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PRODUCER COOPERATIVES AND INDUSTRIAL DEMOCRACY:
A COMPARATIVE STUDY OF THE PERFORMANCE
OF COOPERATIVE AND CONVENTIONAL
PLYWOOD PLANTS

by

Youssef Khodaparast

A dissertation submitted in partial fulfillment of the
requirements for the degree of

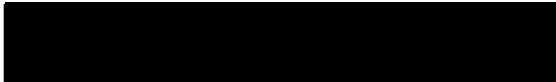
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1986


TO THE OFFICE OF GRADUATE STUDIES AND RESEARCH:


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AN ABSTRACT OF THE DISSERTATION OF Youssef Khodaparast for the Doctor of Philosophy in Urban Studies presented November 18, 1986.


Title: Producer Cooperatives and Industrial Democracy: A Comparative Study of the Performance of Cooperative and Conventional Plywood Plants.


APPROVED BY MEMBERS OF THE DISSERTATION COMMITTEE:


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Widely differing theoretical expectations exist concerning the economic performance of labor-managed firms or producer cooperatives (PCs). While a good number of theoretical studies of these firms by economists have been undertaken, there remain considerable gaps in the empirical record. This is especially true in the case of American PCs. In general, theoretical controversies have not been tempered by enough empirical analysis. While some expect good performance from PCs, others are much less sanguine.

This study compares the economic performance of a group of eight worker-owned producer co-op plants with that of eight conventional mills in the Pacific Northwest softwood plywood industry.

The purpose is to test the validity of several propositions that are typically maintained in the analysis of PCs suggesting that this type of organization basically lacks the incentive to utilize labor inputs efficiently, and is therefore less productive when compared to conventionally organized producing units.

Using secondary data, pooled time-series cross-section equations are estimated. Results indicate that growth in annual output per employee per year is 18 percent greater in the co-ops than in their conventional counterparts. The study provides strong evidence that the two groups of plants differ significantly in their behavior. The major conclusion that emerges is that worker-owned co-ops are a viable and productive form of economic organization that utilize labor inputs efficiently and in doing so can achieve higher worker productivity than their conventional counterparts. In a public policy context, government support of employee ownership and establishment of worker-owned co-ops is viewed as a viable policy option to plant closings.

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Finally it is my hope that this project will contribute to the promotion of worker-ownership and economic democracy.

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CHAPTER I

INTRODUCTION

The 1970s and 1980s witnessed a reawakening of interest in organizational forms such as producer cooperatives (PCs) and the labor-managed economic system. The trend towards this interest has become evident particularly throughout most of western industrialized countries. Employee-owned and participatory firms have begun to emerge in almost every part of the world. French examples include the large watch manufacturing of Lip and furniture manufacturer of Manuest. The Canadian examples include Pioneer Chain Saw Manufacturers and the pulp mills at Tembec. In Britain, transitions into cooperatives include the motorcycle manufacturer at Meriden, Kirkby Manufacturing, and the Glasgow daily newspaper, The Scottish Daily news. In the United States, various federal and state agencies have provided assistance in establishing worker-owned firms. Among the best known American cases are the Farm Home Administration assistance to Bates Manufacturing, the Economic Development Administration assistance to South Bend Lathe, and the \$4.6 million loan provided by the

Department of Housing and Urban Development to the employees of Rath Meat Packing who bought their closing firm.

Interest has also blossomed in schemes providing for some degree of worker participation in decision making, and/or in ownership or profits. Typical of these schemes, which usually--though not always--do not fundamentally challenge the power structure, are employee stock ownership plans (ESOP), quality circle programs, and codetermination.

Various factors have contributed to this recent development of interests in participatory and employee-owned firms. These include a desire for better industrial relations, decline in worker productivity, high rates of inflation and unemployment at times, and finally the increasing awareness of the apparent viability of long established schemes, such as the U.S. plywood PCs. But perhaps the most important factor has been the regional stresses caused by plant closures and industrial relocation. Plant closure frequently has adverse consequences for suppliers, merchants producing local goods and services for sale to its work-force, distributors, municipalities dependent on the firm for revenue, and so forth. Today in a growing number of communities, workers and community groups are buying closing factories to save their jobs and communities.

From an economic point of view, advocates argue that PCs are more likely to remain in local control thereby benefiting the local economy, than are conventional firms.

PCs are thought to be better equipped to tackle some problems such as job preservation and workplace humanization. PCs have been viewed as providing an effective option to plant shutdowns and in many cases an effective overall strategy for local economic development. The establishment of local PCs is, therefore, a recognition of the structural nature of unemployment, requiring more viable solutions than have been offered by different governmental agencies. Advocates of PCs and workers' self-management argue that it is the only permanent solution to the problems of the workplace (e.g., alienation, job dissatisfaction, etc.). Some (e.g., Vanek, 1977 and Jones, 1978) maintain that a great scope exists for the potential PC sector within contemporary industrialized western economies.

What makes the PC form superior to other schemes of industrial democracy is that it provides its employees with not only ownership of the enterprise, but also with active and effective participation in making decisions affecting employees' work and the company's operation. Other schemes of industrial democracy which are employed in the United States emphasize either employee participation on a limited basis or a small degree of ownership of the enterprise. Considering the positive effects of both ownership and participation on work performance, PCs are expected to produce greater results in terms of both human and material rewards than other schemes of industrial democracy.

Critics, including Sidney and Beatrice Webb (1920), who were among the very first advocates of consumer cooperative movements, view PCs as defective and as predisposed to collapse or resort to traditional capitalist forms of organization for some structural reasons. PCs are also thought unable to introduce technical change and to be characterized by poor discipline and poor knowledge of the market. Criticism of PCs has often been centered around the issues of viability and efficiency. For various reasons, some expect PCs to be intrinsically inefficient compared to conventional firms. This pessimism is shared by a number of Marxists as well as mainstream economists, though the particular reasons advanced usually differ. For some mainstream economists the alleged inability of PCs to take risks and questions of management will plague PCs and ultimately help cause their doom (Alchian and Demsetz, 1972; Jensen and Meckling, 1979). For some others, including a number of Marxists and writers connected with PC movements, PCs are viewed as illusory and insignificant, suggesting that workers cannot implement decisions taken (at the factory level) against the operation of market laws; and that "it is impossible to build island of socialism in a sea of capitalism" (Mandel, 1975 and Horvat, 1975).

The conflicting views concerning performance and viability of PCs stem from the fact that the empirical body of evidence on these enterprises is small and hence insufficient to warrant any strong argument against or for

PCs.

In the light of this background, the plywood PCs of the Pacific Northwest stand out as worthy of study. When we find not one but a group of long established participatory and worker-owned firms, an opportunity for a meaningful research presents itself. The group of plywood PCs considered in the present study are functioning examples of producer cooperatives. With eleven of these PCs in operation for at least thirty years and some even longer, they refute the proposition that industrial producing cooperatives cannot survive and cannot remain cooperative. The plywood PCs comprise a sizable segment of the Northwest softwood plywood industry and have been important in its development.

Most previous studies which have dealt with the plywood PCs fall in two general categories: (1) those which mainly provided descriptive overviews of the operation of these PCs (Bernstein, 1974 and Gunn, 1980b) and (2) those which investigated the effects of participation and/or ownership on organizational performance (Bellas, 1972 and Greenberg, 1980). Only Berman (1967) compares the performance of plywood PCs (on an aggregate level) with that of the plywood industry as a whole. No attempt has apparently been made to compare the performance of plywood co-ops with a group of conventional plants.

Using a multilinear regression model, this study compares the economic performance of plywood PCs with a group of conventional plants in the Northwest softwood plywood industry. Special emphasis is given to a comparative analysis of worker productivity between the two groups of plants.

