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In recent decades, as the number of worker-managed firms, or producer cooperatives (PCs), has increased, economists have engaged in extensive theoretical and empirical analyses of such enterprises. However, theoretical and applied studies tend to approach the subject in different terms, often making incompatible assumptions about the institutional structure of PCs. This article reviews and compares the theoretical and empirical literature on PCs, addressing four related questions: Do PCs and comparable conventional firms (CFs) make different decisions about employment, output, and prices? Does the internal organization of the PC affect worker motivation and productivity? Does the assignment of property rights in many PCs lead to underinvestment? Finally, why do so few PCs exist in developed market economies?

The scope of this article is restricted to industrial cooperatives, where workers have formal decision-making power over the firm's operations, in developed countries. Even with this somewhat restrictive definition, there is a broad diversity of experience with PCs. Italy has the largest PC sector, accounting for 2.5% of all nonagricultural employment nationwide. Other countries with substantial numbers of PCs include France, Spain (particularly the Mondragon group of cooperative enterprises), the U.K., and to a lesser extent Sweden and Denmark. In the U.S., the plywood industry in the Pacific Northwest has a long history of cooperatives, as do a scattering of other smaller industries. The size of cooperative enterprises varies, but most are quite small: the average Italian PC has less than 20 workers, while a few have exceeded 2000. Profit-sharing arrangements, limits on salary inequalities, hiring of nonmember workers, and provisions for the sale of shares by departing members all vary widely between countries, industries, and individual firms.

EMPLOYMENT AND OUTPUT

The earliest theoretical analyses of worker-managed firms reached the paradoxical conclusion that an increase in the price of the firm's output would lead to a reduction in employment and production. Subsequent studies have shown that this result depended on an oversimplified picture of a PC's labor supply. More careful analyses of the incentives facing cooperative members imply that PCs will expand employment and output in response to an increase in output prices. However, all such models show that, if a PC is maximizing potential dividends, or value added per worker, it will be inefficient, employing fewer workers, paying them more, and producing less than the optimum amount.

It has been difficult to test such theories empirically. Long data series are available for the U.S. plywood cooperatives, but several of the studies using this data rely on problematical estimates of production functions, which are heavily dependent on the appropriateness of the measure of the capital stock. There is no empirical evidence of short-run inefficiency or negatively sloped supply curves; PCs do appear more likely than CFs to vary wages, and less likely to vary employment and output, when prices change. That is, the plywood cooperatives act as if they are interested in maintaining stability of employment, as well as maximizing value added per worker, contrary to the simplest theoretical models of PCs. The few empirical tests using data from other countries have failed to demonstrate any clear differences in the response to price changes by PCs and comparable CFs.

INCENTIVES AND PRODUCTIVITY

The disjuncture between theory and evidence continues in the analysis of productivity. Theoretical studies have explored the extent to which different payment schemes can efficiently elicit effort from workers. Some have concluded that incentive problems make it more efficient to maintain a hierarchical firm in which the owner is responsible for monitoring labor. "However, shirking by workers is never reported as a concern in studies of real world PCs; observers report that workers monitor each other successfully in cooperative organizations." (1302-3) The absence of workplace hierarchy, in fact, may allow greater productivity through cooperative problem-solving and informal social pressure supporting high levels of effort. One feature of many PCs, profit sharing, has been identified as a factor contributing to productivity increases in conventional firms.

Empirical studies have examined the relationship between productivity and worker participation; most studies are restricted to PCs alone, due to data limitations. Within the world of PCs, there are quantifiable variations in the extent of worker decision-making, profit sharing, and collective ownership. The clearest empirical result is that these variables, as a group, have a positive effect on productivity; the effects of the individual variables differ from one study or country to another. Profit sharing appears to have the strongest effect on productivity, especially in French and Italian PCs.

