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THE EFFECTS OF WORKERS' PARTICIPATION ON ENTERPRISE PERFORMANCE

Empirical Evidence from French Cooperatives*

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The results of estimating production functions augmented by various measures of workers' participation on a large enterprise level data set of French cooperatives are reported. Value added is found to be an increasing function of participation in profits, in collective membership and in ownership, even when a wide assortment of enterprise specific and environmental factors are taken into account. This finding is very robust, suriviving tests between alternative specifications of technology, for reverse causality, for simultaneous equation bias and for multicollinearity. The typical productivity effect from participation, however, is small, around 5% of output. The results suggest that Western policymakers should investigate ways to increase workers' participation in capital stakes and profit shares.

1. Introduction

In this paper, we provide empirical evidence on the relationship between workers' participation and company performance in a large sample of French producer cooperatives. Theorists disagree as to the likely direction of the effects; some, such as Vanek (1970) and Horvat (1982), predict a positive relationship via worker morale and incentives while others such as Alchian and Demsetz (1972) and Jensen and Meckling (1979), expect a negative one because of managerial problems and poor decision-making. We find that

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corporate productivity is in general positively associated with various measures of workers' participation, though the relationship is sensitive to enterprise characteristics and the nature of the broader market environment. In the light of the increasing policy pressure towards workers' participation in Western Europe and North America,[1] our findings have significant overtones for the appropriate sectors and institutional arrangements to implement such schemes.

Our study follows the traditional approach in the literature of estimating production functions augmented by participatory variables to identify the participatory effect [see, for example, Jones and Backus (1977) and the papers in Jones and Svejnar (1982)]. Its contribution lies in choosing from a set of alternative functional forms a specification of technology which best represents the data generation process, in controlling for a large number of organisational and environmental factors, and in using a variety of participatory variables to caputre the various facets of this complicated phenomenon.

Our treatment of 'the degree of participation' assumes that there is a continuum which can be categorised into three broad channels through which workers' involvement in the firm flows and whose strength it is possible to measure. The first is workers' participation in profits through wage bonuses. This represents a material incentive to greater effort and in terms of property rights implies a fairly minimal extension of workers' influence in the firm. At the second level, workers have a personal commitment to the firm via, for example, an equity stake or medium-term loans. At the highest level, the workforce becomes actively involved in company decision-making. The degree of participation is therefore viewed as a vector of continuous variables proxied by various measures of the workers' personal profit share and financial stake. The data set does not contain information about workers' direct involvement in the entrepreneurial activity, so we are unable at this stage to provide evidence about this highest degree of participation [but see, for example, Espinosa and Zimbalist (1978) and Bradley and Gelb (1983a)].[2]

[1]In the United States, some important participatory schemes have been established voluntarily by management and unions, for example in Chrysler and Pan Am, while in other cases plans have been stimulated by the passage of various employee stock ownership plan (ESOP) bills. In Western Europe, the governments of Austria, Denmark, Germany, Luxembourg, the Netherlands, Norway and Sweden have all established participatory firms by law, and the Bullock Report proposed doing so in the U.K. This trend seems likely to continue given the favourable recent report of the Mihr Committee to the European Parliament on co-operation. Finally, in addition to the Yugoslav system of workers' self-management [see Estrin (1983)], established producer co-operative sectors have been growing rapidly on both sides of the Atlantic in recent years, with the new worker-owned firms often being formed after capitalist divestitures and with the aid of central or local government finance.

[2]Richard Long has pointed out in correspondence that the behavioural literature has found substantial variations in actual participation within identical formal structures. Our approach catches more than the formal structure, though the various elements of financial benefit and commitment do not include direct measures of workers' involvement in day-to-day decision-making.

A serious potential problem with our approach is that the profit-sharing variable could be determined by, rather than determine, corporate performance and the remaining participatory variables could themselves be a function of company size. Instrumental variable methods are therefore used to deal with simultaneity between workers' profit shares and company productivity while the remaining variables are specified in a normalised form to eliminate reverse causality between output and the degree of participation. Results for non-normalised measures are reported in Estrin, Jones and Svejnar (1984).

The empirical work is based on a large new data set of about 550 French producer cooperatives in 1978 and 1979. At first sight one might question the generality of testing the effects of participation with this data set because cooperatives are not a typical enterprise type; there may be problems of workers' self-selection, small scale of operation and lack of diversity across region and sector. Against this, we note that the French producer cooperative sector is the second largest in the Western world, employing more than 40,000 workers in some 1300 firms in February 1984, and therefore worthy of study in its own right.[3] Moreover, cooperatives have institutionalised diverse modes of workers' participation, facilitating the collection from company reports of information on the degree of participation. For example, all cooperative workers share in enterprise profits, though a collective decision determines the actual proportion of profit to be distributed as a wage bonus. Moreover, although the minimum stake is very small, not all workers become members (that is, shareholders) and in fact many choose to remain employees of the cooperative. There are firms in our sample with very low and very high worker-membership percentages and as Ben-Ner (1984) argues, this proportion can be taken as a fairly strong indicator of the degree of participation. Finally, worker-members have the option to invest personally in the firm via an assortment of financial instruments, and information about their capital stakes provides a further useful indicator of their commitment to the organisation. Thus, the use of a producer cooperative data set opens up the possibility of using new and diverse measures of the degree of participation and permits consideration of important issues such as the role of material versus non-material incentives and the appropriate extent and form of individual capital stakes.

In the following section we briefly survey the predictions of the theoretical literature and describe the salient features of the data set. In the third we report the estimates of 'best fitting' augmented production functions for the entire sample and by industry and year, focusing in particular on the relative

[3]The performance of this important sector of the French economy has not been examined since Cummings (1890). For more information on recent developments in this sector, see Estrin, Jones and Svejnar (1984).

importance of various participatory channels in differing circumstances. The policy implications are discussed in the conclusion.

2. Theories and data

Economists have rarely considered the relationship between workers' participation and company performance in a formal way, though some work is now beginning to appear [see, for example, Cable (1984)]. However, numerous partial models of workers' ownership have been developed in the industrial relations field which generally predict that participation will improve performance, and case study material is generally supportive of this view [see Long (1978, 1984), Bradley and Gelb (1983a, b) and Gunn (1984)].

