Innovation and market strategy in Italian industrial cooperatives: Econometric evidence on organizational comparative advantage

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This paper argues that more than one type of organizational form can be simultaneously efficient within an industry when differentiation in product qualities are significant. Firms with some exogenous or persistent component to their organizational structure will specialize in product qualities for which their organizational structure处 them at an advantage relative to other firms. This framework is used in an empirical study of innovation and market strategy of industrial cooperatives. Results of management surveys of Italian cooperatives on company strategy are combined with company financial data to test the hypothesis that industrial cooperatives will hold organizational comparative advantages in innovative activity which stresses the production knowledge of ordinary employees, in high quality products, and in the use of specialized corporate alliances. Strong evidence supporting the hypotheses are found when the performance of the firm is measured by its profitability and income per member.

1. Introduction

Innovation, technological progress, and market strategy have been neglected in the analysis of the labor managed firm despite the growing emphasis placed on these topics in studies of the conventional firm. At the same time, such issues will clearly be increasingly important at a practical,
policy level for industrial cooperatives and their associations as business practice becomes increasingly focussed in these fields.

It is striking that very different forms of economic organization sometimes persist in the same market over long periods of time. In North Central Italy, for example, cooperatives and conventional firms have coexisted in the same industry and region decade after decade under conditions of strong market competition.

In this paper I argue that more than one type of organizational form can be efficient within an industry when differentiation in product qualities are significant. In such an environment, firms will have a tendency to specialize in the products or subproduct qualities in which their organizational structure puts them at an advantage relative to other firms. I then test three specific hypotheses about industrial cooperatives: that they will enjoy organizational comparative advantages (1) in innovative activity which stresses the production knowledge of ordinary employees, (2) in stressing high quality products, and (3) in utilizing corporate alliances as innovation and market access strategies.

For this purpose I make use of two independently administered sets of management surveys combined with company financial data. Profitability and income per worker are found to be significantly higher in coops which follow strategies emphasizing these 3 advantages. But considering productivity, only in the area of corporate alliances could these results be confirmed. Productivity is significantly higher among coops emphasizing corporate alliances.

2. Three hypotheses on the organizational comparative advantages of industrial cooperatives

Organizational form is sometimes given at least temporarily by historical, social or political forces exogenous to the market, or by persistence from previous competitive conditions. In many industries, product differentiation may allow two types of organizational form to be simultaneously efficient within which is conventionally seen as the same industry, but which may have a range of product qualities, including types of ancillary services. In other words, efficient organizational differentiation may go hand in hand with product differentiation. Assuming competition, we may infer that firms will have a tendency to specialize in the products or subproduct qualities in which their organizational structure puts them at an advantage relative to other firms.

The 'participatory' structure of an industrial cooperative, which was initially established for social rather than strictly economic goals, may offer relative advantages for particular economic purposes. In this section I offer three hypotheses about those relative advantages.
2.1. Innovation

High tech firms emphasizing continuous innovation tend to have unusually high incidence of worker participation in company profits, stock ownership, and (to a lesser quantifiable extent) in relevant company decisions [Smith (1985, 1988)]. These high tech and high-innovation firms establish a participatory structure because of their need to create incentives for product and process innovations and for dependable decentralized handling of complex tasks. For existing companies utilizing new technologies, Jaikmar's (1986) study of the performance of CAD/CAM technologies in comparative organizational settings in the United States and Japan demonstrates the growing importance of participation in more traditional sectors of the economy. In other words, such participation is a strategic choice variable in achieving corporate goals, especially where innovative behavior is at a premium.

It thus becomes natural to inquire about the innovation and market strategies of firms which take such participatory practices as a given, or an exogenous starting point – in particular the industrial cooperative.

The traditional industrial cooperative is a particular, special case of participatory firm. In its 'mutual' form of 'one-worker, one-share, one-vote', the industrial cooperative is sharply limited in its ability to use targetted gain-sharing plans of the types often seen in the U.S. high tech sector [Smith (1988)], let alone such plans as stock options. Different types of innovative behavior may be expected to thrive on different types of participation; and specialization in forms of innovation may be predicted to proceed according to organizational comparative advantage. It is an empirical question to determine the pattern of that specialization. But if there is a standard thinking about any advantages labor managed firms might have in pursuing innovation it would be in taking advantage of internally developed knowledge of ordinary production employees.