In contrast, studies that compare PCs and CFs, or use mixed samples, often find no significant productivity gains from cooperative organization. There are several difficulties in interpreting this finding. Among U.S. plywood firms, the most profitable PCs have converted to conventional ownership to allow worker-owners to sell their shares on the market (because these shares had become unaffordable for new workers); if such conversions of the most profitable PCs are common, the productivity of surviving PCs will be biased downward. Moreover, comparative studies often use a simple dummy variable to indicate PC status, missing the potentially crucial variation among PCs in the extent of worker participation.

Lacking a clear theory, it is difficult to identify causality in the relationship between productivity and participation. For example, greater reliance on profit-sharing plans may increase productivity; or greater productivity may mean that there are more profits to share. Better theories and better comparative data sets are both badly needed.

INVESTMENT AND FINANCE

Do PCs underinvest, compared to CFs? If (as is usually the case) worker-owners do not receive the full market value of their shares of the company when they leave, they have an incentive to prefer immediate payout of dividends over reinvestment of profits in long-lived capital goods. The worker is sure of receiving the profits from reinvestment only for as long as he/she remains at the firm, and cannot capture the expected value of future profits upon departure. So if there is a chance of leaving before an investment has paid for itself, then the worker is better off receiving dividends which can be invested elsewhere.

In theory, such worker-owners might prefer external financing of the optimal level of investment, combined with high payout of internally generated funds as dividends. However, there often are limits on the availability of external financing for PCs. Outside investors typically have less control over management in a PC than in a CF, and may demand increased risk premiums, or refuse to lend at all.

Some theories of PC investment decisions imply that PCs will operate under conditions of increasing returns to scale -- likely a sign of inefficiency, since they could lower average costs by expanding. However, empirical tests in several countries fail to support the idea that PCs exhibit increasing returns to scale in practice. Simpler data comparisons provide mixed support for the hypothesis of underinvestment by PCs. While U.S. plywood PCs, and Italian and Danish PCs, have lower capital-labor ratios than comparable CFs, the reverse is true for Swedish PCs. In the Mondragon PCs, capital-labor ratios are not lower, and are rising faster, than in comparable Spanish industrial firms; here the existence of a strong cooperative bank, as part of the Mondragon group, may make a difference.

FORMATION AND SURVIVAL

The final question is the most important, and the hardest to answer: why are there so few PCs in industrial market economies? This involves both the formation and the survival of PCs. Some PCs are formed to rescue failing CFs, but most are created from scratch, based on preferences for democratic decision-making and/or concerns for employment security.

The business cycle has contradictory effects on PC formation. In periods of expansion workers have greater assets to use in business formation, and may be less risk-averse and more interested in improved or participatory working conditions. However, in recessions the formation of PCs may be an appealing alternative to unemployment or relocation in search of jobs. Empirically, there is no significant relationship between the unemployment rate and the rate of PC formation, but there are waves of PC formation that are somewhat longer than the business cycle.

PCs disappear either through failure or through conversion into CFs. The degree of institutional support is crucial; Mondragon PCs have almost never failed. Several studies find that PCs have better survival rates than comparable CFs, with some tendency for PCs to concentrate in unusually cyclical industries where protection against employment fluctuations is an important goal. Case studies suggest that there have been waves of conversions of U.S. PCs into CFs, but little is known about the causes of such conversions.

"One explanation for the almost-complete mismatch between theory and empirics in this area is that the factors influencing the formation and survival of PCs can not be separated from the topics in the preceding three sections." [1315] The authors' best guess, which needs to be confirmed through further study, is that

> the explanation of the relative scarcity of PCs lies in the nexus between decision making and financial support. Worker control requires (at least partial) worker ownership for incentive reasons but the latter conflicts with the worker's desire to hold a relatively low-risk, diversified portfolio. External financiers with no direct control of company governance will not commit significant funds without receiving a substantial premium to reflect the risk involved. Hence, worker-controlled PCs have difficulty finding internal sources and competing with CFs for investment funds. [1316]