The less formal economics literature has produced three general competing hypotheses in this area [see Estrin, Jones and Svejnar (1984) for a survey]. Vanek (1970) and Horvat (1982) among others predict a large positive association. The most frequently cited point is that the higher morale of participatory firms will translate itself into greater effort, but Cable (1984) also stresses the gains from eliminating workplace conflict and Cable and Fitzroy (1980a, b) note the potential for sharper material incentives via profit sharing. Jensen and Meckling (1979) survey the pessimistic case, predicting a negative relationship because managers lose control, leading to poor decision-making and raising costs.[4] Other analysts suggest that workers may be relatively risk-averse leading to limited reinvestment, low capital–labour ratios and poor economic performance. Finally, Nelson (1981) offers a more eclectic view, arguing against any general predictions on the grounds that enterprise-specific factors will actually determine the direction of the participatory effect. These three views can be interpreted as hypotheses about the sign of the participatory variables in an augmented production function and will be tested as such in the following section.

The data set covers all the French producer cooperatives filing reports to the central coordinating body, SCOP, in the years 1978 and 1979, approximately 1,100 observations over the two years. French cooperatives have traditionally been concentrated in three broad sectors, construction, printing and mechanical engineering, and these still contain some 45%, 12% and 6% of the firms in our sample, respectively. However, in recent years three new groups, diverse consultancy agencies, general services and electricals, have grown considerably and now comprise some 13%, 10% and 8% of our sample, respectively. The remaining coops are in a clothing and footwear, woodworking and food processing. The two years of our study provide

[4]The case study evidence does not support the hypothesis that managers lose control in employee owned firms. Indeed the reverse seems to hold; Long (1978) reports that discipline is actually tighter than in conventional firms and the point is confirmed in Bradley and Gelb (1983a).

slightly under 1000 useful observations, some 440 in 1978 and 520 in 1979.[5] The French producer cooperative sector was very dynamic during this period, with some eighty new firms being created between 1978 and 1979, as well as several closures. Entry was particularly rapid in the consultancy sector, where firm numbers increased by some 45%, the mechanical sector (39%) and the electrical sector (31%), but was rather more sluggish in the service sector (11%) and printing sector (9%).

Table 1 provides the sample means and standard deviations of some key economic parameters and the vector of participatory and environmental variables in 1978 and 1979. There is generally only information about the environmental variables in 1979 and since new firms are normally smaller than the existing stock, rapid entry implies that the means in 1979 are often lower than in 1978. By considering the age of the firms in 1979 (*Age* 79), it can be seen that on average the oldest coops are in the printing and construction sectors and the newest in electricals and particularly consultancy. Construction firms have the largest number of workers, around 60 on average, though electrical companies are not much smaller and each sector has considerable variation in the size of its labour force. Mechanical engineering and service coops have around forty workers on average, printing coops around thirty and the relatively small consultancy firms only around ten in 1978 and sixteen in 1979. The electrical sector is relatively capital-intensive and labour productive, with a capital–labour ratio in 1979 of some 50,000 francs per head, and output per head of 120,000 francs. The capital–labour ratio in 1979 is some 30,000 francs per head in printing, and around 15,000 in the remaining sectors, except consultancy, where it is below 10,000 francs. Labour productivity shows a similar pattern, while output per unit of capital displays the reverse ordering, ranging from 6.3 in the labour-intensive consultancy sector to 2.3 in electricals.

The articles of incorporation of French producer cooperatives explicitly stipulate a minimum degree of profit-sharing with the labour force. At least 25% of company profit must be distributed to the workers in each year, whether or not they are members, though the precise amount is left to the enterprise governing body. This material incentive could act as a major stimulant to greater work effort along the lines discussed by Cable and Fitzroy (1980a, b) and is therefore included in our vector of participatory variables, though estimated with simultaneous methods to eliminate reverse causability. Table 1 indicates that profits distributed to the labour force per head, denoted *Bonus*, vary as much within sectors and from year to year as between sectors. Even so, on average bonuses are largest in the electrical sector, comprising some 2000 francs per head, and smallest in the service

[5]The records did not always provide complete information on every firm so there were missing values for certain variables in some cases. These missing values were excluded from the empirical and econometric work.

Table 1

Sample means (standard deviation) by sector and year.[a]

	Construction		Electricals		Mechanicals		Services		Printing		Consultancy	
Variable	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
Value added	4590.4 (8432.7)	4817.3 (9103.1)	6618.1 (2489.1)	5974.8 (21477.4)	3763.5 (5685.7)	3468.4 (5473.5)	4323.7 (8518.4)	3872.9 (8394.2)	3028.2 (5339.1)	2740.4 (3945.4)	971.9 (1157.6)	923.9 (948.9)
Capital stock	964.7 (2241.4)	1057.0 (2855.8)	3496.3 (18662.4)	2557.0 (14182.9)	856.1 (1046.4)	759.7 (169.0)	787.1 (1784.2)	668.3 (1488.6)	998.5 (2482.6)	846.7 (1796.9)	147.9 (179.9)	146.7 (186.1)
Employment	63.1 (114.1)	59.5 (106.5)	54.6 (132.4)	49.7 (120.3)	46.0 (70.1)	37.6 (57.2)	55.8 (98.1)	44.4 (77.4)	32.3 (50.3)	26.8 (34.0)	9.9 (9.5)	16.2 (5.2)
Age of firm in 1979	26.2 (24.7)	26.2 (24.7)	17.3 (20.0)	17.3 (20.0)	22.6 (24.2)	22.6 (24.2)	21.7 (21.0)	21.7 (21.0)	32.0 (32.0)	32.0 (32.0)	6.2 (6.1)	6.2 (6.1)
Bonus	0.586 (1.54)	1.032 (4.378)	1.384 (1.99)	2.050 (4.019)	0.622 (1.28)	1.211 (3.43)	0.615 (2.65)	0.34 (1.14)	1.462 (2.62)	1.443 (2.3)	0.972 (2.87)	1.131 (3.316)
Pawm	46.3 (25.2)	48.6 (25.2)	56.5 (27.6)	63.9 (28.8)	61.4 (33.0)	63.8 (24.9)	63.7 (35.8)	66.2 (35.7)	72.3 (20.4)	74.2 (18.6)	71.4 (24.8)	70.9 (26.1)
Control	91.1 (66.4)	86.4 (19.5)	80.2 (30.0)	81.0 (27.1)	86.4 (16.6)	89.3 (14.3)	80.1 (28.4)	80.0 (27.7)	82.0 (23.8)	81.9 (22.0)	71.7 (28.4)	78.3 (25.1)
Share	31.1 (82.8)	27.8 (22.9)	10.5 (77.2)	28.6 (23.8)	18.3 (25.5)	24.2 (20.4)	31.5 (36.9)	50.0 (1.2)	27.2 (26.2)	19.2 (74.5)	61.8 (2.3)	37.7 (0.5)
Loans	33.5 (61.0)	29.3 (34.1)	30.5 (35.6)	31.5 (36.9)	13.4 (20.4)	16.7 (27.2)	41.6 (42.6)	39.0 (37.2)	15.5 (25.9)	18.6 (28.6)	51.1 (42.7)	52.8 (43.0)
New	67.1 (47.1)	67.1 (47.1)	67.3 (47.3)	67.3 (47.3)	66.6 (47.8)	66.6 (47.8)	88.4 (32.4)	88.4 (32.4)	70.8 (45.8)	70.8 (45.8)	84.0 (36.9)	84.0 (36.9)
Transformed	12.3 (32.9)	12.3 (32.9)	14.3 (35.3)	14.3 (35.3)	11.1 (31.9)	11.1 (31.9)	11.6 (32.4)	11.6 (32.4)	10.8 (31.2)	10.8 (31.21)	10.7 (31.7)	10.7 (31.7)
Legal form (SA)	96.0 (19.6)	92.7 (26.0)	100.0 (0.0)	95.2 (21.5)	91.3 (28.8)	88.9 (32.0)	85.3 (35.9)	77.5 (42.3)	96.1 (19.6)	91.8 (27.6)	77.5 (42.3)	78.1 (41.7)
No. of firms (max)	209	239	36	47	26	36	37	41	57	62	49	71