The classic statement of this hypothesis is due to Vanek (1970, pp. 294–296); although he was arguing for an absolute advantage for labor managed firms, his hypothesis can be interpreted in an organizational comparative advantage framework:

In every man there is some inventive or innovative talent ... the labor-managed form of productive organization is highly conducive to minor innovative activity within the firm ... Probably the best way of distinguishing between ... major and minor innovations is that the latter cannot generally be the subject of a full-time professional occupation. Rather, they will arise as an externality (external economy) of an activity whose primary purpose is something else than to innovate – generally to produce or contribute to the production of some good or service ... [A] repeated act of production will stimulate reflection on how that act could be facilitated, or done more efficiently ... First of all, the self-management structure ... provides an excellent channel of communication, unparalleled in any other firm, between those who have innovative ideas, those who decide on and procure the capital implementation, and those who incorporate the innovation into the income distribution scheme of the firm. Second, the innovator in a labor-managed firm need not worry that the capital owner will
exploit the innovation and leave him with only a small part of the gain ... He will be able to argue his case within that decision-making structure ... [or] formal arbitration.\textsuperscript{1}

There are certainly grounds for doubting aspects of Vanek's interpretation. First, his suggestion that major innovation is not sensitive to the economic system (p. 294) is certainly dubious (the present study is not concerned with comparing systems but instead forms of enterprise within a market economy). Second, at the level of the firm, Vanek's analysis underestimates the flexibility of conventional firms in incentivizing the workplace. At least some conventional firms use aspects of cooperative organization to establish a highly innovative workplace;\textsuperscript{2} and in a competitive environment in which innovation is at a premium, such organizations will have a tendency to outperform those which do not do so.

Students of industrial cooperatives in Italy have doubted whether coops would willingly introduce labor-saving innovations that might result in employment cutbacks.\textsuperscript{3} Earlier econometric work on Italian industrial cooperatives has shown that they tend to employ more workers than would maximize the presumed objective of the labor managed firm, income per head [Smith (1984)]. The implicit weight placed on employment as an objective is, however, consistent with either above-median or below-median innovative activity. Successful innovation in product, process or organization in an imperfectly competitive market may lead to expanded sales and employment, perhaps at the expense of other firms. Cooperatives might also be reluctant to introduce labor-skill-saving innovations. This reluctance would be mitigated to the extent that members have a more complete claim over the asset value of the firm. In any case, the reluctance to save on skill requirements and or reduce employment would be one force for specialization in certain types of subproducts, especially those of a more artistic or high quality nature.\textsuperscript{4}

At the same time, in the presence of bargaining over firm-specific rents, innovations may not be introduced in the conventional firm if they result in increasing the bargaining power of employees relative to owners, increasing wages at the expense of profits [see Dow (1985) and Linvill (1991)].

\textsuperscript{1}In a further observation, Vanek argues that 'the labor-managed firm will be in a better position to accommodate and adjust to some negative effects which the innovation may have. For example, consider an innovation which substantially alters the capital-labor ratio ... The labor-managed firm can adjust to such a situation by retrenching, postponement of or phasing in the new techniques, temporary overemployment, or other means ... In contrast to featherbedding, the labor-managed firm may tolerate overemployment in the short run while doing away with it in the long run through attrition, retrenching, or in other ways ...'


\textsuperscript{3}Interview with officials at Istituto Cooperativo per L’Innovazione (ICCI), Rome, April 12, 1990 (Istituto Nazionale per la Ricerca Applicata ed il Trasferimento Tecnologico della Lega Nazionale delle Cooperative e Mutue').

\textsuperscript{4}It is difficult to separate these forces from historical influences (e.g. the centuries-old artisan and artistic traditions in central Italy, where the applied study was carried out).
Management cannot easily induce innovations building on knowledge of ordinary production workers that could strengthen management, because these innovations use information impacted in the work team. Thus the pattern of specialization in innovation is generated by organizational forces acting on each type of firm.

In conclusion, I would state as a hypothesis:

H1. Within a competitive market environment, the labor managed firm or industrial cooperative will have a comparative advantage in choosing an innovation strategy which focuses on minor innovations in which the experience and practical knowledge of production and line employees takes center stage. Whatever the performance of traditional firms relative to cooperatives, on average those cooperatives which adopt such an innovation strategy are predicted to perform better than those which do not.

