I. Introduction

Alternative systems of business organization and of worker's remuneration recently have become the focus of considerable attention. Since the major stimulus has been the work of Weitzman (e.g., Weitzman, 1983), most attention has consequently focused on the particular alternative favored by him, profit sharing, and on the particular crucial issue raised by Weitzman -- the enormous potential importance of structures internal to the firm, especially those that provide for flexible pay, in determining macro outcomes, Yet as been pointed out by some including Meade (1986) there are, in fact, an enormous variety of possible sharing arrangements. Moreover, a variety of benefits, including incentive effects, are claimed for such schemes. Our aim in this paper is, for a variety of forms of the share economy, to provide some information on one of these other claims. Specifically, we examine the notion that sharing in the firm's surplus will affect employment. In addition, we investigate if the employment effects of profit sharing depend upon the degree of worker participation in decision making.

In Meade's (1986) taxonomy of possible sharing arrangements, the crucial distinctions are, on the one hand, whether or not workers own stock in the company and, on the other hand, whether or not workers participate in decision making. This produces four basic types of sharing arrangements: profit sharing schemes; employee share ownership schemes; labor managed firms; and what Meade calls a labor-capital partnership. Yet for most forms of the share economy, as yet there has been very little empirical work on any of the economic effects of sharing. (See Jones and Pliskin (1989) for a review of the existing literature) The possible exception is for work on one form of sharing, namely producer (industrial/worker) cooperatives (PCs) on the issue of the effects of the various forms of financial sharing and participation in decision making by employees upon production efficiency. On this there is a growing body of evidence to suggest that for PCs the overall net effect is generally positive (see Estrin, Jones and Svejnar, 1987).

There are three arguments for profit sharing that are frequently advanced (see Blanchflower and Oswald (1987a) and Estrin, Grout and Wadhwani (1987). First, it is claimed that profit sharing increases productivity by inducing changes in workers' attitudes toward the firm (for example, see Fawcett (1865), and Ely (1889). Morale will improve, thereby increasing effort and reducing absenteeism and labor turnover. Lower turnover would reduce training costs and might be accompanied by more firm-specific human capital. If profit sharing raises the average product of labor, then a profit sharing firm will, other things equal, employ fewer workers at a given level of output.

The productivity augmenting effects of profit sharing is disputed by Jensen and Meckling (1979), who argue that managers will have an incentive to shirk their monitoring function if workers share in the firm's profits. In addition, they predict that worker participation in decision making would also lower productivity because it would increase the cost of monitoring workers. (However, Fitzroy and Kraft (1987) argue that workers in participatory firms might exhibit more cooperative behavior, which would reduce the cost of monitoring a worker's effort.)

The second and third arguments for profit sharing are directed more at the effects of profit sharing on the variability rather than level of employment. A traditional argument is that remuneration would be more flexible under profit sharing. Thus, the effect of unanticipated aggregate demand or aggregate supply shocks on employment would be cushioned by changes in remuneration.

This implies that employment variation over the business cycle would be less for a profit sharing firm than for a conventional fixed wage firm.

The third argument is one given in Weitzman (1983, 1984, 1985, 1986). Briefly, Weitzman argues that an economy populated by profit sharing firms would likely be characterized by an excess demand for labor because firms will attempt to hire workers to equate the value of the marginal product of labor to the base wage rather than to total remuneration (the sum of the base wage and the profit share bonus). If the base wage is set sufficiently low, the demand for labor would exceed the available supply, which is determined by total remuneration. In contrast, a conventional fixed wage economy would likely be characterized by excess labor supply or by labor market clearing. The main implication of Weitzman's work is that a profit sharing <u>system</u> would exhibit a smaller employment response to aggregate demand shocks than a conventional fixed wage <u>system</u>.

Although much of the recent interest in profit sharing reflects the second and third arguments outlined above, we believe that the effects on the <u>level</u> of employment is also an important policy issue. Moreover, as we discussed, economic theory is ambiguous on how profit sharing affects productivity and, consequently, employment. Thus, there is a need for empirical evidence.

The existing evidence on profit sharing alone, however, is mixed. Most studies on the employment effects of profit sharing have used enterprise-level or establishment-level data. Two studies of British firms -- Estrin and Wilson (1986) and Bradley and Estrin (1987) found that profit sharing has a favorable effect on the level of employment. Estrin and Wilson used a short panel data set of 52 firms in the engineering and metal working sectors over 1978-82, a period when the British economy was in a deep recession. A dummy variable was used to indicate if the firm had either a profit sharing or a value added cash bonus scheme. Profit sharing was estimated to have increased employment by approximately 13%. Bradley and Estrin (1987) examined the employment behavior of John Lewis Partnership, a worker owned firm which the authors argued behaved as if it were a conventional profit maximizing firm that distributed a share of its profits as an employee bonus. The sample consisted of data for John Lewis Partnership and its four main competitors in the retail sector for the 1970-1985 period. The effects of profit sharing were captured by four firm specific dummy variables for the four competitors. The estimated coefficients of these dummy variables indicated that employment at John Lewis Partnership exceeded employment at each competitor by 20% to 37% after controlling for remuneration, sales, retail sales, and employment in the previous year. If we take into account the effect of profit sharing on employment in the previous year, then their long run effects are triple those we just cited.