[a]Value variables in 1000 Fr. frs.

sector. It is interesting to note that despite the general effects of the recession and entry in 1979, which on average reduces output and employment, workers in four of the sectors chose to increase their wage bonus, by as much as 50% in the mechanicals industry. Only in the service sector is there an appreciable cut in the bonus.

French cooperatives are owned by their members, who are typically workers or ex-workers in the firm. Membership confers rights in company decision-making via electing representatives to the firm's governing General Assembly on the basis of one-member-one-vote. The General Assembly determines the broad outline of corporate policy especially in large companies; day-to-day administration is delegated to a management board. The law only requires members to hold one share though the firm often imposes additional financial requirements. However, workers do not have to become members to be employed in the cooperative and therefore to gain access to the profit-sharing bonus, and in fact a relatively large proportion of the labour force do not join. The variable *Pawm*. in table 1 measures the proportion of workers who are members of the firm, which varies from around 70% on average in the consultancy and printing sectors to below 50% in the construction industry. The reduction of employment which occurred on average between 1978 and 1979 in every sector, except consultancy, appears to have fallen almost entirely on non-member workers and therefore has led to an increase in *Pawm* between the two years.

Capital ownership beyond the minimum stake confers no additional influence over corporate policy because of the one-member-one-vote rule. Moreover, members' shares are only paid a limited return and are repaid at par on departure. Even so, there is considerable variation in the actual capital stake put forward by worker members which, appropriately normalised, therefore measures the workers' chosen financial commitment to the cooperative.

Two possible ways to normalise the worker's individual ownership stake are with respect to the total individually owned capital or to the permanent funds of the firm. The former measure is denoted *Control* and parallels precisely *Pawm*, measuring the proportion of individually owned member capital in the hands of the labour force. The alternative measure is denoted *Share*, and normalises with respect to the firm's total financial assets. Both variables display more dispersion within than between sectors, with *Control* ranging between 71% on average in consultancy (1978) and 91% in construction (1978) and *Share* between 10% on average in electricals (1978) and 62% in consultancy (1978). The two variables tell a broadly similar picture about the degree of financial participation, but it can be seen that *Share* is rather less stable across time, because of large changes in total assets from year to year, and is therefore probably a less appropriate indicator of the degree of participation.

The bulk of working capital in French cooperatives comes from 'collectively owned reserves' formed by a mandatory allocation of at least 15% from annual profits and loans, primarily from specialist financial institutions. However, either because of credit rationing or because of an unwillingness to become too dependent on outside funds, cooperatives also take considerable loans from their own members. Although these loans do receive interest and are generally of short duration, their extent represents another way that workers can measurably demonstrate their commitment to the firm and may therefore be a further indicator of the degree of participation. The variable *Loans* therefore measures the proportion of total loan capital lent by worker-members, and varies considerably between and within sectors, from around 15% in the mechanicals industry to in excess of 50% in the newer firms of the consultancy sector.

French producer cooperatives are dispersed throughout the country with the major clusters being in Paris, the West, the South East and Provence, accounting for some 32%, 16.5%, 11.5% and 9% of the total, respectively, in 1979. The full list of ten regional dummies are included in the regressions to take account of the possible regional differences in infrastructure, skills and demand conditions.[6] It is also possible that participation will be more effective in areas with a tradition of industrial democracy and where relatively large groupings of firms foster a more effective environment for the success of cooperatives. For example, it has been suggested that the success of the Mondragon experiment in Spain is related to its location, and that the Mondragon experience has had a knock-on effect for other cooperatives in the surrounding areas [see Thomas and Logan (1982)]. In this way the regional dummies, particularly for Paris and the West, may pick up some elements of a participatory effect.

Scop records offer three categories for the formation process of French coops; the creation of entirely new firms (*New*) and firms which have been transferred from other legal forms into coops, either without any break (*Transferred*) or after a period of closure (*Revived*). Table 1 reports the proportions for 1979 — the only year for which this information is available — for *New* and *Transformed*, from which *Revived* can be calculated. The majority of French cooperatives in every sector were created in that form from the outset, ranging from around 67% in mechanicals, construction and electricals to 88% in services. Transformations comprise some 10% of the total in every sector, which implies that revivals are rare in the service and consultancy sectors. Dummies for *New* and *Transformed* are included in the regressions to distinguish the performance of the three types of cooperative. Finally, French coops can choose between two possible legal forms, SA or

[6]The remaining regional dummies are for Burgundy (3.7% of the sample in 1979), the East (2.2%), North Picardy (7.8%), the Centre (5.0%), the Atlantic Coast (4.8%) and the South West (7.6%).

SARL. The majority of older firms have not chosen SARL, which is appropriate for smaller organisations (less than 50 members), but more than 20% of the small firms in the consultancy sector in 1979 have opted for these rules. A dummy for legal form is also included in the regressions to pick up any relationship between formal structure and performance.

3. Specification and results

Our empirical strategy involves searching for an association between output and the various measures of participation in the context of best-fitting production functions and taking into account the possibility of reverse causality between profit sharing and output. Specifically we estimate versions of

$$V = V(K, L, X_1, X_2, Z), \tag{1}$$

$$Z = Z(X_2, V), \tag{2}$$

where V denotes value added; K and L represent the capital and labour inputs, respectively; X_1 and X_2 are vectors of enterprise-specific and environmental factors including regional and industrial dummies, the age of the firm and the average age of workers; and Z is the vector of participatory variables, *Bonus*, *Pawm*, *Control*, *Share* and *Loans*.