2.2. Quality

Management specialists have stressed the importance of developing and maintaining a corporate ‘culture’, revolving around the company’s competitive strategy [Deal and Kennedy (1982)]. Among the successful strategies discussed in these works are customer services, product innovation, lowest prices, high quality production and product or company image (or recognition). Among large U.S. companies, cited successful practitioners of these alternative strategies include IBM (customer service), 3M (product innovation), Caterpillar and Hewlett-Packard (product quality).

Labor-managed firms should have a comparable advantage when the production process requires a team effort on the part of production workers, but information is impacted in that team and it is thus difficult for managers to monitor [Williamson (1975, 1985)]. Certainly production quality is more difficult to monitor than quantity of output. It benefits from a high degree of personal commitment to the success of the enterprise on the part of ordinary employees. Firms which need to increase their quality, such as Ford over the last decade, have been most successful in doing so through introducing worker participation programs [e.g. Halal (1986)]. The organizational comparative advantage framework would suggest that an industrial cooperative seeking a market niche with its (exogenously determined) highly participatory structure and reluctance to introduce skill-saving innovations would tend to settle in high quality segments of that market.

Knowledge acquired in the act of production could also reduce cost.\(^5\) Such innovations, associated with mass production techniques, may be more

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5 I would like to thank an anonymous referee for suggesting this point.
visible to noncooperative firms. Otherwise, they may represent team-impacted knowledge associated with quality production.

Casual observation suggests that industrial cooperatives have a tendency to find a niche in the higher quality end of their markets. The largest cooperative sector in the U.S. is that of plywood manufacturing; these firms have always been known as the high quality manufacturers in the industry. The Mondragon system of cooperatives is known for its high quality production in skill intensive areas. Italian industrial cooperatives are often found in sectors in which they produce high-craftsmanship products for the upscale market, such as artistic ceramics and glassware. This leads to the hypothesis:

H2. A comparative organizational advantage of the cooperative lies in high-quality specialty production.

2.3. Strategic alliances

The development of strategic alliances for innovation, research and development and/or marketing is increasingly important in fostering commercial innovations in all firms [Mowery (1989) and Hamel et al. (1989)]. But strategic alliances are particularly important for cooperative firms. Such alliances may offer a partial remedy for the widely noted 'Illyrian' employment problems of such firms.\(^6\) Partnership with other firms in production offers an alternative to expanding employment, which poses unique problems for the cooperative if business conditions change and employment must later be reduced [Vanek (1970)]. Company partnerships may alleviate inefficiently low employment in the face of economic rents [Sacks (1977)]. Cooperatives in Western Europe also tend to have a more limited and traditional market segment focus, which may not be sufficient or stable in the European single market environment. Alliances with noncooperatives may help cooperatives establish themselves in new market segments.

Consider two hypotheses about the type of partner that would most benefit an industrial cooperative. The first holds that strategic alliances for innovation and technology transfer will be more successful when the partner company is a conventional firm. This is because other cooperatives will be more likely to have a similar history, technology and company strategy (including market segments). Forging a strategic alliance with a cooperative would limit benefits of drawing on the ally’s organizational assets (which the cooperative would more likely already possess).

The alternative hypothesis would imply greater strategic benefits of forming an alliance with other cooperatives, especially a member of the same umbrella association of cooperatives. Industrial cooperatives, accustomed to operating in different business environments and working arrangements may be unprepared for such ventures. It is not just that they might be taken advantage of through opportunism, but that genuine misunderstandings may arise on both sides of the contractual relationships. Other cooperatives with their similar organizational structure would more likely put into place the process and organizational innovations of greatest advantage to a cooperative, and have a lower incentive and means of behaving opportunistically toward other coops. There may, for example, be explicit or implicit sanctions from the cooperative league.

In sum, the issue is to contrast the greater innovation 'gains from trade' possible with noncooperatives, with the potentially greater 'productive relevance' of innovations generated in other cooperatives. Of course, there is nothing to exclude both types of alliance from being advantageous (or disadvantageous). I would conclude with the hypothesis:

H3. Strategic alliances are crucial to the market success of industrial cooperatives in advanced economies in the current period, with different types of advantages offered by alliances with other cooperative or with conventionally organized firms.