The study begins by reviewing the broad field of industrial democracy in Chapter II. Chapter III addresses the general subject of producer cooperatives and reviews the theoretical and empirical research conducted in this area. A discussion of the softwood plywood industry is presented in Chapter IV to provide the basis for understanding the experience of the plywood PCs and the industry in which they operate. A descriptive overview of the formation and operation of the plywood PCs is then presented in Chapter V. Chapter VI presents the methodology used. Results and interpretations are reported in Chapter VII. The study concludes with an assessment of the features of the softwood plywood industry for cooperative operations, and with recommendations for public policies regarding worker-owned cooperatives.

CHAPTER II

INDUSTRIAL DEMOCRACY: WORKER PARTICIPATION AND OWNERSHIP

Any discussion of industrial democracy runs into difficulties because of a vagueness in the concept and the many different meanings injected into the term. In defining industrial democracy many have relied on the concept of worker participation and ownership. Worker participation and ownership, in turn, have a variety of meanings depending upon the objectives or aims they are meant to achieve, the forms they take, the range of issues subject to workers involvement, and the degree to which workers can influence management decisions.

Carnoy and Shearer (1980) perceive industrial democracy as the direct participation of employees in the government of the enterprise in such a way that it gives employees decision power over how work is to be done, how work is to be allocated, and how much workers are to be paid. Direct participation means the ability of all people involved in any situation to be personally engaged in the

participation process. It also means direct involvement of workers and employees in the process of control, management and exploitation of their enterprise (Wright, 1979). A system of industrial democracy, therefore, implies the opportunity for full higher level participation and ownership by employees.

CONCEPTUAL DIMENSIONS OF INDUSTRIAL DEMOCRACY

The subject of industrial democracy consists of a very broad area which has resulted in different conceptual views. Most theorists and researchers have generally focused on dimensions such as political and democratic theory, socialist theory, human growth and development, productivity and efficiency.

Pateman (1970) can be mentioned as one of the leading theorists emphasizing the democratic and political aspects of industrial democracy. In Pateman's view, industry occupies a crucial position in the question of whether a participatory society is possible. Industry, with its relationship of superiority and subordination, is the most "political" of all areas in which ordinary individuals interact, and the decisions taken there have a great effect on the rest of their lives.

The contemporary theorists of participation and democracy, such as Pateman, see a connection between participation in the workplace and participation in the wider political sphere. Political and democratic theorists

of industrial democracy perceive the workplace as a potential training ground for acquiring participatory skills and resources, provided that it is organized in a participatory way. Elden (1981) provides empirical evidence directly supporting this view. However, in his study of the plywood PCs, Greenberg (1981) rejects the theory that experience of direct decision making at workplace necessarily leads to the enhancement of cooperative and egalitarian orientation among participants.

Socialist writers emphasize economic equality as the goal of worker control and industrial democracy (i.e., Mandel, 1975; Coates, 1971). They perceive society in terms of class interests which are incapable of resolutions within the present structure and contend that abuses encountered by workers in their employment can be overcome by a process of workers gaining crucial areas of control from management. The desirability of worker participation and ownership is seen by socialists and radical theorists to be based upon the notion that industry is divided into two opposing camps: the management, with its authority derived from property rights, and economic power to purchase labor; and the employees with their authority derived from the collective will of workers themselves. Thus, in socialists' view, worker participation in management decision making and ownership of means of production develops political efficacy among workers which is a potential threat to the status quo.

Vanek's (1970, 1971, 1975) work belongs to this category. He emphasizes a participatory structure oriented to democratic majority rule. For Vanek, a participatory and a worker-owned-and-managed firm serves as a vehicle for the formation of a participative economy which is responsive to human personality, as well as economic development.

The human growth advocates of industrial democracy mainly emphasize the development of human personality and mental health within organization life as the chief goal of industrial democracy. The work of Allport (1945); French, et. al.(1958); Vroom (1960); and Argyris (1971) stress worker participation program to create desired organizational change and employee motivation at work. The intention of authors in this perspective is to change organizations, by creating participatory program, and establish a better quality of life within them. The implication of the work within the human growth and development area, is that industrial democracy should be viewed as intrinsically worthwhile.

The 1970s and early 1980s have witnessed the growth of literature oriented to the necessity for work and industrial democracy to conform to productivity and efficiency goals. Worker participation and ownership programs are perceived as partial solutions to problems such as declining productivity, absenteeism, alienation and inferior product quality. This view has developed with the assumption that

satisfied workers will lead to a productive and profitable work-force (Long, 1977 and 1978; Greenberg, 1980).

Forms of Industrial Democracy

It is important to distinguish between employees' control of their workplace through participation and control through ownership, since there are many ways in which worker control or industrial democracy can be achieved.

Employee Participation: It may either be through direct involvement, or through representation of some kind (Hespe and Wall, 1976). Within each of these classes we have alternative participative structures such as face-to-face informal contact or meetings in the case of direct involvement. Supervisory boards, trade union representation, joint consultation, and employee directors are examples of representative participation. The extent of employee participation is thus dependent upon the forms of direct or indirect participation. Workers on the Board of Directors, for instance, has been implemented in a growing number of companies both in the United States and abroad. The theory behind this reform, at least to the extent that any clear theory exists, is that corporations ultimately are governed by their boards and that the employees of the firm are a constituency that must be recognized and represented on the governing body of the firm through their own elected representative. However, in a study of the European

experience conducted by Batstone and Davies (1976), it was found that worker directors had little effect on running their firms.

Employee Ownership: This may also take different forms. Profit-sharing plans, for instance, make employees partial "owners" of firms through direct or indirect stock purchases. By 1983, according to the ESOP Association, there were approximately five-thousand firms in the United States with employee stock ownership plans (ESOP) and almost five-hundred companies in which employees held a majority of stocks (ESOP Association, 1983). Profit-sharing plans do not usually give employees much, if any, control over wages, employment, or investment decision. Pension funds in various firms are also a source of worker control. But again, in practice, they have served as a ready and large source of investment capital for the firm without increasing workers' participation in decision making (Frisch, 1982).

It is, however, important to distinguish between firms that have employee ownership arrangements and companies that are "employee-owned".

At the very least, according to Toscano (1983), the term "employee-owned" should be reserved to companies in which (1) more than 50% of company shares are held by a majority of employees; or (2) a plan exists whereby at least 50% of company stock will eventually be acquired by a majority of employees.

PARTICIPATION VERSUS OWNERSHIP

There is an ongoing debate within the field of industrial democracy concerning factors affecting organizational performance. Is it ownership, per se, or worker participation that causes high performance levels? Dahl (1957) provides an interesting and important twist on this question by suggesting that "excessive" participation may in fact have a negative influence on overall performance in a business enterprise. This in turn raises the question: how much participation and control should there be in a firm for its employees to achieve full democracy? Studies reviewed here shed some light on these questions.

Dahl sees ownership as the dominant motivator. He believes that owners work better than employees. Berman (1967), on the other hand, rejects this explanation, almost completely dismissing ownership as a motivator. Berman stresses the participation-productivity relationship and takes institutional features such as autonomous work groups, elimination of status symbols, a single job classification for all, selection of own leaders, and dissemination of economic information to be the principal determinants of the firm's superior economic performance.

In their survey study of 98 companies, of which 68 had ESPOs and 30 had direct ownership, Conte and Tannenbaum (1978) support the hypothesis that it is ownership, and not participation, that has the greatest effect upon profit-related performance in employee-owned companies.

Long (1977, 1978a, 1978b) conducted the most extensive test of work-organization motivation theory that have been conducted in a Canadian employee-owned-and-managed firm. Long's studies provide strong evidence for the participation-productivity relationship in employee-owned firms. The results indicate that employee share ownership and participation each had significant and independent effects on some job attitudes and organizational performance but participation seemed to be the stronger of the two variables.