The first problem is to choose a functional form for eq. (1), and in so doing we seek a balance between relatively simple functions whose properties are well known and a desire to avoid misspecification that could bias the estimated relationship between the residual and participation. We therefore select between three forms of production technology, the generalised Cobb–Douglas (CD), Kmenta's (1967) linear approximation to the Constant Elasticity of Substitution (CES), and the transcendental logarithmic function (translog).[7] With OLS estimation of the production function one can

[7]Specifically, denoting firms by i, the date by t, the elements of the X vectors by x, the elements of the Z vector by z, we estimate on the entire data set the CD function

$$\ln V_{it} = \alpha_0 + \alpha_1 \ln L_{it} + \alpha_2 \ln K_{it} + \sum_j \alpha_{3j} x_{jit} + \sum_{k=1}^{5} \alpha_{4k} z_{kit} + \mu_{it},$$

Kmenta's CES function

$$\ln V_{it} = \beta_0 + \beta_1 \ln L_{it} + \beta_2 \ln K_{it} + \sum_j \beta_{3j} x_{jit} + \sum_{k=1}^{5} \beta_{4k} z_{kit} + \beta_5 \left| \ln \frac{K_{it}}{L_{it}} \right|^2 + \mu_{it},$$

and the translog form

$$\ln V_{it} = \gamma_0 + \gamma_1 \ln L_{it} + \gamma_2 \ln K_{it} + \sum_j \gamma_{3j} x_{jit} + \sum_{k=1}^{5} \gamma_{4k} z_{kit} + \gamma_6 |\ln L_{it}|^2 + \gamma_7 |\ln K_{it}|^2 + \gamma_8 \ln L_{it} \ln K_{it} + \mu_{it}.$$

The participatory variables enter the function linearly because they are assumed to augment output in a disembodied way. Although theory might suggest that productivity augmentation would also operate via the labour input, previous attempts to test this hypothesis have only ever isolated a disembodied participatory effect [see Estrin, Jones and Svejnar (1984) and Jones and Svejnar (1983)].

distinguish between the CD, CES and the translog forms on the basis of *F*-tests since the CD function is nested in both the CES and the translog functions and the CES is nested in the translog. If eqs. (1) and (2) are estimated jointly as a system, log likelihood ratio tests are required to distinguish between the production function forms.

In table 2, we report the best-fitting augmented production function estimates for 1978 and 1979. The years are treated separately because the value variables are denominated in nominal terms and because as table 1 has shown there is significant entry and exit of firms between 1978 and 1979. The equations are estimated using two stage least squares procedures on augmented production and *Bonus* functions, the latter being specified in terms of log (value added), total profits, the average age of workers and managers, the debt–equity ratio, collective reserves as a proportion of total assets, and the industry dummies. Value added, total profits and perhaps the industry dummies represent the opportunities for profit distribution, the age of workers and managers proxy for collective preferences and the remaining variables indicate the opportunity cost of distributing profits in terms of the companies' financial health. *Bonus* is a positive significant function of value added in 1978, but not 1979. Other significant variables are total profits, the age of managers and the industry dummies.

The augmented production functions display good fits for cross-section estimation with an $\bar{R}^2$ of 0.946 in 1978 and 0.975 in 1979. The coefficients on the factor inputs are in general precisely estimated at plausible levels. The CES form is always dominated by the CD and the translog, but the latter provides a marginally better fit in 1978 while the CD does in the considerably larger data set of 1979. The Cobb–Douglas factor weights indicate that on average French producer cooperatives operate with a relatively large labour share (93%), a small capital share (6%) and approximately constant returns to scale.[8] The industry and regional dummies are rarely individually significant though *F*-tests refute their joint exclusion from the model. Normalising on the printing sector, there is a significant positive coefficient on the plumbing sub-sector of construction and a negative one on the service sector. Normalising the regional dummies on Provence, there is a weakly significant positive coefficient on the Paris dummy and a significant negative coefficient on the East in 1978 and weakly significant negative coefficients on the East, Burgundy and the Centre dummies in 1979.[9]

Turning to the enterprise-specific variables, enterprise performance is systematically associated with the legal form of the cooperative in 1978.

[8]The Cobb–Douglas factor estimates for 1978 are similar, at 1.00 with a *t*-statistic of 29.39 on labour and 0.06 with a *t*-statistic of 1.69 on capital.

[9]The *t*-ratio for the Paris dummy is 1.80 in 1978 but only 1.24 in 1979. The *t*-ratio for the East is 2.24 in 1978 and 1.1 in 1979. The *t*-ratio in 1979 for Burgundy is 1.66 and for Centre 1.43.

Table 2

Best-fitting augmented production functions, 1978 and 1979.[a]

Variable	1978	1979
$\ln K$	−0.34	0.06[b]
	(0.43)	(2.11)
$\ln L$	1.24[b]	0.93[b]
	(9.36)	(22.01)
$[\ln L]^2$	0.02	—
	(0.53)	
$[\ln K]^2$	0.03[b]	—
	(2.51)	
$\ln L \ln K$	−0.06[b]	—
	(2.03)	
Control	0.03	0.35[b]
	(0.81)	(2.65)
Share	0.02	−0.02
	(0.51)	(0.48)
Bonus	0.06	0.07[b]
	(0.91)	(2.16)
Pawm	0.003[b]	−0.0009
	(3.10)	(0.69)
Loans	−0.03	0.02
	(0.61)	(0.20)
New	−0.11[c]	−0.22[b]
	(1.68)	(2.49)
Legal form (SA)	−0.18[b]	0.08
	(2.29)	(0.78)
Age 79	0.007[c]	0.013[b]
	(1.85)	(3.40)
[*Age* 79]^2	−0.00009[c]	−0.0001[b]
	(1.86)	(2.74)
Industry/branch dummies	yes	yes
Regional dummies	yes	yes
$\bar{R}^2$	0.9465	0.8750

[a]Equations estimated using two stage least squares, jointly with an equation determining *Bonus* as a function of value added, total profits, the average age of workers and managers, the debt–equity ratio, collective reserves as a proportion of total assets and industry dummies. Figures in parentheses denote *t*-statistics.

[b]Significant at 5% level.

[c]Significant at 10% level.