In contrast to the positive findings discussed above, Blanchflower and Oswald (1987b) find for their sample of British firms that employee share ownership schemes do not have a significant effect on employment. Blanchflower and Oswald (1987b) used survey data (the 1980 Workplace Industrial Relation Survey -- WIRS) for 637 establishments in the British manufacturing sector. A dummy variable indicated if the establishment had an employee share ownership scheme in which workers receive or can purchase cheaply shares of the firm. Data were not available on cash-based profit sharing. However, their results are less than definitive because Blanchflower and Oswald did not have data on remuneration and only had qualitative measures of the level of and the change in demand for each firm's products.[1]

By employing a rich new enterprise level data set that includes not only a variety of forms of the share economy but also conventional fix wage firms, we are able to progress beyond earlier studies. We are able to exploit the variability of the data across firms with a variety of profit sharing and participatory schemes, as well as fix wage firms. In the main, previous empirical work on the economic effects of a different share features has been based either on the variability of the data across firms within one category of sharing firms (e.g., Jones and Svejnar (1985) on the production efficiency of Italian producer coops) or between two sectors (e.g., Estrin and Wilson (1986) on employment in profit sharing versus fix wage firms). The premise underlying our empirical strategy is that it would be useful to exploit variations in the extent of profit sharing and participation in decision making by the sharing firms in our sample as well as between these firms and conventional firms. To this end, the detailed data on the variety of sharing arrangements will enable us to compare the results obtained by using continuous measures of profit sharing and participation with those obtained by the customary practice of capturing these organizational dimensions by using dummy variables. In addition, whereas previous researchers were able to use only post war data for relatively short time periods, we have available a long span of data. This will enable us to investigate whether the effects of incentives on employment at the enterprise level have changed significantly during the twentieth century.

The potential relevance of the study to students of industrial relations is shown in part by the international growth of forms of the share economy. Whereas in 1981 in the U.S. there were about 5300 ESOPs covering about 4,250,000 workers, by 1986 there were (excluding PAYSOPs) about 7500 ESOPs covering 7,500,000 workers. Of these, 12 majority employee-owned firms ranked among Forbes' list of the 400 largest private firms (N.C.E.O., December 1986). So far as profit sharing in the U.S. is concerned a survey in 1984 by the Bureau of National Affairs showed that 19% of employers have a profit sharing plan. In Canada, employee share ownership schemes have been introduced at a very rapid rate over the past few years (Toronto Stock Exchange (1987)). Moreover, this "phenomenal growth" was not supported by the sort of tax incentives available to U.S. ESOPs. Elsewhere, a survey in January 1987 revealed that in the U.K. about 4% of the adult population now own shares in the company for which they work (The Observer, January 18, 1987); this compares with less than 1% five years ago. Many ascribe the success of the Japanese economy in part to its payment system whereby about one quarter of the average worker's total compensation is in the form of a twice yearly bonus (Weitzman (1986)). In addition already there have been, and it looks as though there will continue to be, legislative initiatives in this area both in the West and possibly elsewhere too. For example, in the U.S. the new tax law has generated more interest in ESOPs. In the past five years various states, including New York and Massachusetts, have introduced legislation that encourages the formation of PCs. In the U.K. in March 1987 the government endorsed the merits of profit related pay by granting tax relief to encourage the adoption of such schemes.

II. Institutions and the Data

The data on which the subsequent empirical analysis is based are derived from two data sets, one for profit sharing firms and the other for conventional firms. The first data set, the share data set, comprises firms in three British industries - printing, footwear and clothing - that submitted reports to public agencies. For many years the data set contains considerable detail on dimensions of sharing including: the amount distributed as profits to (and earnings of) workers; the value of the average individually owned shares; the dividend income; indicators of the nature and extent of worker participation. Also there are financial data on items such as total assets and sales. Information on the labor force includes the gender structure of the work force and average earnings from wages, profit sharing and stock ownership. There is firm specific information on items such as the age of the firm and the region in which the firm is located.[2] Also we note that firms are both large and small and include, for example, enterprises in the clothing industry that employed more than 2000 workers during the 1930s.

For many firms this includes information from date of inception until demise, in some cases more than 100 years of data.[3] No other panel data set of this length exists for share firms. Another important feature of the share data set is that there are in fact a variety of sharing types, covering the whole spectrum from "only profit sharing" to firms that are completely controlled by workers -- "labor managed firms" (Vanek (1970)). In terms of Meade's taxonomy there are definitely examples that fall within each of three of his basic types, and possibly some which come quite close to resembling his labor-capital partnerships. Thus some firms are Weitzman-like profit sharing enterprises -- without employee ownership or worker participation in decision making -- and remunerate employees entirely in the form of cash. But many distribute profit as shares. The extent of employee ownership varies from zero in several cases, to more than 50% in more than a quarter of instances. So far as worker participation in decision making is concerned there are many cases in which workers have no representation whatsoever on any organs of enterprise decision-making. But there are also many examples in which the policy making board of directors includes employees that work in the firm. In some cases that body consists entirely of workers and these firms may be regarded as producer cooperatives (PCs) or labor managed firms.

The second data set <u>fixwage</u> is for firms in the same industries which have no share features whatsoever, and, as with the share data set, firms are both large and small.[4] Unfortunately, the range of the data set is confined to the period prior to 1940, which reflects data unavailability rather than the demise of these firms.

In Table I we present comparative descriptive information on key statistics for these different kinds of firms. The data used to prepare the table includes only the 3411 (annual) observations on 127 firms that were used to estimate the employment specifications reported below.[5] Still, we have long time series for many firms. Nine firms have at least 70 observations, thirty have at least 30, and sixty two have at least 20 years of data. The thirty firms account for 56% of the 3411 observations, while the sixty two firms account for 87% of these observations.

From column (1) we see that during the whole period (from 1890-1975 excluding 1940-45) the average firm in the combined data sets - share plus fixwage - had a labor force of 226 workers and sales (measured in 1980 pounds) of 1,166,000 pounds. About 13% of the observations for the combined data sets are for firms without profit sharing. From columns (2) and (3) of this table we see that, on average, profit sharing firms are smaller (LABOR, SALES), older (AGE) and better paying (W, R). On average the amount of profits received by workers in profit sharing firms is about 2.8% of total remuneration (B/(B + W)), which is similar to the practice of firms in the Estrin and

Wilson (1986) study.[6] However, there is a fair amount of variation in profit sharing across firms and over time for many firms. Six firms accounting for 260 of the 2955 observations on profit sharing firms paid on average over 5% of worker's pay in the form of a bonus. The bonus exceeded 10% in at least one year for seventeen of the firms and workers at most firms did not receive a bonus in at least one year. In our sample of profit sharing firms (which includes PCs) about 46% of the board of management comprises workers (EEBD), and about 53% of the workers choose to become members (WKDL). In columns (4) and (5) we present comparative data for sharing and non-sharing firms for the period preceding the second world war. By comparing columns (2) and (4) we see that in the period before 1940 compared to the period since 1945 profit sharing firms employed about the same number of workers, both measures of participation were smaller and distributed a slightly smaller fraction of total remuneration as a profit share to workers.