Hespe and Wall (1976) argue that employee participation in decision making could hardly be expected to be successful when it is not desired by employees. Their studies, in organizations ranging from a coal mine to a number of hospitals, reveal considerable individual and organizational differences in the manner and extent of desired participation. They conclude that higher level forms of participation, though a commendable ideal, may be inappropriate where the climate of the organization denies employees suitable opportunities to participate in decisions seen to be of more relevance to their everyday activities. Hespe and Wall further maintain that participation is only desired or demanded by employees when it deals directly with work activity on the job.

French, Israel, and As (1960) inferred from their research that participation in decision making will only be effective if it is perceived by employees to be legitimate.

More importantly, Powell and Schacter (1971) found participation to be largely ineffective in a situation where no extrinsic reward was provided. Since employee-owners share directly in the success of the organization, through dividends or surplus and share appreciation, share ownership may provide the extrinsic rewards hypothesized by Powell and Schacter and to be necessary for successful employee participation in decision making.

In separate studies of different employee-owned firms Goldstein (1978) and Sockell (1985) concluded that share-ownership is not sufficient to ensure job satisfaction and motivation of employees and that a combination of both ownership and participation may be required to produce the desired results. Long's (1978b) study also found that combined share ownership and participation are equally desired and needed for better organizational performance.

Review of these studies suggests that we have to be skeptical about the organizational effects of either employee ownership or participation alone. Researchers and theorists have often focused on the effects of either employee participation in decision making or ownership of the enterprise on workers or on organizational performance. Very little attempt has been made to study the relative effects of employee ownership and participation in decision making on variables (such as productivity and efficiency) which they are both thought to affect. There is a lack of

effort in the literature to establish a consistent and reliable relationship between the extent or degree of worker control in the workplace and organizational performance. It can, however, be inferred from the existing research that changes in organizational structure which generate widespread control through employee ownership and participation in decision making, that are perceived by employees as desirable and relevant can improve the worklives of employees as well as organizational performance.

Industrial democracy must, therefore, create mechanisms which sufficiently increase participation relevant to the workers' lives on the job and ownership of the enterprise. This aim can largely be enhanced by establishing an organization which provides its employees with direct participation in decision making and full ownership of the enterprise; mainly producer cooperatives (PCs). If combined ownership and participation in decision making results in better organizational performance, as some have hypothesized; then PCs should be able to show a relatively better performance than conventional organizations.

CHAPTER III

PRODUCER COOPERATIVES (PCs):

THEORY AND EVIDENCE

There is no generally accepted definition of the PC and the term has been employed by various authorities to include diverse organizational forms. In many instances in the literature, the term "labor-managed firm" (LMF) has been used to characterize the PC, and hence a large body of the literature on PCs is derived from the formal theory of LMFs.

It should be mentioned here that most traditional models and definitions presented by theorists such as Ward (1958), Domar (1966), Vanek (1970) and Meade (1972), seem inappropriate for characterizing and defining the American PC due to the fact that the models developed by these authorities are primarily based on the Soviet or Yugoslav system of labor-managed economy. It is therefore essential to introduce a model of PC which can characterize these participatory forms of organizations in a market-oriented economic system. Such a PC is defined here as the following:

1. The enterprise is autonomous.
2. Employees are able to become members of the enterprise by nominal holdings of share capital.
3. Sharing of the net revenue by members after payment of taxes and the cost of capital. Members specify a wage structure and then distribute the net residual according to a distribution formula.
4. Ownership is widely distributed among the employees.
5. Members participate in the enterprise's management.
6. The cooperative principle of "one-member-one vote" and "limited return on capital" apply.

Many would agree that the attributes above include the necessary aspects of an acceptable definition of a PC in a market economy (e.g., Carson, 1977; Steinherr, 1978; Jones, 1978; Jensen and Meckling, 1979).

THE ORIGINS OF PCS

We can find a number of studies examining the reasons why people join PCs or cooperative communes (e.g., Barkai, 1977; Zablocki, 1980) or why particular co-ops have been founded. However, the modeling literature appears silent as to the general reasons why PCs are founded. There is a lack of serious and extended attempts in the literature to find and test propositions on the social, political and economic forces underlying the formation of such co-ops.

There have always been some PCs in the United States, and interest in them was strong at various times. Saposs (1914), Stockton (1931), and Shiron (1972) have documented early American PCs. The earliest recorded PC was in 1791 in Philadelphia. Waves of PCs were established in the periods of 1837-1844, and 1880-1914.¹ Each wave coincided with a period of industrial depression and substantial unemployment. Moreover, it is noteworthy that within each wave, a record number of PCs was established at the time when the depression reached its peak (in terms of unemployment). PCs then, were conceived by workers to be a possible solution to economic exigencies caused by periods of persistent and substantial unemployment.

Some labor organizations such as Iron Molders' Union and the Knights of Labor pioneered in establishing co-ops in the 1880's. In the long depression of 1837-1844, for instance, forty-nine PCs reportedly started in the direct aftermath of an unsuccessful strike by organized labor.² Establishment of PCs was included among the first principles of some union from the outset, but it was the depression and failure of strikes that resulted in shifting major emphasis to cooperation.

The number of PCs has historically been a cyclical phenomenon. After a rather rapid and sudden increase in the depression years, their number has generally had a declining trend beginning with the end of each depression. In fact, once the depression was over, the usefulness of the co-op to

workers declined. What distinguishes the emergence of older PCs from the newer ones, according to Shiron, is the apparent lack of "movements" for participatory and cooperative industrial relations in recent years.³ The practical consequences of lack of "movementism" are significant. Fighting for survival in an often hostile business environment, PCs are usually devoid of any financial, marketing, or educational-promotional help which might be offered by a central organization.

Most of the PCs which were formed in the 1880s and early 1900s were short-lived. Many reasons have been given for their failure, including the lack of capital, decline in union sponsorship, internal dissension and poor labor discipline (Horvat, 1975 and Ben-Ner, 1981). A more detailed analysis of why some PCs fail will be presented later in this chapter.

Although useful data for some countries on the relative importance of PCs in different branches of industry are available, no one appears to have tested the various conjectures about the characteristics of particular industries allegedly encouraging or discouraging the formation of PCs. However, according to Meade (1972), PCs are more likely to be found in labor intensive industries. Waedikin (1973) and Digby (1975) include not only labor intensity of the industry, but product lines in which certain management problems are small, e.g., in agriculture where the crops do not require much skill in production, are

not perishable, or are not difficult to store or handle. Berman (1967), on the other hand, argues that PCs can operate most advantageously in industries where labor cost is a significant share of total cost.

Carnoy and Shearer (1980) divide industrial PCs into two broad categories:

- a) PCs formed by workers as new firms (job creation).
- b) PCs arising out of corporate divestitures (job preservation).

The development of a cooperative firm as an entirely new enterprise, apparently requires a set of conditions that makes it profitable to begin such an enterprise and/or an ideological motivation to work in a cooperative setting rather than a traditional capitalist firm.

In the United States and some other western industrialized countries, a new situation has developed; plant closures, which are sometimes met with workers' attempt to run the business themselves. Workers organize to buy the plant, often with community support, and sometimes with financial help from government agencies and banks whose officials are interested in maintaining or restoring local employment. The evidence of this case is the recent wave of worker buyouts in the United States (i.e., Vermont Asbestos Group, Youngstown Sheet and Tube Steel Mill, Mohawk Rubber, Campbell Works). Whereas most traditional PCs began as new ventures, the majority of the new worker cooperatives are the so-called "ailing" conventional firms which have been

converted into PCs.

Cooperative enterprises have also been established by governments in order to achieve national and social goals. In the United States, for example, in the late 1930s, the federal government established 262 co-ops or collective farms to create jobs (Infield, 1945).