Specifically, output is higher, *ceteris paribus*, in the smaller and possibly more cooperative SARL form than with the more widespread SA rules. This effect disappears in 1979, perhaps reflecting the relative inefficiency of the numerous entrants in that year who had adopted the SARL form. The dummy for the mode of creation, *New*, is significant at the 10% level or better in both years, reflecting the relatively poorer performance, *ceteris paribus*, of enterprises created from scratch as cooperatives. The coefficient on *Transformed* is insignificant in both years and is not reported. It would therefore appear that worker morale and commitment are relatively high in both transformed and revived firms, giving them a competitive edge over their cooperatively founded counterparts in a given region and sector. It is particularly interesting that this effect appears to last over time, in the sense that the regressions control for the age of the firm, and this is perhaps a worrying thought for those concerned to promote brand new cooperatives. Finally, the significant coefficients on *Age* 79 and $[Age\ 79]^2$ indicate that French producer cooperatives display a quadratic life cycle in both years, with output peaking on average after around 39 years in the 1978 sample and 65 years in the 1979 sample. In fact, the estimated life cycles do not differ in a statistically significant way — the two sets of estimates lie well within two standard errors of each other — and the greater precision of the 1979 estimates point to 65 years as the relevant maximum. This long life-cycle belies pessimistic predictions about the survival capacity of cooperatives.

The effects of participation upon performance hinge on the joint significance of the five participatory variables in the augmented production functions. *F*-tests and log-likelihood ratio tests establish that we cannot exclude the *Z* vector as a whole from eq. (1), and this result holds for all the possible functional forms and specifications of eqs. (1) and (2), as well as the best-fitting ones reported in table 2. Thus the statistically significant association between participation and performance does not depend on the particular functional form adopted to describe production technology, nor reverse causality between value added and the cooperative bonus. Moreover, this significant participatory effect clearly acts to augment output; the coefficients on all the statistically significant coefficients are positive in both years. This is strong evidence for the optimistic view propounded, for example, by Vanek (1970) and Long (1978) and runs counter to the predictions of, for example, Jensen and Meckling (1979).

However, there is no simple pattern to the relevant channels of participation. We find that neither *Share* nor *Loans* is statistically significant in either year, which confirms the inappropriateness of normalising private capital stakes by total assets and is consistent with the findings of Estrin, Jones and Svejnar (1984) that short-term loans by worker members are not an adequate indicator of commitment. The profit-sharing variable, *Bonus*, is strongly significant in OLS estimates of the production function in both

years but the simultaneous estimates reported in table 2 suggest that for 1978, causality is reversed from output and profits to *Bonus* rather than the other way round. The profit-sharing variable is, however, significant at the 5% level in the augmented production function for 1979. The membership variable, *Pawm*, is significant at the 5% level in 1978 but not in 1979, while the normalised capital stake variable *Control* is significant in 1979 but not in 1978. The behaviour of *Pawm* probably reflects the relatively high degree of worker membership in the relatively smaller and less efficient new firms created in 1979. It may also indicate a problem with the measure itself in the tendency of coops to lay-off non-members rather than members means that *Pawm* rises in a recession such as in 1979, without this necessarily reflecting changes in the degree of participation.[10] The declining relevance of *Pawm* as a proxy for participation in 1979 may underlie the significant role of *Control* in that year.

One can calculate the proportion of value added explained by the significant elements of the Z vector, each evaluated at their sample means, to give the approximate scale of output augmentation attributable to participation in the typical French cooperative. In this way, denoting sample means with a bar, we find productivity increases of

$$\frac{0.003\ (\bar{Pawm})}{\ln(\bar{Valad})} \cdot 100 = 2.4\%$$

in 1978 and

$$\frac{0.35\ (\bar{Control}) + 0.07\ (\bar{Bonus})}{\ln(\bar{Valad})} \cdot 100 = 5.0\%$$

in 1979. Thus the average degree of participation is estimated to increase output in the typical coop by around $2\frac{1}{2}\%$ in 1978 and 5% in 1979, the disparity between the years reflecting the higher average level of participation in 1979. The effects of productivity augmentation, though always positive, are therefore modest, though of course they could be greater in certain circumstances. Consider, for example, an enterprise with sample mean characteristics in 1979 except that it was not paying its workers a bonus and there was no individual capital ownership. The same firm with a 33% profit-sharing scheme, under which $Bonus = 1.95$, and full member ownership of equity ($Control = 100$) would have 12% greater production.

[10]We are indebted to Will Bartlett for pointing out this argument. It suggests that *Pawm* will underestimate the relevant degree of participation in a boom and overestimate it in a slump. If there is a lag for workers becoming members, *Pawm* will underestimate the degree of participation in fast-growing firms.

The possibility that the changing pattern of participatory channels is caused by multicollinearity is examined with the aid of a backward elimination stepwise procedure. This involves dropping participatory variables in OLS estimates of the augmented production function singly in inverse order of t-value up to some limiting level, in this case $t \geqq 1.0$. In 1978, participatory variables are eliminated in the order *Share*, then *Loans* leaving a final form including *Bonus*, *Pawm* and *Control*, the latter having a t-value of 1.37. In 1979 participatory variables are dropped in the order *Loans*, *Share* and *Pawm*, the latter displaying a last round t-value of 0.24. The stepwise procedure therefore broadly confirms the results of table 2, except that multicollinearity between *Share* and *Control* leads us to understate the t-value of the coefficient on *Control*, particularly in 1978.

It has been assumed until now that the normalisation of private capital and membership measures by equity capital and the labour force, respectively, will ensure the exogeneity of the *Control* and *Pawm* variables. To test this, *Control* and *Pawm* functions were each run jointly with an augmented Cobb–Douglas production function using two stage least squares methods. *Control* was estimated as a function of log (valued added), interest rates on internal and external loans, the debt–equity ratio and the ratio of collective to total assets, as well as a quadratic on the age of the firm. However, the $\bar{R}^2$ was only 0.02 in 1978 and 0.05 in 1979, and no variable was statistically significant at the 90% level in either year. The augmented production function results for *Control* follow the pattern reported in table 2, with the estimated coefficient being insignificant in 1978 and significant at the 95% level in 1979.

Pawm was estimated as a function of log (value added), the average age of workers and managers, average earnings in the firm, the sectoral, region and formation dummies and a quadratic in the age of the firm. The fit was relatively good in both years, with $\bar{R}^2$'s of 0.389 in 1978 and 0.420 in 1979. The significant coefficients in 1978 are for the average ages of workers and managers, various sectoral and regional dummies and, at the 90% level, value added. There is also a significant relationship between *Pawm* and the size of the firm in 1979, this time at the 95% level. The simultaneously estimated augmented production functions reveal the same broad pattern for all the variables, including the participatory ones, as in table 2. For 1978, *Pawm* continues to have a significant coefficient but with a higher t-value (5.49 as against 3.10) and it also becomes significant at the 90% level for 1979. Simultaneous equation methods therefore indicate that while *Control* is not determined simultaneously with output, there is an inverse relationship between *Pawm* and value added which leads us to a systematic undervaluation of the role of worker membership in the augmentation of productivity.