In the remaining columns we present data disaggregated for the main industrial sectors. On average, the biggest firms are in clothing and the smallest are in printing. The two measures of employee participation indicate that participation is always highest in footwear firms and lowest in clothing enterprises. Also, both the percent of total remuneration distributed as a profit share and the size of the average bonus are highest in the footwear industry. Since non-profit sharing firms are more abundant in clothing (NPS/T = 28%) than in other industries, in the final two columns we present data for firms in that industry alone dependent on whether or not they are profit sharing. The picture that emerges is basically the same as appears in columns (2) and (3) for the whole data set: sharing firms are considerably smaller, older and pay better.

III. Empirical Strategy

In analyzing the employment effects of sharing, one way of viewing our empirical strategy in this preliminary study is that we are not testing directly for productivity effects, but rather looking for evidence of an effect of sharing on employment levels, including one that arises indirectly from productivity changes.[7] Specifically, we estimate employment equations that are similar to one used in the recent study by Bradley and Estrin (1987). We will investigate whether the conclusions obtained by Bradley and Estrin are supported by our longer and richer panel data set. Also we shall see if our results on profit sharing are sensitive to how profit sharing is measured, the degree of worker participation, and the particular time period and industry under study.

We estimate a log-linear employment equation (i.e., a constant-output demand for labor equation) in which employment is determined by its previous value, current and lagged remuneration, current and lagged sales, two industry dummy variables, C and F, to capture industry specific effects, and measures of profit sharing and worker participation in decision making. Our first employment equation, which corresponds most closely to the one estimated by Bradley and Estrin, is given by

$$\ln L_{it} = \beta_1 + \beta_2 \ln L_{it-1} + \beta_3 \ln R_{it} + \beta_4 \ln R_{it-1} + \beta_5 \ln S_{it} + \beta_6 \ln S_{it-1} + \beta_7 C + \beta_8 F + \beta_9 D_{it} + \varepsilon_{it} \qquad (1)$$

where

L = employment

R = (real) remuneration per employee

S = (real) sales (of the firm)

C = a dummy variable for firms in the clothing industry

F = a dummy variable for firms in the footwear industry

D = a dummy variable for firms <u>with</u> profit sharing

Remuneration is wage payments for firms that have no profit sharing and equals the sum of the wage and the bonus for profit sharing firms. The coefficients on C and F indicate employment differences between these industries and the printing industry.

The above specification differs from the one that Bradley and Estrin reported in three ways. First, we omit a term to capture industry demand (Bradley and Estrin used a retail sales variable) because we have data only for the post World War II period on industrial production for each of our industries. However, we believe that this omission is appropriate because none of the theories of behavior of profit sharing firms suggests that this sort of variable necessarily belongs in an employment equation that includes a measure of the firm's sales to capture the demand for the firm's products. Moreover, the estimated coefficient on retail sales that Bradley and Estrin obtained was small, negative (contrary to expectations), and significant. Second, we have included two industry dummy variables, C and F, because our sample consists of firms from three separate industries while Bradley and Estrin used firms from a single industry. Finally, we included the lagged value of sales. Bradley and Estrin dropped this term because its coefficient was not significantly different from zero. We find this coefficient to be significant in all of our regressions.

The inclusion of a measure of (real) sales[8] (or output) and remuneration in equation (1) implies that the estimated employment effects are for a given level of output and for a given level of remuneration. If profit sharing also alters how much a firm produces or pays its workers, the total effect on employment will differ from that implied by (1). An alternative approach, which was used by Estrin and Wilson, is to include the firm's capital stock in place of sales and to estimate a remuneration equation. However, we were unable to investigate including an appropriate measure of the capital stock because for many observations we have data only on total assets measured at historical cost. If the firm hires workers in a competitive labor market, one would doubt that remuneration would be much lower in a profit sharing firm.

The coefficient on the profit sharing dummy variable only partly indicates the employment effect of profit sharing because we have included the lagged value of employment as an additional explanatory variable. Since the level of employment of a historically profit sharing firm would also be affected by its remuneration practices, we believe it is appropriate to focus on the "long-run" effect of profit sharing, which is given by $\beta_9/(1 - \beta_2)$. Thus, we will take into account both the "direct effect" through D and the "indirect effect" through $\ln L_{-1}$.[9]

The above specification assumes that the employment effect depends only on the existence of profit sharing. Clearly, the size (or expected size) of the profit sharing component of total remuneration might determine the magnitude of the employment effect. To investigate this, we replace the profit sharing dummy variable (D)[10] by a continuous measure of profit sharing -- the ratio of the bonus (B) to total remuneration (B + W).[11] This alternative specification is given by

$$\ln L_{it} = \beta_1 + \beta_2 \ln L_{it-1} + \beta_3 \ln R_{it} + \beta_4 \ln R_{it-1} + \beta_5 \ln S_{it} + \beta_6 \ln S_{it-1} + \beta_7 C + \beta_8 F + \beta_9 (B/(B + W))_{it} + \varepsilon_{it} \quad (2)$$

where

B = Bonus (firm's surplus allocated to workers)

W = total wage payments

Weitzman's model of profit sharing firms has been criticized for its sensitivity to a number of its assumptions, especially those related to how the firm and its employees bargain (for example, see Estrin and Wilson (1986), Blanchflower and Oswald (1987a), and Estrin, Grout, and Wadhwani (1987)). It has been argued that profit sharing may not raise employment levels in a monopoly union model (see Tracy (1986) for a simple illustrative model) or in an efficient contract model because in these models the firm does not have exclusive control over the level of employment. (Weitzman assumes that the firm controls the employment decision. In Weitzman (1986) he is critical of labor-managed firms because existing members make the hiring decisions. For a similar observation, see Mitchell (1987).) Thus, one might expect that the employment effects of profit sharing would depend upon the extent of worker participation in decision making.