THEORY

Theoretical analysis of the PC (or LMF) is essentially framed as an extension of the micro-economic theory of the firm. The theory was developed chiefly by Ward (1958) and Vanek (1970) and extended by others. The theoretical analysis is devoted to a comparison of the pure LMF with the pure capitalist firm. The chief question is whether the LMF can achieve the same allocational efficiency as the capitalist firm of pure theory.

Two basic propositions emerge from this work. First, it shows that the level of production and employment in the LMF would be lower than that of the capitalist firm. The reason for this outcome is that as the LMF's output increases, the marginal product of labor declines, given the capital endowment and the existing workers will be unwilling to accept the resulting lower wages. With a wage or equal pay system, workers in the LMF have less incentive to work hard in the same manner that employees of an enterprise with a salary system have less incentive to work the optimal number of hours (Vanek, 1970). The resulting situation would be less efficiency, and output comes to rest at some

point on the declining segment of the average cost curve. If the assumption of equal income is dropped, the inefficiency of the LMF disappears, as shown by Meade (1972) and Sisk (1982). It also disappears if we move beyond the simple assumption that workers seek to maximize their income. If we add the motive of maintaining or increasing the number of jobs, which is often a prominent motive in PCs, there is no reason to believe that the optimum level of employment and output is the one at which profits are maximized. The second basic proposition might be called the self-extinction theory. Vanek (1975) argued that the optimizing LMF will destroy itself. Starting with the first proposition above, diminishing returns to labor means that income per worker can be raised by reducing the number of workers. This causes the capital-labor ratio to be suboptimal. The capital stock is then reduced to achieve optimality. This sets off another reduction in the number of workers, and so on, until the collective disappears. Optimality is never restored by increasing the amount of labor, because that would reduce the size of the individual's dividend. Finally, there is a tendency for the LMF to be starved for capital because of the desire of workers to maximize their incomes.

These two propositions about the LMF--suboptimal output and capital starvation/self destruction--have triggered a volume of theoretic literature. One line of theorizing deals with the possibility of worker

participation in decision making increasing productive efficiency, either by increasing worker motivation or by bettering the ability of the LMF to tap the know-how of workers. This analysis extends the discussion beyond the Ward-Vanek model of the pure LMF to include the participatory firm. In this type of enterprise, ownership may be either public or private, but workers and owners participate jointly in determining policy. Examples would include firms with employee stock ownership (but not control) and the German codetermination scheme (sitting of workers on the board of directors). The basic question is whether employee participation has a favorable or unfavorable impact on the level of output, capital accumulation and efficiency in the allocation of resources. The chief studies along this line are Carson (1977), Aoki (1980) and Svenjar (1982). This line of analysis is an extension of a type of bargaining model in which both parties seek to optimize their bargaining positions. The result is an intermediate position between the goals of the two parties that is determined by their relative bargaining power. As might be expected, the effect on resource allocation depends on the assumptions made with regard to time preference, income maximization, desire to maintain employment levels, and related matters. Several results have emerged. First, in the participatory firm, in comparison with the pure capitalist firm, worker's

bargaining power will lead to higher wages in the participatory firm, along with lower employment and output and greater capital intensity--a suboptimal result in comparison with the pure capitalist firm. However, if X-efficiency (e.g., when actual output is equal to the maximum output, for given inputs) is introduced into the model (Leibenstein, 1966 and 1969) the participatory firm is potentially more efficient. This is due to the belief that a major element of X-efficiency is motivation of employees, and in participatory firms workers have strong motives (e.g., share-ownership) to reduce such inefficiencies.

This second result has been challenged by Furubotn and Pejovich (1970), Furubotn (1976), Jensen and Meckling (1979). These studies are based on the idea that the unqualified property rights of owners in the pure capitalist firms are a necessary condition for allocational efficiency. Any abridgement of this condition by public authority or worker participation in management must be inefficient--modified, of course, by the qualification that if the abridgement is more efficient, it will be willingly adopted by the private owners.

These theoretic works offer predictions or hypotheses that can be subjected to empirical tests. Before examining the empirical literature on PCs, however, the type of organizational structures that are implicit in the theories should be distinguished.

FORMS OF INDUSTRIAL ORGANIZATION

We can distinguish four institutional forms of the producing enterprise (Fusfeld, 1983). One is the pure capitalist firm with untrammelled private ownership in a perfectly competitive economy. This form has been analyzed in great detail in modern general equilibrium theory. One aspect of the capitalist firm that the mainstream theory does not deal with, but which has been discussed at length by institutionalists and economists of the socialist and Marxist left, is the social organization of the firm. The capitalist firm has a clearly defined division of labor among workers, supervisors and managers, and owners (as well as differentiation within those three groups). The distribution of authority among those groups is the distinguishing feature of the typology of institutional forms implied in the theoretic literature on the labor-managed and participatory firm (or producer cooperative). In the pure capitalistic firm, authority is exercised exclusively by the owners.

The second organizational form is the capitalist firm in a system of collective bargaining. Ownership remains private and managerial decisions are in the hands of the owners or their delegated representatives. The focus of authority remains essentially the same as in the capitalist firms. When collective bargaining enters the model, however, optimization of the utility of the workers must be taken into account.

The third organizational form is the participatory firm. It differs from the firm with collective bargaining in two respects. In some versions, such as "quality circles" and related programs for worker control over production in the individual shop, some of the supervisory and managerial functions are shifted to workers. In other versions, such as employee stock ownership plans or "codetermination", workers take on some of the functions and responsibilities of owners and/or management. The social organization of production is somewhat changed. There is also a shift in the structure of power: theoretically we would expect the participatory firm to respond to the worker's preferences to a greater extent than the capitalist firm with collective bargaining, and less strongly compared to the owner-management interests.

With the fourth organizational form, the LMF, we reach the other end of the continuum. In this form, workers control policy throughout the managerial hierarchy. In theoretic terms, the utility functions of owners and workers are fused into a single utility function, and a separate ownership interest no longer exists (Svenjar, 1982). It is this absence of a separate property interest that causes the property rights theorists to argue that the pure LMF is inherently inferior to the pure capitalist firm.

The distinguishing feature of this typology is not the ownership of productive resources since all four types could exist with either private or social ownership of capital.

For example, the pure capitalist firm (private ownership) and the Soviet firm (social ownership) can be analyzed in terms of their responses to the utility functions of the top management, which would include directors and officers in the capitalist firm, and ministry officials plus plant management in the Soviet firm. At the other end of the continuum, the LMF can take the form of PCs in which the firm is privately owned by its workers, or the Yugoslav enterprise, which is socially owned by worker-manager within constraints imposed by limited central planning.

Nor is this typology based on the presence or absence of a particular form of management. All four types could be organized in a centralized, hierarchial form (the large capitalist firm; the Soviet enterprise; the multi-plant Yugoslav firm). And all four could be organized with a degree of decentralized control (the mom-and-pop retail store; small producer cooperatives in the U.S. plywood industry).

The distinguishing feature is the social organization of production and the authority relations it embodies. In the pure capitalist firm, owners determine policy in a single center of power at the peak of the organizational structure, and retain all earnings. At the other extreme, workers determine policy and retain the surplus over costs. Between these two extremes, in the capitalist firm with collective bargaining, owners retain authority and control, modified by the bargaining power of workers, while in the

participatory firm a portion of ownership authority has passed to workers. Theoretically, the capitalist firm optimizes with respect to the utility function(s) of owners, without taking into account the utility function(s) of workers. In the intermediate forms, optimization involves both utility functions in a complex and often uncertain relationship.

EVIDENCE

It is interesting to note that there are many theoretical assumptions about worker's cooperatives as democratic organizations but fairly little empirical evidence to support the various theories.