The findings suggest that participation might affect performance differently according to sector and year. To test this possiblity, augmented production

functions are estimated for each industry separately by year and the results for best-fitting functions are reported in table 3.[11] In general, the Cobb–Douglas form dominates at the sectoral level, with the exception of the consultancy sector in 1979, usually because the coefficient on capital and therefore the square and cross-product terms of the remaining production function forms are insignificant. The apparent irrelevance of fixed capital to the process of adding value in French producer cooperatives may reflect measurement problems or the undercapitalisation of the sector as a whole, with fixed assets only averaging between one half and one sixth of value added in each year. Apart from this, the production functions fit relatively well, with $\bar{R}^2$'s ranging from 0.6919 in the rapidly growing consultancy sector in 1979 to 0.9758 in services in 1978 and with plausible and in general precisely determined coefficients on many of the independent variables.

Table 3 highlights that there *are* significant differences in the underlying technologies across sectors and, given the rapid pace of entry, even between years in particular industries. The construction and service sectors in 1979 display approximately constant returns to scale with a labour share in the former of around 0.95 and in the latter of 0.70, and capital shares of 0.07 and 0.25, respectively. The remaining sectors with Cobb–Douglas functions display labour shares in excess of unity, significantly so in electricals and in consultancy in 1979. One cannot accept the restriction that the coefficients on labour and capital are the same in the various sectors or across years, which brings into question the validity of grouping the data, even when sectoral dummies are employed. More generally, these findings cast doubt on the results from experiments in this area which have failed to control for technological differences between sectors, especially if enterprise specific and environmental factors have also not been taken into account.

The regressions in table 3 broadly confirm our previous results on the productivity-enhancing effects of participation, although the pattern which emerges is more complicated than hitherto. We reject joint exclusion of the entire participatory vector in ten of the twelve sectors — the exceptions being consultancy and services in 1979, regressions for which the overall fit is relatively poor. A possible explanation in consultancy is the rapid pace of entry and exit between 1978 and 1979 — around one third of firms operational in 1979 were actually founded in that year — and the service sector did see a particularly sharp decline in output and employment over the period. But, at least measured in terms of the number of significant

[11]Problems with degrees of freedom in certain sectors and identification in estimating four equation models to cover fully the possibility of reverse causality prevented implementation of simultaneous equation methods. Rather than present partial or non-comparable results, table 3 is constructed on the basis of OLS estimates. It will be remembered that, in general, the simultaneous equation bias leads us to over-estimate the significance of *Bonus* and underestimate *Pawm*.

Table 3
Best-fitting augmented production functions by sector and year.[a]

	Construction		Electricals		Mechanicals		Services		Printing		Consultancy	
Variable	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
$\ln K$	0.078[b]	0.067[b]	−0.09	−0.134	0.214	−0.007	−0.152[c]	0.241[c]	0.043	0.003	0.002	−0.127
	(3.27)	(2.51)	(1.13)	(1.47)	(0.90)	(0.04)	(1.89)	(1.94)	(0.87)	(0.07)	(0.03)	(0.47)
$\ln L$	0.936[b]	0.97[b]	1.287[b]	1.373[b]	1.211[b]	1.256[b]	1.011[b]	0.708[b]	0.962[b]	1.05[b]	1.387[b]	0.966[b]
	(25.05)	(23.89)	(9.48)	(8.19)	(4.91)	(4.29)	(10.29)	(3.79)	(12.14)	(13.36)	(8.99)	(2.32)
$[\ln K]^2$	—	—	—	—	—	—	—	—	—	—	—	−0.078[b]
												(3.26)
$[\ln L]^2$	—	—	—	—	—	—	—	—	—	—	—	−0.354[b]
												(4.23)
$\ln L \ln K$	—	—	—	—	—	—	—	—	—	—	—	0.352[b]
												(2.92)
Control	0.018	0.313[b]	0.113	0.948[b]	−2.130	2.716**	0.441	0.724	0.342[b]	0.73[b]	−0.046	0.612
	(0.61)	(2.57)	(0.47)	(2.29)	(1.30)	(1.94)	(1.63)	(1.15)	(2.05)	(4.55)	(0.14)	(1.37)
Share	0.003	0.054	0.007	−0.413	−1.671	0.175	0.227	−0.095	−2.29	0.01	0.727[b]	−0.101
	(0.13)	(0.43)	(0.07)	(0.70)	(1.28)	(0.21)	(0.82)	(0.90)	(−2.28)	(0.23)	(2.58)	(0.48)
Bonus	0.053[b]	0.018[b]	0.070	0.095[b]	−0.166	0.093[b]	0.353[b]	0.088	0.031[b]	0.071[b]	0.042	0.047
	(3.39)	(3.20)	(1.20)	(2.34)	(1.27)	(2.35)	(3.55)	(0.65)	(2.27)	(4.09)	(2.13)	(1.48)
Pawm	0.003[b]	0.004[b]	0.008[b]	0.006	0.012[b]	0.025[b]	0.001	−0.005	−0.002	−0.001	0.008	−0.001
	(2.82)	(3.57)	(2.81)	(1.00)	(2.004)	(1.83)	(0.64)	(0.98)	(0.93)	(0.01)	(1.70)	(0.28)
Loans	−0.006	0.113	−0.362	0.501	−1.88	−2.45[b]	−1.08[b]	−0.470	0.235	−0.09	−0.324	0.320
	(0.17)	(1.36)	(1.52)	(1.46)	(−1.67)	(2.20)	(4.49)	(1.03)	(1.76)	(0.67)	(1.74)	(1.27)
New	0.111	−0.032	−0.061	−0.495	0.537	0.654	0.008	−0.488	0.080	0.007	−0.110	−0.099
	(1.57)	(0.45)	(−0.26)	(1.22)	(0.921)	(0.92)	(0.04)	(0.92)	(0.77)	(0.06)	(0.39)	(0.23)
Legal form	0.012	0.087	0	1.106	0.370	−0.103	−0.755[b]	−0.147	−0.395[b]	−0.019	−0.221	0.088
	(0.10)	(0.85)		(1.54)	(0.38)	(0.16)	(4.11)	(0.39)	(2.25)	(0.15)	(1.45)	(0.01)
Age 79	0.007[b]	0.011[b]	0.010	0.049[c]	−0.050	0.024	0.060[b]	0.031	0.002	0.008[c]	0.01	−0.003
	(2.18)	(2.90)	(0.55)	(1.89)	(1.21)	(0.74)	(4.80)	(1.31)	(0.06)	(1.88)	(0.37)	(0.08)
$[Age\ 79]^2$	0.00008[b]	−0.0001[b]	−0.0001	−0.00008[c]	0.00007	−0.0003	−0.00008[b]	−0.0004	0.0000005	0.00007[c]	0.0008	−0.00005
	(1.84)	(2.71)	(0.44)	(1.71)	(1.41)	(0.60)	(4.36)	(1.15)	(0.15)	(1.71)	(0.91)	(0.04)
Branch dummies	yes	yes	—	—	—	—	—	—	—	—	—	—
Regional dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.9377	0.9558	0.9623	0.9007	0.8644	0.9125	0.9758	0.8314	0.9618	0.9601	0.9288	0.6919