3. Empirical analysis

Two recent independent management surveys of Italian industrial cooperatives regarding technology change and business strategy provide an opportunity for empirical investigation of the organizational comparative advantage issues raised in the last section.7

3.1. The data sets

Industrial cooperatives in Emilia-Romagna and the Veneto belonging to the Lega Nazionale delle Cooperative e Mutue (hereafter Lega) were interviewed by a team from the regional offices of the Lega in Bologna in 1988 using a questionnaire entitled 'Strategic Business Areas of Cooperative

7I would like to thank Emmanuel Daniell of the regional offices of the Lega in Bologna for making available the first questionnaire and Edwin Morley-Fletcher of the Lega Nazionale delle Cooperative e Mutue in Rome for arranging for the availability of the CESPE questionnaire and Riccardo Azzolini of Fondazione CESPE for his assistance in obtaining and discussing it. I would like to thank Tiziana Osio for her assistance with coding and downloading the matching financial data. Finally Donald Lockley provided invaluable assistance in transforming these data into a form that could be processed on my computer equipment in the United States.
<table>
<thead>
<tr>
<th>Table 1</th>
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<tbody>
<tr>
<td>Innovation questions in the first (Lega) questionnaire.</td>
</tr>
</tbody>
</table>

*Indicate the firm's strategic enterprise actions over the last five years (check the two most important):*
(a) emission of new products  
(b) entry into new markets  
(c) process innovations  
(d) increased expenditure/investment in 'directional structure' (management)  
(e) increased expenditure/investment in research and development  
(f) collaborative agreements with cooperative and/or private firms  
(g) acquisition/creation of other firms cooperatives and noncooperators  
(h) no strategic action

*Indicate the prevalent factors utilized in innovative activity:*
(a) knowledge developed internally in the firm  
(b) knowledge acquired from employees coming from other firms  
(c) collaborative relationships with cooperative firms  
(d) collaborative relationships with noncooperative firms  
(e) external consulting  
(f) acquisition of patents and licenses  
(g) other

*Indicate the factors critical to the success of the firm:*
(a) price  
(b) quality  
(c) distribution services  
(d) new products for the market  
(e) image  
(f) other

Firms. A national survey by Fondazione CESPE in Rome under contract from the national Lega was undertaken at about the same time.

Wherever possible, responses from these questionnaires were combined by the author with financial and balance sheet data from these companies, made available for the study through the Lega's finance department. Not all of these data were usable due to such factors as incomplete reporting, mergers or closures in the study period, or lack of certainty in matching firms. Financial and managerial observations were available for 87 observations on 27 firms for the first study and up to 240 observations on 63 firms in the second study. Pooled, cross-section regression analysis was then performed within each data set.

Three sets of questions from the first (Bologna) survey were preselected to test the hypotheses of the previous section. These questions are presented in English translation in table 1.

The first set of questions asks management to identify the firm's two most important strategic enterprise actions over the last five years, from among

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9 "Le Aree Strategiche D’Affari delle Imprese Cooperative."
10 Results are presented in the order that the data sets were received and analyzed.
11 All translations in the paper are by the author.
emission of new products, entry into new markets, process innovations, increased expenditure/investment in management structure, increased expenditure/investment in research and development, collaborative agreements with cooperative and or private firms, acquisition/creation of other firms (cooperatives and noncooperatives) and 'no strategic action'. A labor-managed firm was predicted to gain most from stressing process innovations (to the extent these innovations are based on production workers' accumulated knowledge), and in collaborative agreements (strategic alliances). A stress on investments in management structure would appear to be outside the area of comparative organizational advantage of a labor managed firm, which emphasizes an egalitarian production organization capable of taking advantage of horizontal monitoring. The regression coefficient on this qualitative variable offers a good test of organizational comparative advantage, since if there is no viable relative advantage for horizontal monitoring, the cooperative firm will have to 'catch up' in this deficient area. The other actions listed may be more likely to help than to hurt, while firms not taking any strategic action may be reasonably suspected of poorer performance. These points, however, do not follow from the analysis of the labor-managed firm as such and are not clearly related to organizational comparative advantage considerations.