This section reviews some of the recent evidence on three areas of recurring concern in the literature: (1) the ability of PCs to survive; (2) the reasons for their failures; and, (3) the economic performance of PCs.

Survivability of PCs

Theory has often given scholars the wrong research agenda by failing to point out that all firms tend to disappear, not simply worker-owned co-ops. The key questions about PCs are whether they tend to die more rapidly or grow more slowly than comparable conventional firms.

When the average age of British PCs during the period 1895-1963 is calculated (Jones, 1975), the average age is seen to trend upwards. Jones (1977) also reports that there

were cases of American PCs in barrel-making surviving for more than fifty years. In a study of American PCs by industry (foundry, cooperage, shingle, plywood), Jones (1979) again shows that altogether 39 PCs have survived for more than twenty years. And according to Bradley and Gelb (1983), of the fifty to sixty worker buyouts of conventional closing firms in the United States in the early 1970s, none was known to have failed by the end of the decade.

Some evidence also exists, however, that not all PCs survive nor avoid the degeneration tendencies discussed by theorists. Jones (1982) examines the problems of survival and self-destruction in the American PCs and finds that survival problems are strong. For most groups of PCs, whether or not mortality is greater than for conventional firms, remains an open question.

Reasons for Demise and Degeneration

From the literature a list of causes of failures of PCs can be drawn up (Horvat, 1975 and Ben-Ner, 1981). Some of the major reasons underlying such a situation can be briefly listed:

- a) Failure of PCs due to internal dissension. Such problems can be traced to leadership struggles, and lack of common values.
 - b) Lack of economic viability due to small size and inability to generate internal savings.
 - c) Adverse outside conditions. The reason for failure given in this regard lies primarily in
-

factors essentially beyond the control of individual PCs. These include legal restrictions or complications, difficulties within and without the wider cooperative movement in obtaining credit because of the lack of trust in the PC form and conflicts with more conventional firms.

- d) Lack of adequate management. PCs may be unable or unwilling to pay competent managers adequately to retain them.
- e) Economic success. Paradoxically, success may breed failure in a number of different ways.

When the experience of American plywood PCs is examined (Bellas, 1972 and Berman, 1967), one could argue that the degeneration of some of these co-ops, usually the most successful ones, into conventional firms stem from imperfections in the formal structure of the enterprise (Vanek, 1975). Of paramount importance is the role of equity ownership instead of the preferred requirement of active participation (Jones, 1978). Particularly where the capitalized value of individual shares in the PC becomes very high, young workers are unable to afford to become members, and founder members find it difficult to leave the co-op without recouping their equity. Two classes of workers (founder members and hired workers) will likely emerge or the founder members will be forced to sell the PC to capitalist interests.

According to some evidence, worker's co-ops that adhere

to the democratic principle of "one-member/one-vote" and require that all workers also should be members, are least liable to degenerate. Some writers such as Zablocki (1980) stress the importance of selectivity of membership in PCs so that disputes or internal dissention can be resolved according to a common set of beliefs. Russel (1984) emphasizes the role of culture and ethnicity in the degeneration of PCs and argues that strong ethnic and cultural bonds link present and future members of a co-op, and brings about unity and solidarity among members. Separate surveys by Bernstein (1976) and Rothschild-Whitt (1979) found members in successful PCs to be strongly committed to some sort of "collectivist spirit" or "democratic consciousness". Such commitments to collectivist or democratic values appear to play an important role in discouraging current members from maximizing their own incomes at the expense of future generations of workers. Common cultural and ideological values have apparently played important roles in the success of Mondragon PCs in Spain.

Economic Performance of the PCs

Evaluation of the performance of PCs is complicated by various problems. Studies usually try to compare performance of PCs with that of comparable conventional firms. In such cases, according to Jones (1978), the appropriate level of aggregation is not clear: is it all

PCs or PCs in an industry/area or on an individual "paired-firm" basis? There is also the question of appropriate criteria: what indicators of success are useful in comparing success either between PCs and other firms or even among PCs? Despite these apparent problems, a number of comparative studies have been conducted.

In his study of Kibbutz PCs and private enterprises in Israel, Melman (1970) found that according to various efficiency criteria the co-ops were more efficient than conventional organizations. This was clearly the case with respect to capital productivity, with little difference in comparative administration costs. Berman's (1967) study provides evidence that efficiency in the plywood PCs (measured in terms of productivity, log recovery ratio and profitability) to be compatible with--and in some instances greater than--the average for the industry. Jones (1979) evaluated the efficiency of some early American PCs in terms of labor productivity and profitability. For the PCs for which productivity could be calculated, he found output per worker to be greater than the comparable conventional firms. Thomas (1982) found that the average performance of Mondragon PCs (measured in terms of value-added per factor of production) to be better than that of the 500 largest enterprises in Spain, and generally exceeded that of medium and smaller-sized factories. For long-established British PCs and conventional firms, Jones (1974) undertook a variety

of exercises bearing on comparative labor efficiency. No obvious comparative advantage was apparent.

One of the specific weaknesses seen by some in the PC form is the allegation that PCs are usually unable to undertake technical change and that the more participatory PCs are the least innovative. Fragmentary evidence suggests otherwise. Construction of efficiency frontier maps and fitting production function provided evidence that PCs in footwear industry of Britain can undertake technical change and that innovation and degree of participation are positively related (Jones, 1974).

With regard to the issue of employment stability and labor turnover, Wiles (1977) reports that labor turnover, measured by leaves as percentage of industrial labor force, is relatively low in the Yugoslav labor-managed economy by international standards.

It is often argued that PCs are smaller, and if they grow at all, they will do so more slowly than conventional firms (Atkinson, 1973). In fact, one of the major propositions made by Vanek (1970, p. 105) is that "there is a far lesser danger of gigantism--and a corresponding far greater likelihood of competitive conditions in labor-managed market structure than in just about any other economic regime". In an empirical study of Yugoslav economy, Sacks (1982) finds it difficult to confirm Vanek's theory. Jones' (1979) study of some early American PCs,

however, provides partial support for that contention.

When the ability of PC movements to grow and to form new PCs is examined, no single answers are yet ascertainable. The British and American movements, for example, appear to register disappointing performance by this token. But a contemporary form of PC in Britain is enjoying much more success at procreation. Even more startling has been the success of the Mondragon PCs in Spain and their growth between 1955 and 1982 from nothing to a group of more than 85 industrial cooperatives (producing everything from machine tools to refrigerators to electronic equipment) with 20,000 worker-members (Gilman, 1984).

SUMMARY

Most of the theoretical literature focuses primarily on static resource allocation in the short-run and has resulted in conflicting theories of behavior of PCs. As a consequence, theories have generated few distinct propositions for econometric analysis and have failed to provide predictions about some of the most important problems of PCs--expansion and growth. There is even little certainty that most theoretical assumptions apply to producing cooperatives.

The empirical studies of the behavior of PCs have begun to move away from the purely descriptive level to become increasingly informed by theory. Some studies have attempted to test critical propositions about the behavior

of PCs from microeconomic perspectives. In most cases, such studies are often ill-conceived and poorly executed, and results obtained must be interpreted cautiously.

Any attempt to generalize the performance of PCs runs into difficulties due to the lack of sufficient empirical work in this area. This is particularly true of American PCs. Concern should be expressed in regard to studies dealing with PCs in different countries and their relevance to the experience of American PCs. Based on the relatively small body of evidence, to conclude that all forms of PCs are superior in all important respects to conventional firms would be premature. Some conclusions are, however, evident. For example, the views of some critics on the alleged inability of PCs to survive are refuted. And it has never been established that PCs are more prone to failure than their conventional counterparts.

FOOTNOTES

¹Shiron, 1972, p. 535.

²Stockton, 1931, p. 260.

³Shiron, 1972, p. 537.