[a]Figures in parentheses denote t-statistics.
[b]Significant at 5% level.
[c]Significant at 10% level.

participatory variables, the augmentation effect in 1978 is anyway quite weak in these sectors, operating only via *Share* in consultancy and with the positive profit-sharing effect in services being offset by a negative coefficient on *Loans*.

Table 4 provides further evidence on the typical impact of participation; the proportion of observed mean ln(*Valad*)s explained by the summed effects of at least weakly significantly participatory channels evaluated at their sectoral means. On this basis, the participatory effect is observed to be largest in the mechanical and printing industries, reaching a peak via the four significant channels of mechanicals in 1979 of 26% and typically around 10%. These sectors are characterised by well-established, moderately large, productive and capital-intensive firms with relatively high levels of participation as measured by *Pawm*, *Control* and, in printing, *Bonus*. The larger firms of the electrical and construction industries also have positive but rather smaller participatory effects, typically around 5%. In electricals this is associated with the fact that relatively few participatory channels are significant — only *Pawm* in 1978 and *Control* and *Bonus* in 1979 — but in construction, though two or three participatory channels are significant the mean levels of participation are relatively low. Finally we turn to the unsatisfactory regressions for the service and consultancy sectors. The net impact of participation in services in 1978 is actually to lower output, with the negative effect from *Loans* outweighing the positive one from profit sharing. In fact, *Bonus* in services is low and declining while *Loans* are very high, on average the highest in the sample. These variables may therefore also in part reflect financial difficulties of the firms themselves. The consultancy sector has a positive augmentation effect of around 6% in 1978. The absence of a similar relationship in 1979 suggests that productivity enhance-

Table 4

Productivity augmenting effects of participation in typical coops.[a]

	Output augmentation (%)	
	1978	1979
Construction	2.0	5.6
Electricals	5.1	11.2
Mechanicals	8.9	26.0
Services	−2.8	0
Printing	13.3	8.9
Consultancy	6.5	0

[a]Augmentation calculated as the effect of participation via the significant participatory channels (at the 90% level) at the mean values of the relevant variables as a proportion of average actual ln(*valad*).

ment may not take place immediately in new firms; rather there may be a lag before the organisation has settled and output augmentation begins to show.

In terms of participatory channels, the disaggregated regressions tell a similar story to that of table 2. *Bonus* is the most frequently significant element of the Z-vector, although of course this may be an overestimate because of simultaneous equation bias. *Pawm* and *Control* are each significant in 50% of the possible cases, though rarely simultaneously. The tendency for *Pawm* to be significant in 1978 and *Control* in 1979, observed in table 2, is found to be something of an artifact of aggregation and only recurs in the electrical sector. At the industrial level, it is more typical for *Pawm* to be significant in both years though, except for printing, *Control* is generally only significant in 1979. There is also some significance at this level for the two other participatory variables. In fact, *Share* proves to be the appropriate indicator of capital stakes in the consultancy sector in 1978, perhaps successfully picking up the very high degree of participation in these new cooperatives, but its impact is wiped out in 1979 by the unstable behaviour of total assets. There is also a negative impact from *Share* in printing in 1978, which is more than offset by the positive effect via *Control*. The coefficient on *Loans* is at least weakly significant three times, two of those with a negative coefficient. In fact, one might expect the extent of loans by members to be negatively associated with output for participatory reasons, in that workers who choose to lend capital to their firm for short periods in return for interest, rather than take out long-term capital stakes, may be revealing their lack of commitment to the cooperative. Turning finally to the environmental variables, the branch and regional dummies display a similar pattern to the regressions of table 2 and the dummy for firms created as cooperatives (*New*) is never significant at the disaggregated level. However we confirm the negative effect of the SA legal form in 1978, at least in services and printing, and despite rather limited variation in age of firm by sector, isolate a significant and rather long life cycle in the construction, service and electrical industries in at least one year.

4. Conclusion

The central finding of this paper is the existence of a significant relationship between output and various measures of workers' participation. Value added is found to be an increasing function of workers' participation in profits, in collective membership and in capital stakes, even when factor inputs and a wide assortment of enterprise-specific and environmental factors are taken into account. This finding is very robust, surviving tests between alternative specifications of technology, for reverse causality, for simultaneous equation bias and for multi-collinearity between the participatory variables. Moreover, it carries over to more disaggregated classifications of the data set

by industry and branch. The results support theorists predicting that participation will enhance productivity and may comfort those who propose the widespread introduction of schemes for workplace participation.

However, care must be taken in intepreting the results since they have been deduced from a cooperative data set and may not carry over to capitalist firms. At the very minimum, we have established that producer cooperatives will be technically efficient, more so than their capitalist counterparts. The observed capital–labour ratios and insignificant coefficients on fixed capital in the production function estimates also indicate that cooperatives may have problems in accumulating capital, because of either under-investment or constraints on the supply of funds. It is interesting that performance tends to be associated with legal form, and therefore implicitly size, and that productivity enhancement is more pronounced in cooperatives transformed from other enterprise types rather than those founded from scratch. There are problems in identifying the source of the productivity gains here, but the finding may lead policy-makers encouraging the formation of new cooperatives to reflect on the potential advantages of introducing cooperation into an already existing organisation. Finally, the results from the consultancy sector indicate that cooperatives may not be able to reap positive participatory effects in the first years of production, which suggests that experiments should not be evaluated until the enterprise has been properly established. However, the long cycle confirms Jones' (1975) finding that once established, cooperatives survive at least as long as their capitalist counterparts.