The firms were also asked to indicate the 'prevailing factors utilized in innovative activity', from among knowledge developed internally in the firm, knowledge acquired from employees coming from other firms, collaborative relationships with cooperative firms, collaborative relationships with noncooperative firms, external consulting, acquisition of patents and licenses, or 'other'. The organizational comparative advantage framework predicts that firms stressing 'internally developed knowledge' will exhibit superior performance, this is more specifically related to the first hypothesis (H1) than the variable for 'process innovations'. Strategic alliances were hypothesized to be of particular importance (H3), but whether a cooperative would benefit more from strategic alliances with other cooperatives, or with private firms, was impossible to predict a priori. Cooperatives would hold a comparative advantage in utilizing personnel coming from other firms as an innovation strategy only if these personnel were more ordinary production employees. Unfortunately, the question was not disaggregated by type of employee. The organizational comparative advantage in utilizing consultants would appear to rest with noncooperatives; but in the absence of additional information, such as the extent to which ordinary production workers were affected by, contributed to, or involved in the consultant's activities, a definitive hypothesis is not possible. Since licensing is clearly an alternative strategy to utilizing internally generated knowledge, it is predicted to be an area of comparative disadvantage for the cooperative.

Finally, the cooperative firms were asked to indicate the factors critical to
Table 2
Innovation questions in the second (CESPE) questionnaire.

Indicate the predominant innovations introduced in the firm in the 1981–1986 period, if any (indicate the two principle ones in order of importance):
(a) new products  
(b) product improvements  
(c) process  
(d) marketing  
(e) organizational  
(f) no innovations

Indicate which sources were predominantly utilized in innovative activity (only one answer):
(a) knowledge developed internally in the firm  
(b) knowledge acquired from personnel coming from other firms  
(c) collaborative relations with other cooperative firms  
(d) stimulus from consortia in which the firm participates  
(e) collaborative relations with noncooperative firms  
(f) external consulting  
(g) patents and licenses  
(h) no innovations

The success of the firm, from among price, quality, distribution services, new products for the market, image, or other. The theoretical framework led to the hypothesis (H2) that industrial cooperatives have a comparative advantage in quality production.

The relevant questions from the second (CESPE) questionnaire are found in translation in table 2. Firms were first asked to indicate the predominant innovations introduced in the firm in the 1981–1986 period, from among new products, product improvements, process innovations, marketing, 'organizational' innovations or none. They were then asked which sources were predominantly utilized in innovative activity from among (a) knowledge developed internally in the firm, (b) knowledge acquired from personnel coming from other firms, (c) collaborative relations with other cooperative firms, (d) stimulus from consortia in which the firm participates, (e) collaborative relations with noncooperative firms, (f) external consulting, (g) patents and licenses, or (h) no innovations. These questions were reasonably well matched to the first study’s innovation questions. Unfortunately, no questions comparable to the first survey’s queries on firm strategy were asked.

3.2. Results from the first survey

Econometric studies of the effects of organizational variables on company performance often consider these variables as, on the one hand, an explanatory variable in a profit function and on the other hand an input in an estimated production function [e.g. Fitzroy and Kraft (1986, 1987)]. This
study follows both procedures. In addition, I have added income per member as a performance measure, since it is widely regarded as the key objective of a labor-managed firm, and thus may offer the best guide to interpreting the firm’s behavior and strategy success. Results of the joint hypothesis tests on the first dataset for profit, income per member and production functions, respectively, are reported in tables 3, 4 and 5.

Consider first the results for the profit and income per worker functions. Initially, the log of profits was regressed on the log of labor and capital use and all explanatory qualitative variables. A few variables were insignificant. The stepwise elimination procedure described by Maddala (1977, p. 125) was employed to eliminate extraneous variables to arrive at the results in table 3.

\[ R^2 = 0.98; \text{DOF} = 70. \]

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11 After dummy variables for year were rejected by the appropriate F-test. Regressions not published in the paper due to space limitations are available from the author upon request.