An additional reason to consider the effect of worker participation is that some existing studies have found that productivity is enhanced by participation. (For example, see Jones and Svejnar (1985)). Moreover, the effect of profit sharing on employment might depend upon the degree of worker participation, especially if both work through employee identification with the firm.

We examine the role of worker participation by augmenting equations (1) and (2) with a measure of worker participation and in the case of (2) with an interaction term that is the product of the participation measure and the ratio (B/(B + W)).[12] Thus we will estimate the following additional models:

$$\ln L_{it} = \beta_1 + \beta_2 \ln L_{it-1} + \beta_3 \ln R_{it} + \beta_4 \ln R_{it-1} + \beta_5 \ln S_{it} + \beta_6 \ln S_{it-1} + \beta_7 C + \beta_8 F + \beta_9 D_{it} + \beta_{10} P_{it} + \varepsilon_{it} \quad (3)$$

$$\ln L_{it} = \beta_1 + \beta_2 \ln L_{it-1} + \beta_3 \ln R_{it} + \beta_4 \ln R_{it-1} + \beta_5 \ln S_{it} + \beta_6 \ln S_{it-1} + \beta_7 C + \beta_8 F + \beta_9 (B/(B + W))_{it} + \beta_{10} P_{it} + \beta_{11} (B/(B + W))_{it} {*} P_{it} + \varepsilon_{it} \quad (4)$$

where P is a proxy for worker participation in decision making. We draw on previous studies of worker participation and productivity and use two alternative proxies for worker participation in decision making -- the proportion of the members of the Board who are workers (EEBD) and the proportion of the workforce who are members of the PCs in our sample (WKDL).

IV. Results

All four specifications were estimated by ordinary least squares (OLS).[13] To conserve on space we report the estimates of equation (3) only for EEBD as a proxy for employee participation in decision making.[14] Results for both participation variables are given separately for versions of equation (4). We begin by discussing our empirical results for the entire sample which are presented in Table 2.

In both the short-run and long-run, reassuringly we always find that employment varies inversely with remuneration.[15] Employment increases with sales; the short-run elasticity is approximately .46, while the long-run elasticity approaches 1.[16] The coefficient on the lagged dependent variable is quite large, i.e., approximately .9. Consequently, our estimated "long-run" effects will tend to be quite large even when the coefficient on the profit sharing measure (e.g., D or B/(B + W)) is small.[17] Moreover, as we discuss below, these estimated long-run effects are sensitive to how we specified the dynamic response of employment to sales and remuneration. Similarly, the significance of the profit sharing variable sometimes depends on how we specify the dynamics. The specifications reported in Table 2 are preferred on the basis of standard t and F tests to those obtained by dropping either lnL_{-1}, both lnS_{-1} and lnR_{-1}, or all three variables.

We see that the coefficients on the profit sharing dummy variables indicate that profit sharing firms have significantly lower employment levels than conventional fixed wage firms after controlling for remuneration and sales. When a participation variable is omitted, our estimated model indicates that employment is 33% lower in profit sharing firms in the long-run (see column #1). If we control for worker participation by including EEBD, employment is estimated to be about 50% lower in the long-run if there is profit sharing (see column #2).[18]

These results are clearly surprising, especially in light of the small amount of a worker's pay accounted for by a bonus. We believe that these results indicate that the profit sharing dummy variable is a poor measure perhaps because it fails to capture differences among our profit sharing firms or because it is picking up systematic differences between profit sharing firms and conventional wage firms unrelated to their labor compensation systems. We will not examine the first possibility by replacing D with a continuous measure of profit sharing. The second possibility will be investigated below by estimating the specifications only for the larger firms in our sample.

The OLS estimates of equations (2) and (4) reported in columns #3 to #5 imply that the negative employment effect that we found in columns #1 and #2, are not necessarily robust to the use of our continuous measure of profit sharing. The results for equation (2) imply that the effect of profit sharing on employment is virtually zero and highly insignificant. However, a different conclusion emerges when we omit $\ln L_{-1}$ or all three lagged variables: now the coefficient on B/(B + W) is negative and significant and implies a (short-run or long-run) lowering of employment of 4.1% to 4.7% if B/(B + W) = 2.8%.[19] Our results for equation (4), however, show the important role participation plays in determining the effect of profit sharing on employment. From equation (4) for firms with no worker participation, profit sharing is estimated to reduce employment if EEBD is included in the model (column 4) and to increase employment when WKDL is included (column 5). However, this effect is not significant when either measure of participation is used. The point estimates implies that in the long-run employment falls by 3.4% (EEBD) and rises by 4.5% (WKDL) when a firm increases the share of the bonus in total remuneration from zero to the average value of B/(B + W) for the profit sharing firms in our data set, i.e., 2.8%.[20] The coefficients on the interaction variables in both columns 4 and 5 are positive but insignificant. The point estimates indicate that for profit sharing firms with an average amount of worker participation (EEBD = 46% and WKDL = 53%), employment is estimated to vary directly with the ratio B/(B + W). This employment effect is insignificant when either EEBD or WKDL is included. If the firm for which WKDL = 53% pays a bonus equal to 2.8% of remuneration, then employment will be 6.3% higher than a conventional wage firm in the long run. The corresponding long-run effect for EEBD is only 1.2%. For EEBD the positive employment effect reflects the positive (but insignificant) coefficient on the interaction term.