CHAPTER IV

SOFTWOOD PLYWOOD INDUSTRY^{*}

This chapter discusses the important characteristics of the softwood plywood industry and provides the basis for understanding the experience of the worker-owned plywood co-ops. A study of this industry also seems essential in regard to the comparative analysis of the economic performance of co-op and conventional plywood plants. Assessment of the significance of the industry characteristics for the plywood PCs is, however, deferred until the concluding chapter. Part A discusses the manufacturing process and factors of production. Part B deals with the nature and uses of softwood plywood and current industry situation; and Part C with industry structure. The main emphasis will be the Pacific Northwest

^{*}Principal general references and sources used in the preparation of this chapter are the following: Guthrie and Armstrong (1960); Mead (1966); State of Oregon Department of Employment (1969); Berman (1967); and various issues of "Forest Industries"; "Forest Science"; "The Oregonian" and author's personal investigation and interviews with industry sources.

segment of the softwood plywood industry.

**A. PROCESS OF MAKING SOFTWOOD PLYWOOD AND
FACTORS OF PRODUCTION**

Plywood traditionally has been made from an odd number of layers (plies) of veneer or of veneer in combination with lumber core, particleboard core, or other types of a very thin sheet varying in thickness from 1/100 to 1/4 of an inch. Each layer is glued at a right angle to the adjacent layer. The face (top) ply determines the classification of the plywood. One of the most important distinction in softwood plywood products is between sanded and unsanded. Unsanded plywood panels are made of lower-grade veneers; and are often known as sheathing, from their principle use for sheathing walls in construction.

Softwood plywood mills are of two different kinds: (1) those producing plywood only (layup plant), and (2) integrated mills producing both veneer and plywood. Only the latter existed in the 1930s. Not until around late 1940s did the plywood layup plant come into operation. The difference between two mills is that the layup plant buys its veneer from veneer producing mills and then makes its own plywood. Combined veneer and plywood (or integrated) plants are the backbone of the industry in terms of their number and production capacity.

Not all softwood plywood plants produce all types of

softwood plywood products. Some mills, for instance, produce combination of sanded and unsanded, whereas others may settle with one or other specialty products.

Production Process

The process of making softwood plywood begins with the veneering operation, which consists of cutting logs to suitable length; removing the bark; peeling the veneer, clipping, sorting, trimming, drying and finally passing veneer on to the plywood process. The mechanics of veneer and plywood production is virtually the same throughout the Northwest. Differences in operation appear to be largely a function of the time of construction of the plant in this industry; the species processed, and the degree of capitalization and the opportunity it provides for introduction of new or replacement machinery.

The U.S. plywood industry has been one of the fastest growing and most rapidly changing segments of the lumber industry insofar as production process and occupations are concerned. Sophisticated electronic devices, linear hydraulic systems and unique mechanical equipment are transforming plywood plants. The advancements have been made in virtually every phase of manufacturing. Microprocessors and programmable logic controllers capable of reliable operation in a plant environment are contributing measurable gains to production, operating efficiency and recovery. Computer-run mills are estimated

to have increased output by 10 to 20 percent at some plants.¹ These new changes are contributing to increased capital costs, but provide a handsome return on investment through reduced production costs per volume.

A major step toward increased automation of the production process in the softwood plywood industry occurred with the introduction of the automated panel layup in 1969. This replaced the hand feeding of veneers through glue spreading machines and the conventional manual layup previously done by a crew of four. A 1976 version of the continuous core layup line allows better core utilization and tighter control of glue application. With this version, the necessary personnel is reduced by ten over two shifts.² The areas that have received prime attention in terms of the new technology deal with veneer peeling and drying; other concepts such as mechanized layup having gained maturity as well. The key word is log recovery. Once peeler blocks have been softened in hot water (time and temperatures calculated by computer) to enhance their peelability, the challenge is to recover the maximum volume and value in veneer. Veneer drying technology has also taken off in a number of directions which include a new drying concept that optimizes energy consumption and drying capacity through microprocessor control. During the last decade, the development of automatic mechanisms in the panel sizing and sanding operations, for instance, have completely eliminated

five to six classifications involving six to ten men, depending on the size of the plant and number of machines concerned.

All the latest development of course, have not been incorporated into every plywood plant. Some are exclusive patents of individual corporations, others are not of sufficient improvement to warrant their replacing relatively new and efficient machines, and others involve a major expenditure not within the financial capabilities of a given company.

Labor

Labor inputs constitute one of the two largest cost item (second to timber) in the manufacturing of softwood plywood. Labor cost, like any other costs, may vary from region to region. By 1980, for instance, labor accounted for approximately 26 percent of production costs per thousand square feet of plywood in the Northwest compared with only 19 percent in the South.³

For many years plywood labor has been considered to be semi-skilled, and not highly skilled. For this reason plywood workers, along with other wood products workers, have been paid at lower rates than all other manufacturing industries combined. Table I presents the average hourly earnings of production workers in wood products industry of the United States for the 1972-1982 period. The average hourly earnings of production workers

in the United States wood products industry increased at an average annual rate of 8.3 percent for the 1972-1983 period with the sharpest increase in 1976 and the lowest increases in 1981 and 1982 respectively.

TABLE I
AVERAGE HOURLY EARNINGS (AHE) OF
PRODUCTION WORKERS IN THE WOOD
PRODUCTS INDUSTRY OF THE U.S.,
1972-82.

YEAR	AHE
1972	\$3.33
1973	3.61
1974	3.89
1975	4.26
1976	4.72
1977	5.10
1978	5.60
1979	6.07
1980	6.55
1981	6.99
1982	7.46

Source: Bureau of Labor Statistics

Over the years demand for labor in the Northwest plywood industry has been declining substantially. As it is presented in Table II, employment in the plywood and veneer industry of the Northwest has dropped from almost thirty-four thousand persons in 1973 to approximately

twenty-two thousand in 1983, a decline of nearly thirty-five percent. Recent technological advancement in the softwood plywood industry has, however, resulted in substantial increases in employee's skills. In general, it is the demand for unskilled labor which has declined the most.⁴ The recent trends suggest that employment in the plywood industry will probably continue to decline nationally and regionally, and that the decline may be accelerated by further changes in production technology discussed earlier.

TABLE II
EMPLOYMENT IN PLYWOOD AND VENEER INDUSTRY
OF THE NORTHWEST, 1973-1983
(IN THOUSANDS OF PERSONS)

YEAR	EMPLOYEES
1973	34.7
1974	31.4
1975	28.1
1976	30.7
1977	31.9
1978	32.3
1979	30.9
1980	26.2
1981	24.4
1982	21.6
1983	22.5

Source: Western Wood Products Assoc.
Statistical Year Book

Productivity

The economies effected by reducing man-hours spent in producing plywood and increasing yield from a given volume of raw material have a large potential influence on production. The question of efficiency or productivity is, therefore, an important one.

Productivity is commonly measured in the plywood industry by output (square feet) per man-hour, or man-hours per 1,000 square feet of plywood. Use of the 3/8 inch equivalent basis takes into account the area and thickness of the product, but not the grade of the finished output, which determines its value.

The quality of output that can be obtained from a given log is to a considerable extent limited by the qualities inherent in the log, but subject to this limitation, quality can be upgraded to a greater or lesser degree at the cost of additional labor time. Profit margins are larger for high-grade than for low-grade products.

Helped by new technology and strong demand for its products, the veneer and plywood industry easily surpassed the productivity trend for all manufacturing up to 1980 (see Table III). From 1958 through 1980, output per employee-hour grew at an average rate of 4.2 percent for all production workers. Most of the productivity growth in plywood and veneer occurred during 1958-1975, a period characterized by strong demand for plywood products. The high growth in veneer and plywood productivity over the

entire 1958-1980 period reflects an average annual increase in output of 4.3 percent and in employee-hours of 0.3 percent.