12 As a robustness check, the alternative of simply eliminating variables statistically insignificant at the 0.25 level yields the same specification. Note also that two qualitative variables must be dropped because of perfect collinearity (two variables can be constructed from linear combinations of other variables). When these insignificant variables were dropped from the regression, no changes in sign resulted; the only changes in significance are that firm acquisition as a strategy became negative within the 10% level, and company image positive at that level (signs unchanged). Two variables were perfectly collinear with other variables: 'No strategic action', which as expected may be computed from the form of the collinearity to have a significant negative effect on company profits, and focus on distribution services', which may also be computed to have a likewise negative effect.
Considering innovation, a corporate focus on process innovation (PRO-CINNOV) actually exhibits a significant negative effect on profitability, with a t-statistic of -4.8. On the other hand, firms which indicated that they used 'knowledge developed internally in the firm' (INTKNOW) were more profitable (with a t-statistic of over 8). This evidence is mixed, but generally conforms to Vanek's innovation theory, since even if the firm focuses on process innovations, it may utilize methods outside their area of organizational comparative advantage to achieve it. The regression coefficient on the qualitative variable for knowledge of persons coming from other firms (NEWPSN) is also positive and significant. This is consistent with the organizational comparative advantage theory as well as Vanek's hypothesis, to the extent that this knowledge is introduced by ordinary employees.

Turning to broader 'strategic action' questions, the effect of new product strategy (NEWPROD), entry into new markets (MKTENTRY), and especially augmented R&D (INVRND) and strategic alliances (STRALL) are positive and statistically highly significant. The effects of licensing as an innovation strategy and of taking 'no strategic actions' are also negative and significant.

Firms stressing quality (QUALITY) as a factor critical to firm success had significantly higher profits (a t-statistic of over 6), supporting hypothesis H2.

Finally, the general importance of strategic alliances is strongly confirmed. Firms stressing such alliances (called collaborative accords in the questionnaire) exhibited higher profits, with a t-statistic of about 9.5. Most interestingly, holding this general gain constant, firms which stress collaborative relationships for the purpose of innovation with other cooperatives exhibit significantly lower profits ($t = 2.7$), while those stressing such collaboration with noncooperatives exhibit significantly higher profits ($t = 2.6$). These results support the theory that greater innovation 'gains from trade' will be possible with noncooperatives, despite the potentially greater 'productive relevance' of innovations generated in other cooperatives. Parameter estimates suggest that an emphasis on strategic alliances make a firm much better off even with other cooperatives, but especially with noncoops.

As a robustness check, profits were replaced by rate of return on capital as a dependent variable. Only three qualitative differences: (1) the effect of emphasis on price competition went from negative and insignificant to negative and significant at the 5% level; (2) emphasis on company image went from positive and significant at the 10% level to negative and significant at the 10% level; and (3) the significance of emphasis on product quality dropped from 1% to only 10%.

Next, income per member was calculated and used as the (dependent) performance variable measure; the same specification procedure led to the

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13This regression is available from the author upon request.
regression in table 4. The only significant differences in the qualitative variables were: (1) the coefficient on general strategic alliances is now negative; however the signs on alliances with cooperatives and non-cooperatives remain the same (with higher significance levels and larger numerical magnitude); (2) price strategy becomes significant and positive (while the t-statistic for the coefficient on quality strategy also rises); and (3) the coefficient on image is now negative and barely significant at the 10% level.

Finally, in keeping with the literature on the labor-managed firm, which has emphasized productivity studies [e.g. Jones and Svejnar (1985)], the same set of qualitative variables were used as explanatory variables in a production function. The first step was to determine the appropriate underlying production function for the study. To this aim, Cobb-Douglas, Translog and Kmenta-CES production functions were estimated. The dependent variable was the log of value added. As independent variables, the log of total workers and the log of total hours worked were considered. In each case, utilizing the log of hours worked yielded a better fit. The appropriate F-tests led to acceptance of zero restrictions on coefficients in the CES approximation and Translog functions that yielded the Cobb-Douglas production function as the appropriate specification for these data. Specifications involving firm-specific and time-specific effects were also rejected. These F-tests are summarized in table 5. Thus all tests involving the qualitative

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter estimate</th>
<th>Standard error</th>
<th>T-stat for H0: parameter = 0</th>
<th>Prob &gt;</th>
<th>T’</th>
</tr>
</thead>
<tbody>
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<td>INTERCEPT</td>
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<td>2.233</td>
<td>-5.357</td>
<td>0.0001</td>
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<td>4.488</td>
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<td>0.452</td>
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<td>MKENTRY</td>
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<td>7.615</td>
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<td>IMAGE</td>
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<td>0.152</td>
<td>-9.838</td>
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</tr>
</tbody>
</table>