The results reported in columns 4 and 5 are sensitive to how we specify the dynamics. In particular, when $\ln L_{-1}$ is omitted, we find the coefficient in B/(B + W) to be negative and significant for both EEBD and WKDL. The estimated effects for a firm that pays an average ratio of bonus to remuneration and that has no participation is approximately 6.6% (EEBD) and 5% (WKDL). Although the interaction terms are positive, employment varies inversely with B/(B + W) for profit sharing firms with average amounts of participation. Altering the dynamics of the model does not change our finding that the coefficients on the interaction terms are positive and, in all but two cases, insignificant.

Since the sample period covers more than 70 years for some firms in our data set, we examine the sensitivity of our results by estimating our specifications separately for pre-World War II (Table 3) and post-World War II (Table 4) observations.[21] In general, the results obtained with prewar data are broadly similar to those reported in Table 2 and hence we discuss only the main differences. The most important one arises when equation (4) is estimated using WKDL where the coefficient on B/(B + W) is positive and significant at the 10% level, while the coefficient on the interaction term is negative but insignificant. However, the effect of profit sharing on employment for profit sharing firms with an average value of WKDL (WKDL = 46%) remains positive and is now significant at the 10% level. A firm that pays its workers 2.8% of total remuneration in the form of a bonus would employ 28% more workers if WKDL = 53%, i.e., considerably more than the corresponding estimate derived from Table 2. A second difference is that the interaction term in column 4 is now much larger and closer to being significant.

The results for the post war data exhibit a fair amount of agreement with the results given in Table 2. None of the profit sharing variables or the interaction terms is significant. All long-run effects are modest.

As discussed earlier, Bradley and Estrin (1987) included a measure of industry output in their estimate, whereas we have not done so. To check on the sensitivity of our results to this different specification, we augment our models by the inclusion of the natural logarithm of the industrial production index for each industry and its lagged value.

When we compare the results reported in Table 4 with the corresponding specifications that have been augmented the most interesting changes occur in equation 4.[22] For both participation variables, the coefficients on B/(B + W) are negative, while those on the interaction term are positive. All are insignificant. (The coefficient on the interaction variable when WKDL is used has a t statistic of 1.53.) The large coefficient on lnL_{-1} (.94) implies a sizeable long-run effect of an increase in (B/(B + W)) when WKDL = 0. If B/(B + W) increases to 2.8% employment will fall by 21%.

As Table 1 reveals, profit sharing firms are smaller than conventional firms in our sample. Thus, the results we obtained might reflect the scale differences of the two types of firms rather than their labor compensation practices. To examine if this might be true, we estimated the four equations using only firms with sales at least as large as average sales for profit sharing firms in their industries.[23] In comparison to the results reported in Table 2, the effect of eliminating small firms was to more than double the proportion of the data set accounted for by conventional wage firms. Although the coefficients on the dummy variables became smaller in absolute value, the implied long-run effects increased because the coefficient on lnL_{-1} rose.

The new parameter estimate for B/(B + W) in equation (2) is now negative but insignificant and implies long-run fall in employment of 5%. The implied employment effects for the specifications including interaction terms are still modest.

Next, we investigated whether similar results are obtained if each specification is estimated separately for each of the three industries. The results for clothing are reasonably similar to the estimates reported in Table 2. The main difference is that the coefficient on the interaction term is much larger than when WKDL is used, thereby implying that the expansion of employment for firms with average levels of participation is now much higher than before and significant at the 10% level. When equation (1) was estimated for firms in the printing industry, the coefficient on the dummy variable became -1.3 and insignificant. The long-run employment effect was estimated to be -13.8%. Similarly when equation (3) was estimated the dummy variable was also insignificant and implied a similar long-run employment effect. When WKDL is used as the proxy for participation, the sign on the interaction variable differs from that displayed in Table 2. However, for printing firms, that coefficient as well as the coefficient on B/(B + W) are insignificant. Finally, the estimated coefficient on lnR for firms in the footwear industry was small and <u>positive</u> for the specifications including participation variables. However, except for the model with WKDL and an interaction term, these coefficients were all insignificant and much smaller than the negative coefficients on $\ln R_{-1}$. In this specification, lnR was significant. Moreover, both B/(B + W) and the interaction term were significant. Also, the coefficients as B/(B + W) in equation (2) is now negative and highly significant. However, the long-run effect of an increase in B/(B + W) to 2.89 is only -3.3% because the coefficient on $\ln L_{-1}$ falls to .73.

Finally, we attempted to control for unobservable firm characteristics by including firm specific fixed effects. However, we did not estimate a fixed effects model for equations (1) and (2) because the coefficient on the dummy variable is not identified. This, in turn, reflects the assumption that the profit sharing status of each firm is constant over time. We report the results for equations (2) and (4) in Table 5. [24]

There are a number of important differences between the results given in Table 5 and the corresponding results given in Table 2. First, the coefficient on B/(B + W) is negative and significant at the 10% level; it implies a long-run effect of -1.6% when the share of the bonus in total remuneration rises from zero to 2.8%. This negative effect disappears when we take into account worker participation (columns 4 and 5). Now the coefficients on B/(B + W) are positive and close to being significant at the 10% level. In contrast to most results obtained without fixed effects, coefficients on the two interaction terms are negative; the one involving EEBD is significant at the 10% level, while the other one is close to being significant at the 10% level. For firms with average levels of participation, the net effect of profit sharing on employment is positive but modest.

When we examine the sensitivity of our fixed effect results to disaggregation by time period (prewar versus post war) and by industry, we find that some results are not robust. If we look at separate time periods, we confirm the finding that the coefficient on B/(B + W) is positive, while that on the interaction term is negative. However, when we estimate the fixed effect model for separate industries, we obtain two positive coefficients for clothing and a negative coefficient for B/(B + W) and a positive coefficient for (B/(B + W))*WKDL for printing. The corresponding results for footwear are suspect because we again find a positive but insignificant coefficient for lnR. In general, the disaggregate fixed effect results imply modest employment effects.