TABLE III
INDEXES OF OUTPUT PER EMPLOYEE-HOUR
AND RELATED DATA IN THE U.S. VENEER
AND PLYWOOD PLANTS, 1970-1980.
(1977 = 100)

Year	Output/Employee-Hour		OUTPUT	Employee-Hours	
	All Employees	Prod. Workers		All Employees	Prod. Workers
1970	83.2	83.0	78.5	94.5	94.6
1971	87.6	87.3	88.3	100.8	101.2
1972	89.8	88.7	95.7	106.6	107.9
1973	87.5	87.5	94.1	107.6	107.6
1974	87.8	88.7	83.8	95.4	94.5
1975	97.8	99.9	80.5	82.3	80.6
1976	97.9	98.0	92.5	94.5	94.4
1977	100.0	100.0	100.0	100.0	100.0
1978	101.0	102.2	106.0	104.0	103.7
1979	95.8	97.5	97.9	102.2	100.4
1980	96.7	99.6	84.4	87.4	84.7

Average Annual Percent Change

1958-80	3.9	4.2	4.3	0.3	*
1975-80	-0.3	*	1.3	1.6	1.3

*Less than 0.05 percent

Source: U.S. Department of Labor, Bureau
of Labor Statistics, Bulletin 2128

While productivity showed strong growth, employee-hours in the veneer and plywood industry grew very slowly in the 1958-1980 period. The average annual rate of productivity growth for 1975-1980 was well below that of the overall 1958-1980 period. It is, however, important to note that while productivity declined during the 1975-1980 period, employee-hours increased substantially in the same period. The increase in employee-hours can be attributed to new housing starts and a subsequent rise in demand for plywood in the period of 1975-1978; and also to efforts to compensate for the decline in productivity growth.

Caution is, however, necessary in using output per man-hour to measure productivity or the increase in productivity in the plywood industry. The rate of increase in output per man-hour is not an accurate measure of technological advance in the industry. It is the result of improved technology and capital equipment and higher quality labor partially offset by the progressive decline in the quality of available raw material. Output per man-hour measures of productivity increase are affected by changes in the proportion of the various types of products produced because of the difference in man-hours required to produce the different types of plywood. Sheathing products, for instance, require fewer man-hours input, and it is the sheathing plants that are the most highly mechanized.

Raw Materials: Timber and Glue

For many years Douglas Fir has been one of the major species used in production of softwood plywood. However, faced with a decline in the quality and volume of the large diameter Douglas Fir, the plywood industry was able to switch to other species, including Southern Pine, due to the development of a lathe to handle smaller diameter logs and the solution of the gluing and drying problems with Southern Pine. These developments, along with other factors have led to a decreasing trend in the use of Douglas Fir as the main source of raw material. The percentage of softwood plywood made from Douglas Fir dropped from 97 percent in 1958 to 53 percent in 1976, and finally to almost 47 percent in 1980.⁵ Douglas Fir will continue to be a minority species, with old-growth Douglas Fir playing an even smaller role. The area of commercial timberland in the Pacific Northwest is projected to decline by 6.6 million acres by the year 2030 from 1977 levels.⁶ Most shrinkage will be due to wilderness use withdrawals from the national forests.

Douglas Fir for many years was preferred because the species, compared with other western softwoods, had several important cost and production advantages. For one thing, this species is of uniform texture and yields a larger percentage of clear face stock than many other species. Douglas Fir also cuts easily on the lathe and can be dried faster. For years it has been growing in heavy concentration in an area which is highly developed

commercially, with adequate transportation facilities. These advantages, however, have been overshadowed by increasing shortage of Douglas Fir as the principal source of raw material and the subsequent technological changes in the plywood industry.

Today's logs are small and getting smaller. Over the last decade, peelable diameters have shifted downward from around 16 to 24 inches to the present 8 to 12 inches.⁷ The use of smaller size logs in plywood manufacturing seems to pose the problem of inferior quality. Not all logs of all sizes are considered to be peeler grade logs. Smaller logs are more likely to produce lower quality products. It appears that the gradual shift to smaller logs has had a great influence on the pattern of development of the plywood industry. Some manufacturers of plywood, for instance, have successfully modified lower quality materials so that they can sell on the market.

Raw material supply is a problem in the Northwest plywood industry. This problem has been generated by an increasing shortage of timber and concentration of privately held timber land. The share of company-owned timber increased in the Northwest whereas the share of federally-owned timber declined. In Oregon company-owned timber source increased from almost 30 percent in 1968, to about 33 percent in 1982; whereas in Washington 43 percent of all timber in 1968 and approximately 46 percent in 1982

were owned by private companies (see Table IV).

TABLE IV
SOURCE OF TIMBER BY OWNERSHIP IN OREGON
AND WASHINGTON, 1968 and 1982

	Federal	Company Owned	Other
Oregon:			
1968	55.0%	27.9%	17.5%
1982	44.7%	33.1%	22.2%
Washington:			
1968	39.6%	43.0%	17.4%
1982	23.0%	46.2%	30.8%

Source: Western Wood Product Association

In addition to the domestic sources of timber, imports of logs constitute another source of raw material. Softwood log imports from neighboring Canada have been substantial for quite some time. The imported Canadian softwood logs have recently been flooding the United States' log market and have had impacts on domestic prices of logs.

Timber constitutes the largest cost component in the production of softwood plywood. In 1980, for instance, timber accounted for almost 72 percent of manufacturing costs per thousand square feet of plywood in the Northwest.⁸ The importance of wood costs varies with the product mix, as well as with the quality and price of raw material. The share of total cost represented by timber costs is normally higher in unsanded products than in sanded ones. Geographic differences are also suggested by higher dollar timber costs

in some areas. Table V presents the average stumpage prices for saw timber from national forests, by selected species for the 1970-1982 period. The average stumpage prices of Douglas Fir have almost always been substantially higher than the prices of Southern Pine or Western Hemlock. Douglas Fir prices have also increased more rapidly and reached its all time high of \$432.00 per volume in 1980. The decline in the prices of Douglas Fir and other western species since 1980 has helped the Northwest plywood producers to compete with the Southern producers, who in turn have a better cost advantage over their western competitors.

After timber, glue is considered the second most important raw material costs, and accounted for approximately six percent of manufacturing costs per volume in 1982.

TABLE V

**AVERAGE STUMPAGE PRICES FOR SOFTWOOD
SAWTIMBER SOLD FROM NATIONAL FORESTS,
BY SELECTED SPECIES, 1970-1982.
(CURRENT DOLLAR PER THOUSAND
BOARD FEET)**

YEAR	Douglas Fir ^a	Southern Pine ^b	Western Hemlock ^c
1970	\$41.00	\$44.00	\$20.00
1971	49.00	52.00	20.00
1972	71.00	65.00	49.00
1973	138.00	93.00	99.00
1974	202.00	76.00	110.00
1975	169.00	57.00	68.00
1976	176.00	87.00	79.00
1977	225.00	100.00	89.00
1978	250.00	134.00	113.00
1979	394.00	155.00	200.00
1980	432.00	155.00	212.00
1981	350.00	172.00	163.00
1982	118.00	127.00	44.00

a. Western Oregon and Washington

b. Southern Region

c. Pacific Northwest Region

Source: U.S. Forest Service

In the manufacture of plywood, several basic substances are used for adhesive. The most common to the industry are blood glue, soybean glue, and phenolic resins. Some other adhesives are also used to a lesser degree for edge gluing, panel patching and scarfing. Glue is mixed in the plywood plant in large, dough-type mixes, and applied to

the veneer with a glue spreader. The amount of glue normally varies with the species of wood and other factors. Glue mixing in the plant requires accuracy and attention to detail. The basic glue substances noted above are mixed with other chemicals to the exact proportions listed on a formula sheet by the adhesive manufacturer. Deviations from the formula or mistakes in mixing can have a severe effect both from the standpoint of expensive waste or poorly bonded panels.