$R^2 = 0.98$, DOF = 76.
variables were performed with the Cobb-Douglas specification. The back-ward elimination procedure yielded the specification in table 6.\(^4\)

The production function findings in table 6 may be summarized as follows. Neither of the two coefficients on the dummy variables representing Vanek’s innovation hypothesis are statistically different from zero. The coefficient on the product quality variable is also insignificant. But the findings on collaborative relationships, or strategic alliances, also apply to productivity. Emphasis on such alliances as a general strategy has a positive effect on the production function at the 1% level, while, given this general shift, alliances with other cooperatives as an innovation strategy has a negative and significant effect at the 1% level, and alliances with noncooperators as an innovation strategy has a positive and significant effect at the 10% level.

3.3. Results from the replication (CESPE) survey

This section summarizes the principle findings using the second set of survey data. Regression results are reported in tables 7, 8 and 9.

\(^4\)The initial (mispesified) regression including all qualitative variables whether significant or not is available from the author. As elsewhere, the robustness check of eliminating all variables with a significance level less than 0.25 was found to yield the same specification.
The profit function results in Table 7 may be compared with the analogous results from the first study in Table 3. The same specification procedures were employed as detailed for the first data set. The value of using internally generated knowledge in the cooperative’s innovation strategy is strongly corroborated by these results, with a t-statistic of about 4.8. The value of forging alliances with noncooperative firms is also corroborated but only weakly, with a positive coefficient and a t-statistic of about 1.65. A strategic focus on product improvement and organizational innovations are associated with lower profits. The use of consultants exhibited the one clearly different result; here it is positive and significant. Unfortunately, the lack of information on market strategy, especially quality production or other market orientation, means on the one hand less comparability with the results from the first study and on the other hand leads us to be concerned about omitted variable bias.

Results for income per worker, reported in Table 8, are similar. The use of internal knowledge, alliances with noncooperative firms and external consultants for innovation have a positive association with income per member while a reliance on involvement in consortia, focus on product or process improvements and marketing exhibit a negative effect. Interestingly, the backward elimination procedure leads to the elimination of all qualitative variables from the production function, as indicated in Table 9.

4. Concluding remarks

The empirical findings of this study should be treated with caution. The questionnaires often addressed managers’ perceptions rather than verifiable company or economic conditions; questions might have been written differ-

\textsuperscript{15} Because the regression fit was poorer, robustness checks were run on the specification, available from the author. The signs and significance of the critical variables are highly robust.
Table 8

CESPE data set. Dependent variable: log of income per member.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter estimate</th>
<th>Standard error</th>
<th>T-stat for H0 parameter = 0</th>
<th>Prob &gt;</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERCEPT</td>
<td>1.925</td>
<td>1.047</td>
<td>1.839</td>
<td>0.0672</td>
<td></td>
</tr>
<tr>
<td>LK</td>
<td>0.041</td>
<td>0.092</td>
<td>0.448</td>
<td>0.6541</td>
<td></td>
</tr>
<tr>
<td>ORGANZTN</td>
<td>-1.695</td>
<td>0.618</td>
<td>-2.741</td>
<td>0.0066</td>
<td></td>
</tr>
<tr>
<td>CONSULT</td>
<td>3.789</td>
<td>0.730</td>
<td>5.185</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>PROCESS</td>
<td>-2.150</td>
<td>0.674</td>
<td>-3.189</td>
<td>0.0016</td>
<td></td>
</tr>
<tr>
<td>NEWPROD</td>
<td>-2.732</td>
<td>0.630</td>
<td>-4.333</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>PRODIMPR</td>
<td>-2.279</td>
<td>0.642</td>
<td>-3.456</td>
<td>0.0005</td>
<td></td>
</tr>
<tr>
<td>LICENSE</td>
<td>-1.089</td>
<td>0.524</td>
<td>-1.925</td>
<td>0.0555</td>
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</tr>
<tr>
<td>INTKNOW</td>
<td>2.837</td>
<td>0.591</td>
<td>4.798</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>NONCOOPA</td>
<td>4.450</td>
<td>0.899</td>
<td>4.948</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>MARKETING</td>
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<td>0.719</td>
<td>-3.556</td>
<td>0.0002</td>
<td></td>
</tr>
<tr>
<td>CONSORTM</td>
<td>3.801</td>
<td>0.805</td>
<td>4.717</td>
<td>0.0001</td>
<td></td>
</tr>
</tbody>
</table>

$R^2 = 0.19$; DOF = 229.