V. Discussion and Conclusions

The principal finding from our preliminary estimates is that the employment effect of profit sharing is dependent upon the way in which profit sharing is measured, how the dynamics is modelled, and whether or not measures of employee participation in decision making are included in the estimating equation. If profit sharing is captured by a dummy variable, we estimate large employment effects. But when a continuous measure is used the employment effects, which typically range from -6% to 6%, are much more modest than those obtained by Bradley and Estrin (1987) and by Estrin and Wilson (1986).[25] But in contrast to Blanchflower and Oswald, we often find significant employment effects. This is especially true of our fixed effects results, which are our preferred specifications.[26] Most of our findings about the employment effects of profit sharing are not dramatically affected by estimating for separate time periods, individual industries or separately for only the larger firms in the sample.

A partial explanation for the difference between our relatively small employment effects and those obtained by Bradley and Estrin is that the bonus paid by the John Lewis Partnership accounted for a larger fraction of workers' income (13% to 24%) than is true for a typical sharing firm in our sample. Since the bonus paid by a typical firm in Estrin and Wilson sample is around 3% of average pay, which is similar to the practice of our sharing firms, the importance of the bonus does not help reconcile our results with those of Estrin and Wilson.[27] It is also possible that Estrin and Wilson and Bradley and Estrin obtained larger estimated effects because they studied cash-based profit sharing while many of the profit sharing firms in our study distributed the bonus in the form of shares. As we noted above, Blanchflower and Oswald (1987b) found that employee share ownership schemes did not have a significant effect on employment. Thus, the form of the profit sharing plan appears to matter.

Finally, our results suggest that the effects of profit sharing may depend crucially on aspects of institutional setting in addition to profit sharing. In many of our specifications, the point estimates indicate that worker participation in decision making had an important influence on the employment effect of profit sharing. For example, the fixed effects results given in Table 5 show that the employment effects of profit sharing are greater if there is no worker participation in decision making. Clearly, there is a need for additional research on alternative sharing arrangements to try to determine which organizational structures promote favorable economic outcomes.

APPENDIX

Definitions of Variables

L	= Labor
S	= Sales = (Real) Sales
B	= (Real) value of profit share paid per worker
W	= (Real) base wage rate per worker
R	= (Real) remuneration per worker = B + W
EEBD	= % of board in producer coops that are worker-members
WKDL	= % of the labor force in producer coops that are members
AGE	= age of firm
B/(B + W)	= % of total remuneration distributed as a profit share
D	= profit sharing dummy (D = 1 for profit sharing firms)
NPS/T	= % of observations for non profit sharing firms

Notes: (1) All real values are in constant 1980 pounds.

(2) B/(B + W), WKDL, EEBD are entered in the regressions reported below as proportions rather than as percentages.

Notes

[1]Blanchflower and Oswald also did not find that employee share ownership affected the variability of employment to changes in the demand for the plant's products. Kruse (1987) studied the effects of profit sharing on the variability of employment to cyclical factors by using a panel data set of 1491 U.S. firms over the 1971-1985 period. Profit sharing data was limited to profit sharing pension plans; no data were available on cash-only plans. Two (alternative) measures of profit sharing were used -- a dummy variable and the percent of employees covered. Kruse found that the response of employment to changes in the (national) civilian unemployment rate was lower for profit sharing firms and for some specifications significantly so for firms in the manufacturing sector. This is an issue to which we will return in a future study.

[2]As such the data are at least as good as others that have been used in related work on sharing firms, such as for European producer coops (Estrin, Jones and Svejnar, 1987) and US PCs (Conte and Jones, 1985).

[3]Since data on some variables are missing for some observations, the most observations from a single firm used in the empirical work reported below is 77.

[4]Data are for productive plants that are affiliated to the cooperative wholesale society. For a discussion of these enterprises see Carr-Saunders, Florence and Peers (1938).

[5]The combined data sets contain over 4000 observations on some variables. However, we have only 3411 observations available to estimate our models because of missing values of some variables and because we deleted observations from 1940 to 1945.

[6]It is considerably smaller than the 13% to 24% paid by the John Lewis Partnership during the period studied by Bradley and Estrin (1987).

[7]Since other research on sharing firms has used this indirect approach, this will enable us to make direct comparisons of results. In subsequent work we plan to adopt a more straightforward and direct approach by estimating production functions, the approach favored in studies of PCs (e.g., Jones and Svejnar, 1985).

[8]Although we would have preferred to use (real) value added or to adjust sales for inventory change, data were not available for many firms to use these alternative measures.

[9]One limitation of our data sets is that we have information only on total employment rather than total hours worked. However, this shortcoming also characterizes the data used in Bradley and Estrin (1987), Estrin and Wilson (1986), Blanchflower and Oswald (1987b), and Kruse (1987).

[10]In addition to Bradley and Estrin, Estrin and Wilson (1986) and Blanchflower and Oswald (1987b) use a dummy variable to capture the employment effects of profit sharing or employee share ownership (see our brief literature survey above). The use of a continuous measure of profit sharing in place of a dummy variable is analogous to the use of a union density variable rather than a dummy variable indicating if the firm is unionized in the literature on the economic effects of unionization.

[11]Our measure of profit sharing might yield misleading findings because both employment and the bonus might be related to the state of demand. We have attempted to control for this by including sales as one of the explanatory variables.

[12]Since our proxies for worker participation are positive only for profit sharing firms, it is impossible to include an interaction term in the

specification containing the profit sharing dummy. If one would attempt to do so, the model would be characterized by perfect multicollinearity.

[13]Since we lack data on the participation variables for some years, the number of observations varies across specifications. In all cases, we use the maximum number of available observations because we believe these results to be the most reliable. Sometimes differences between models reflects the data used to estimate these models as well as the differences in the specifications. Although one might suspect that either sales or remuneration is correlated with the disturbance terms, we lack variables that we think would be appropriate to investigate whether our OLS results are similar to those obtained by instrumental variable estimation.

[14]The sign and the significance of the coefficient on D did not depend upon which participation variable was included. However, the magnitude of the coefficient and its t statistic were larger when EEBD was included rather than WKDL.