The results also have some bearing on the appropriate internal rules to encourage productivity augmentation in cooperatives. Since value added is a continuously increasing function of *Bonus*, *Pawm* and *Control*, at least in certain circumstances, it is important to encourage the maximum profit sharing consistent with the long-run viability of the firm, perhaps via tax incentives, and to stimulate high membership ratios and substantial individual capital stakes. One way would be to propose cooperative rules which, like those in Yugoslavia, enforce the principle of 100% worker membership (except for apprentices); and also to institutionalise significant private ownership, perhaps along the lines of the Mondragon experiment [see Thomas and Logan (1982), Bradley and Gelb (1983a)]. The productivity reducing effect of worker loans in our regressions suggests that internal loans should not be encouraged, which means that the cooperative must rely on external funds. Given the apparent productivity enhancement from the clustering of coops in a region, a neat solution might be the creation of a system of regional cooperative banks to provide short-term credit, to advise on longer-term capital supply and to internalise the externalities of stimulating an inter-connected regional cooperative complex. These proposals are consistent with some of the ideas of Oakeshott (1978), who stresses the

lessons to be learnt from Mondragon and argues that the creation within coops of a motivated and committed labour force depends on the workers owning their own capital stake individually.

The size of the productivity effect from participation is typically rather small, around 5% of output, though it varies between around −2% and 26%. The regressions indicate that the effect could perhaps be doubled by increasing the degree of participation to the maximum feasible level, but this remains far short of the most optimistic theoretical predictions [see, for example, Vanek (1970)]. However, it is broadly in line with evidence from U.S. plywood cooperatives and Chile, as well as anecdotal evidence [see Berman (1967), Gunn (1984), Espinosa and Zimbalist (1978) and Jones and Svejnar (1982)].

The data set is sufficiently large and the variation in the degree of participation sufficiently wide to suggest that the productivity enhancing effect might carry over to capitalist firms. In the bulk of Western corporations, workers have no opportunity to share in profits, little influence on enterprise decision-making and virtually zero individual capital stake. Weitzman (1984) has recently argued convincingly in favour of profit-sharing schemes to encourage employment, but does not draw adequate attention to the possible productivity gains of such schemes. Our results further indicate that greater labour commitment and effort could be stimulated by relaxing the institutional constraints in capitalist firms on workers' participation in decision-making and in equity ownership.

References

Alchian, A.A. and H. Demsetz, 1972, Production, information costs and economic organisation, American Economic Review 62, no. 5, 777–795.

Ben-Ner, A., 1984, On the stability of the cooperative type of organisation, Journal of Comparative Economics 8, no. 3, 247–261.

Berman, K.V., 1967, Worker owned plywood companies (Washington State University Press, Pullman, WA).

Bradley, K. and A. Gelb, 1983a, Cooperation at work: The Mondragon experience (Heinemann, London).

Bradley, K. and A. Gelb, 1983b, Worker capitalism: The new industrial relations (Heinemann, London).

Cable, J., 1984, Employee participation and firm performance: A prisoners' dilemma framework, Mimeo. (Department of Economics, University of Warwick, Coventry).

Cable, J. and F. Fitzroy, 1980a, Co-operation and productivity: Some evidence from West German experience, Economic Analysis and Workers Management 33, 100–121.

Cable, J. and F. Fitzroy 1980b, Production efficiency, incentives and employee participation: Some preliminary results for West Germany, Kyklos 33, 100–121.

Cummings, E. 1890, Co-operative production in France and England, Quarterly Journal of Economics 4, July, 357–386.

Espinonsa, J. and A. Zimbalist, 1978, Economic democracy (Academic Press, New York).

Estrin, S., 1983, Self-management: Economic theory and Yugoslav practice (Cambridge University Press, Cambridge).

Estrin, S. and D.C. Jones, 1982, The effects of worker participation upon productivity in French producer co-operatives, Mimeo. (Hamilton College, Clinton, NY). Discussion paper no. 68 (Department of Economics, European University Institute, Florence).

Estrin, S., D.C. Jones and J. Svejnar, 1984, The varying nature of importance and productivity effects of worker participation: Evidence for contemporary producer co-operatives in industrialised western economies, CIRIEC working paper (University of Liège, Liège).
Gunn, C.E., 1984, Workers' self-management in the United States (Cornell University Press, Ithaca, NY).
Horvat, B., 1982, The political economy of socialism (Armonk, Sharpe, NY).
Ireland, N.J. and P.J. Law, 1982, The economics of labour-managed enterprises (Croom Helm, London).
Jensen, M.C. and W.H. Meckling, 1979, Rights and production functions: An application to labour-managed firms and codetermination, Journal of Business 52, no. 4, 469–506.
Jones, D.C., 1975, British producer cooperatives and the views of Webbs on participation and ability to survive, Annals of Public and Cooperative Economy LVI, 23–44.
Jones, D.C., 1982, British producer cooperatives, 1948–1968: Productivity and organisational structure, in: Jones and Svejnar, eds., Participatory & self-managed firms (Lexington Books, Lexington, MA).
Jones, D.C. and D.L. Backus, 1977, British producer cooperatives in the footwear industry: An empirical test of the theory of financing, Economic Journal 87, no. 3, 488–510.
Jones, D.C. and J. Svejnar, 1982, Participation, profit-sharing, worker ownership and efficiency in Italian producer co-operatives, Working paper no. 283 (Department of Economics, Cornell University, Ithaca, NY) forthcoming in Economica.
Kmenta, J., 1967, On the estimation of the CES production function, International Economic Review 8, 180–189.
Long, R.J., 1978, The effect of employee ownership on organisational identification, employee job attributes and organisational performance: A tentative framework and empirical findings, Human Relations 31, 29–48.
Long, R.J., 1984, The effects of employee ownership on job attitudes and organisational performance: An overview of the empirical literature, Paper presented at the National Employee Ownership and Participation Conference for Educators (Greensboro, NC).
Meade, J.E., 1982, Wage fixing (Allen and Unwin, London).
Nelson, R., 1981, Research on productivity growth and differences, Journal of Economic Literature XIX, no. 3, 1029–1064.
Oakeshott, R., 1978, The case for worker co-operatives (Routledge and Kegan Paul, London).
Sertel, M., 1982, Workers and incentives (North-Holland, Amsterdam).
Thomas, H. and C. Logan, 1982, Mondragon: An economic analysis (Allen and Unwin, London).
Vanek, J., 1970, The general theory of labor-managed market economies (Cornell University Press, Ithaca, NY).
Vanek, J., ed., 1975, Self-management: Economic liberation of man (Penguin, London).
Weitzman, M., 1984, The share economy (Harvard University Press, Cambridge, MA).