Table 9

CESPE data set. Dependent variable: log of value added.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter estimate</th>
<th>Standard error</th>
<th>T-stat for H0 parameter = 0</th>
<th>Prob &gt;</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERCEPT</td>
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<td>0.972</td>
<td>-8.658</td>
<td>0.0001</td>
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<td>LK</td>
<td>0.964</td>
<td>0.089</td>
<td>10.784</td>
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<tr>
<td>LTOTHRS</td>
<td>0.185</td>
<td>0.079</td>
<td>2.353</td>
<td>0.0197</td>
<td></td>
</tr>
</tbody>
</table>

$R^2 = 0.52$; DOF = 185.

ently had they been designed for the particular purposes of this study; it would be helpful to gain more data, especially financial data, to increase the number of observations; and it would be better to also compare data for labor managed with conventional firms, but such are not available for the issues of this study. Results on profitability and income per member often could not be confirmed with the production function study, though the latter type of study is less tied to the hypotheses set out in the first part of the paper. Finally, the study cannot resolve some causality problems: were the firms emphasizing strengths when they stressed an innovation program, or were they trying to bolster shortcomings? For example, when a firm stressed product improvement we do not know if it had or believed it had a strong product mix but would benefit by emphasizing that strength with continued product upgrading and refinement or whether it had or believed it had an intolerably backward product mix which had to be rectified or the firm could face bankruptcy. Moreover, only coops in a relatively strong position may be able to initiate strategic alliances with conventional firms.

On the other hand, there are more than the usual grounds to call for
further research. First, this was not 'data-instigated research'; the hypotheses were carefully formulated prior to the study, so there are reduced grounds for concern over spurious correlations. Second, the data gatherers did not undertake their work holding the hypotheses of this paper; so there are reduced grounds for concern over 'interview bias'. Third, tests were performed by combining managerial response data with separately and regularly collected financial data, adding weight to the assumption that responses on management strategy were independently of ex post performance. Fourth, a systematic and straightforward procedure was used to decide on the inclusion and exclusion of variables, and the general findings proved robust to alternative procedures. Finally, the most important results were corroborated by a second, independent data set (except for product quality orientation, for which data were not available). The framework and econometric results of the first survey had been fully completed before the second data set was available.\(^{16}\)

One particularly striking finding was that a company strategy of collaborative relationships with other firms was strongly and robustly associated with higher profitability and income per member and, in the first data set, productivity. Holding this general gain constant, coops which stressed such relationships with other coops experienced smaller gains, while coops which stressed such relationships with noncoops did even better by these measures. This result could not be fully verified with the second data set since the more general question about collaboration was not asked; but the effect of alliances with noncooperatives was positive and highly significant and with cooperatives was negative and borderline significant. But careful case studies of particular partnerships would be strongly advised before collaborative agreements with noncoops – in particular as a superior alternative to forming them with coops – could be recommended as a policy.

The use of internally generated production knowledge as an innovation strategy is robustly associated with better cooperative firm performance, as measured by either profitability or income per member. This key hypothesis of the organizational comparative advantage approach received strong support in both data sets.

Finally an emphasis on quality production as opposed to alternative market strategies was an important factor in firm performance. This could not be examined in the second survey because the information was not available.

In conclusion, the study of labor managed firms in comparison to more traditional firms is often a useful starting point in the development of new theories of the economics of organizations and in their initial testing. Since

differences between labor-managed and conventional firms are typically more striking than the organizational differences among more traditional firms, issues in economic organization are more readily highlighted.

In this study only a preliminary framework of organizational comparative advantage has been introduced to guide the analysis. In future work, development of a complete theory of organizational comparative advantage from which predictions might be drawn on a more systematic basis would appear to hold great promise.

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