[15]Bradley and Estrin found a similar pattern of a negative coefficient on lnR and a positive coefficient on lnR_{-1}. However the values of these coefficients and the coefficient on lagged employment, lnL_{-1}, imply a distributed lag in lnR that is characterized by negative coefficients that decay geometrically beginning with the first lag.

[16]The values of the coefficients on lnS, lnS_{-1}, and lnL_{-1} imply a distributed lag in lnS that is characterized by positive coefficients that decay geometrically beginning with the first lag.

[17]Bradley and Estrin's coefficient on lagged employment was .67, which implies their long-run effects are triple the coefficients on the profit sharing variables.

[18]The estimated long-run effects for profit sharing implied by both columns 1 and 2 are sensitive to how we specify the dynamics of the employment equation. For example, the long-run effect is approximately 26% and 28% for columns 1 and 2 respectively when we drop lnL_{-1} from the model. We also obtain smaller long-run effects if we drop lnS_{-1} and lnR_{-1} either alone or along with lnL_{-1}.

[19]If only lnR_{-1} and lnS_{-1} are omitted, the coefficient on B/(B + W) remains positive and insignificant and implies a long-run effect of .7%.

[20]It is interesting to measure the employment effects of profit sharing using 15% as one benchmark for the share of bonus in total remuneration because Estrin, Grout and Wadhwani (1987) estimate that this is the share of Japanese workers' total remuneration that is profit related pay. (Many proponents of profits sharing attribute Japan's superior economic performance to its bonus system.) Of course, the estimated effect on employment is proportional to the assumed share of bonus in total remuneration. However, we are using our estimated model to extrapolate beyond the range of B/(B + W) typical of our sample.

[21]As noted above, our sample of conventional wage firms does not extend into the post-World War II period, and therefore, the results reported in Table 4 are for sharing firms only. Thus we were unable to estimate equations (1) and (3) for the latter period.

[22]It is appropriate to compare the estimated models with the industry production variables to the results in Table 4 because the production series are available only for 1948 and subsequent years.

[23] We eliminated observations on the basis of sales rather than labor because if we were to do otherwise, we would, in principle, introduce sample selection bias.

[24]Since C and F are constant over time for each firm, we are unable to estimate their coefficients.

[25]The estimates for equations (2) to (4) are for firms with levels of B/(B + W), WKDL, and EEBD equal to the corresponding average values for profit sharing firms in our data set. In addition, all comparisons are for long-run effects of profit sharing. As noted above, Bradley and Estrin's estimated model exhibited a moderately slow speed of adjustment and their implied long-run effects are still substantially larger than ours, including those based on models with dummy variables. In contrast, Estrin and Wilson obtained a coefficient on the lagged dependent variable that was very small and insignificantly different from zero, thereby implying that their long-run effect was very close to their short-run effect.

[26]In all cases, the fixed effect model is supported by an F test of the equality of the firm specific dummy variable.

[27]Unlike Estrin and Wilson, we (following Bradley and Estrin) included sales variables in our employment equation. Thus, our estimated employment effects for profit sharing should be interpreted for a given level of output. In contrast, Estrin and Wilson included a cubic function of the (logarithm of the) capital stock to control for both labor productivity and scale effects. Thus, their employment effect reflects both the direct effect of profit sharing holding output constant and the indirect effect arising from any adjustment in output. In addition, Estrin and Wilson found that less than 1% of the total employment effect is attributable to the reduction in remuneration arising from profit sharing.

Table 1: Key Statistics - Means (Standard Deviations)

	AGGREGATE					DISAGGREGATED				
	ALL YEARS			PRE2WW		ALL YEARS			ALL YEARS Clothing	
	(1) All Firms	(2) PS	(3) Non PS	(4) PS	(5) Non PS	(6) C	(7) F	(8) P	(9) PS	(10) Non PS
L	226 (413)	133 (240)	827 (700)	132 (250)	827 (700)	403 (569)	183 (327)	90 (170)	247 (396)	811 (729)
S	1,166 (1,824)	800 (1,295)	3,540 (2,746)	710 (1,273)	3,540 (2,746)	1,961 (2,375)	1,022 (1,497)	505 (1,005)	1,406 (1,962)	3,408 (2,725)
EEBD%	29 (35)	46 (35)	0 (0)	30 (34)	0 (0)	10 (21)	62 (42)	24 (24)	32 (27)	0 (0)
WKDL%	32 (36)	53 (32)	0 (0)	44 (37)	0 (0)	14 (27)	50 (36)	38 (36)	47 (30)	0 (0)
AGE	33 (22)	36 (21)	14 (11)	26 (15)	14 (11)	29 (21)	35 (21)	34 (22)	36 (20)	11 (8)
B/(B + W)%	2.5 (3.4)	2.8 (3.6)	0 (0)	2.6 (3.5)	0 (0)	2.2 (3.2)	3.0 (3.9)	2.2 (3.0)	2.9 (3.5)	0 (0)
B	47 (74)	53 (78)	0 (0)	40 (57)	0 (0)	31 (58)	57 (84)	51 (76)	43 (65)	0 (0)
W	1,838 (1,786)	1,932 (1,887)	1,235 (589)	1,644 (2,120)	1,235 (589)	1,354 (486)	1,760 (832)	2,418 (2,879)	1,422 (531)	1,175 (271)
R	1,885 (1,794)	1,985 (1,894)	1,235 (589)	1,685 (2,121)	1,235 (589)	1,385 (505)	1,818 (855)	2,470 (2,882)	1,465 (550)	1,175 (271)
NPS/T%	13	-	-	-	-	28	8	5	-	-
N	3,411	2,955	456	2,089	456	1,133	1,173	1,105	819	314

Notes:
1. All values are in constant 1980 pounds except sales which is in thousands of 1980 pounds.
2. All variables are defined in the appendix
3. PS = profit sharing; 2WW = second world war; C, F and P refer to clothing, footwear and printing respectively.
4. The number of observations is for all variables except for EEBD and WKDL which contain fewer observations. For example EEBD and WKDL are based on 1,222 and 1,131 observations respectively in column 1.
5. "All Years" excludes 1940-1945.

Table 2

Estimates of Employment Equations

Independent Variable	#1	#2	#3	#4	#5
Constant	.02 (.35)	-.12 (1.10)	.01 (.24)	-.01 (.11)	-.003 (.03)
lnL_{-1}	.90 (122.4)	.90 (77.74)	.90 (123.8)	.91 (78.63)	.91 (76.06)
lnR	-.31 (28.67)	-.25 (11.76)	-.32 (29.01)	-.26 (12.31)	-.28 (12.24)
lnR_{-1}	.21 (18.07)	.18 (8.12)	.21 (17.92)	.17 (7.83)	.19 (8.20)
lnS	.46 (37.92)	.46 (22.85)	.46 (37.73)	.46 (22.59)	.49 (22.28)
lnS_{-1}	-.36 (27.86)	-.37 (17.30)	-.37 (28.03)	-.38 (17.40)	-.40 (17.68)
C	-.07 (7.44)	-.05 (3.96)	-.07 (7.57)	-.04 (3.38)	-.04 (2.98)
F	-.04 (4.50)	-.03 (2.51)	-.04 (5.23)	-.02 (1.68)	-.02 (1.40)
B/(B+W)			.0005 (.006)	-.11 (.46)	.14 (.52)
EEBD		.01 (.79)		-.02 (1.12)	
(EEBD)*[B/(B+W)]				.32 (.85)	
WKDL					-.04 (1.91)
(WKDL)*[B/(B+W)]					.11 (.23)
D	-.03 (3.50)	-.05 (3.28)			
$\bar{R}^2$	.988	.992	.988	.992	.991
N	3,411	1,222	3,411	1,222	1,131

Note: Figures in parentheses are the absolute values of the t statistics.

Table 3

Pre-War Estimates of Employment Equations

Independent Variable	#1	#2	#3	#4	#5
Constant	-.01	-.39	-.04	-.29	-.31
	(.10)	(2.25)	(.45)	(1.75)	(1.75)
$\ln L_{-1}$	.89	.92	.90	.92	.93
	(102.0)	(52.91)	(104.0)	(52.96)	(51.62)
$\ln R$	-.30	-.13	-.31	-.14	-.14
	(23.41)	(4.36)	(23.47)	(4.81)	(4.37)
$\ln R_{-1}$	.20	.11	.20	.11	.12
	(14.75)	(3.87)	(14.72)	(3.68)	(3.81)
$\ln S$	.47	.48	.47	.48	.50
	(32.81)	(17.35)	(32.77)	(17.27)	(17.18)
$\ln S_{-1}$	-.37	-.41	-.37	-.41	-.44
	(24.20)	(13.63)	(24.37)	(13.58)	(14.06)
C	-.07	-.03	-.07	-.01	.002
	(5.76)	(1.44)	(5.80)	(.58)	(.08)
F	-.03	-.02	-.04	-.001	.01
	(3.37)	(1.02)	(4.01)	(.06)	(.61)
B/(B+W)			.03	-.03	.86
			(.31)	(.07)	(1.82)
EEBD		.04		-.04	
		(1.19)		(1.14)	
(EEBD)*[B/(B+W)]				1.19	
				(1.35)	
WKDL					-.06
					(1.45)
(WKDL)*[B/(B+W)]					-.23
					(.22)
D	-.03	-.06			
	(3.07)	(2.38)			
$\bar{R}^2$	.987	.990	.987	.990	.987
N	2,545	669	2,545	669	617

Note: Figures in parentheses are the absolute values of the t statistics.

Table 4

Post-War Estimates of Employment Equations

Independent Variable	#1	#2	#3	#4	#5
Constant	NA	NA	.28 (2.19)	.11 (.67)	.23 (1.31)
lnL_{-1}			.91 (73.35)	.89 (61.67)	.89 (60.18)
lnR			-.38 (18.04)	-.49 (17.23)	-.53 (17.82)
lnR_{-1}			.26 (11.12)	.36 (11.76)	.39 (12.21)
lnS			.40 (18.04)	.42 (14.90)	.42 (13.91)
lnS_{-1}			-.31 (13.38)	-.31 (10.31)	-.31 (9.78)
C			-.09 (5.95)	-.11 (6.07)	-.11 (6.08)
F			-.04 (3.84)	-.07 (4.53)	-.05 (4.20)
B/(B+W)			.05 (.49)	.02 (.08)	-.04 (.12)
EEBD				.03 (1.42)	
(EEBD)*[B/(B+W)]				-.004 (.01)	
WKDL					-.01 (.81)
(WKDL)*[B/(B+W)]					.20 (.44)
D					
$\bar{R}^2$			.991	.992	.992
N			866	553	514

Note: Figures in parentheses are the absolute values of the t statistics.

Table 5

Estimates of Employment Equations With Fixed Effects

Independent Variable	#1	#2	#3	#4	#5
lnL_{-1}	NA	NA	.67	.60	.60
			(55.18)	(26.64)	(24.74)
lnR			-.33	-.26	-.28
			(30.27)	(12.46)	(12.46)
lnR_{-1}			.12	.07	.09
			(10.28)	(3.31)	(3.60)
lnS			.48	.51	.54
			(37.93)	(24.27)	(24.22)
lnS_{-1}			-.24	-.23	-.25
			(16.70)	(9.33)	(9.76)
B/(B+W)			-.18	.49	.55
			(1.88)	(1.57)	(1.53)
EEBD				.03	
				(.58)	
(EEBD)*[B/(B+W)]				-.86	
				(1.86)	
WKDL					-.05
		(1.12)			
(WKDL)*[B/(B+W)]					-.82
					(1.46)
D					
$\bar{R}^2$			.989	.994	.993
N			3,411	1,222	1,131

Note: Figures in parentheses are the absolute values of the t statistics.

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