B. MARKET AND USES OF SOFTWOOD PLYWOOD

The softwood plywood industry in its earlier years enjoyed a rather unique position, that of furnishing a material which could be used in lieu of the product produced by sawmilling industry. More and more, plywood began to replace lumber as a basic construction material. The ease in which it is handled, the reduction in actual construction time involved, and the increased strength its use offers are a few of its finer qualities. The plywood industry, in effect, has encroached on the market previously occupied by the lumber industry.

As shown in Table VI, housing, home repair, and remodeling represent the biggest market for plywood panels. Approximately 65 percent of the estimated demand for plywood was represented by housing and related markets in 1983. Non-residential roof systems, plus industrial uses such as material handling, plant repair and transportation equipment

components are targeted areas of growth.

TABLE VI

**Estimated Plywood Panel Demand
By Market, Million Square Feet
3/8 Inch Basis, 1983**

MARKET	DEMAND	CHANGE FROM 1982
Housing	6,400	+25%
Home Repair and Remodeling	5,400	+ 2%
Industrial	2,850	+ 4%
Non-Residential Construction	2,700	- 2%
Exports	650	+30%

Source: "Forest Industires", April 1983

However, as new building materials and methods are being used, plywood products are receiving an increased amount of competition from other products. Just as plywood running boards on automobiles were replaced with metal in the 1920s, plywood is being replaced with stone, plastic, metal, and reconstituted boards. As a result, the plywood industry is now experiencing the same marketing problems that a few decades ago it forced upon the lumber industry.

The Pacific Northwest has been one of the major producers of softwood plywood products in the United States.

However, the significance of this region as the main supplier of softwood plywood has been declining since 1965. Table VII presents softwood plywood production and consumption for the years 1973-1982.

TABLE VII
SOFTWOOD PLYWOOD PRODUCTION AND
CONSUMPTION, 1979-1983
(MSF, 3/8-INCH BASIS)

<u>YEAR</u>	<u>US PRODUCTION</u>	<u>COASTAL REGION PROD.</u>	<u>SHARE</u>	<u>US CONSUMPTION</u>
1973	18,305	10,751	60%	17,902
1974	15,878	8,908	58%	15,340
1975	16,050	8,651	56%	15,266
1976	18,440	9,811	55%	17,734
1977	19,677	10,122	51%	19,408
1978	19,936	10,310	52%	19,671
1979	20,022	9,656	49%	19,638
1980	16,573	7,512	46%	16,232
1981	17,073	6,943	42%	16,408
1982	17,150	7,279	43%	16,719

Source: U.S. Forest Service

As it is evident from the above table, the Northwest's share of the total output has been declining steadily. The production level dropped from almost 10 billion square feet

(BSF) in 1973 to nearly 7 BSF in 1982. It is, however, important to note that the Northwest remains as the main producer of sanded plywood products in the United States despite the fact that sanded plywood has been declining as a portion of the total output produced.

The continuing decline in the production of softwood plywood in the Northwest is reinforced by the rapid loss of market shares for this region's industry. The region's share of the total United State's market dropped from 60% to 43% in 1973 and 1982 respectively. Table VIII shows the Western plywood market shares for the four main consuming regions covering the 1970-85 period.

TABLE VIII
REGIONAL MARKET SHARES FOR
THE WESTERN SOFTWOOD PLYWOOD
(SHEATHING)

	U.S.	NORTHEAST	NORTHCENTRAL	SOUTH	WEST
1970-73	61%	83%	67%	21%	100%
1974-77	52%	68%	53%	9%	99%
1978-80	47%	57%	44%	5%	99%
1981-85 *	38%	28%	27%	2%	97%

Note: Western Region includes both Coastal and Inland Regions. * Estimated

Source: Data Resources, Inc.

The Western region's shares of the market declined in all four major consuming regions during the 1971-1985 period. The greatest declines have occurred in the Northwest (from 83% to 28%) and Northcentral (from 67% to 27%). Substantial declines have also occurred in the South (from 21% to 2%) and the West (from 100% to 97%).

As it can be inferred from Tables VII and VIII, the Northwest softwood plywood industry has been experiencing a period of decline for some time. Two general reasons can be presented to explain this situation (Strathman, 1985): (1) the emergence and expansion of the Southern industry; (2) economic matters. The rapid growth of plywood demand during the 1960s provided the necessary incentive for refinement of small-log peeling technology and subsequent development of the industry in the South. Since its first large softwood plywood plant opened in the mid-1960s, the South has emerged as a major producer of plywood, and captured most markets which were previously served by the Western of the Northwest industry. The Southern industry faces a favorable condition due to its more recent development, and its geographic location close to the faster growing population and hence construction markets in the sunbelt regions. The economic matters concern primarily with production costs and prices. Due to a significantly higher labor cost, the Northwest industry has been disadvantaged to compete with its Southern producers.

The Northwest plywood industry is, however, taking aggressive steps to diversify markets and minimize the effect of the demon housing whiplash. Market expansion, especially through exports, and realignment of the plywood product mix is the route being taken in the quest for survival and profitability.

Prices of Softwood Plywood

Price movements of softwood plywood may be measured by prices or price indexes for major items (such as sanded A-D). The prices of different types of softwood plywood sometimes move in opposite directions.

Movement of prices can generally be described as an upward trend beginning in 1972 that continued through 1979, with some interruptions in the trend for the sheathing type (see Table IX).

TABLE IX
WHOLESALE PRICES OF SELECTED WESTERN
SOFTWOOD PLYWOOD PRODUCTS, 1972-83.
(IN CURRENT DOLLARS PER
THOUSAND SQ.FT.)

Year	Sheathing 3/8 Inch Basis, CD	Sanded 1/4 Inch Basis, AD
1972	92.00	101.00
1973	107.00	127.00
1974	92.00	140.00
1975	99.00	146.00
1976	127.00	160.00
1977	157.00	183.00
1978	169.00	214.00
1979	164.00	221.00
1980	155.00	211.00
1981	148.00	203.00
1982	135.00	185.00
1983	154.00	179.00

Source: U.S. Forest Service

The increasing trend in the 1970s can be attributed to new housing starts in the period 1974-1978, which caused demand for plywood to rise. Following this period, plywood prices have generally been declining. This situation has allowed the Northwest industry to somewhat compete with other plywood producing regions. The declining price trend has been considered to be the result of excess capacity, technological improvements aimed at reducing costs, and more importantly, decline in timber prices.

C. STRUCTURE OF THE INDUSTRY

The softwood plywood industry grew at a fantastic rate in the past three decades. The number of Northwest softwood plywood plants, for instance, increased from 26 in 1950 to 116 in 1966. However, due to a sluggish demand for the Northwest plywood products in recent years, the number of mills declined to about 90 by 1982.

The first plywood plant of the Northwest was constructed in 1905. Thus, the plywood mills built during the 1950s and early 1960s, a period of rapid technological advancement, used the developments and knowledge garnered through fifty years of production experience. The generally declining price of plywood in the 1960s tended to discourage investment in plants that were equipped to operate profitably only at relatively high prices. Thus increasing production was dependent primarily on increase in worker productivity. This in turn helped to decrease the unit cost of production and tended to maintain the profitability of manufacturing softwood plywood in spite of a declining price index. For its own part, the price drop in the 1960s apparently helped the competitive position of the Northwest industry in the building materials market.

Plant Location

The early reliance of the industry on its main source of raw material, namely Douglas Fir, has to a large extent, dictated plant location. The advantages inherent in Douglas

Fir as to moisture content, peelability, glueability, and the like invited plant location in an area where Douglas Fir has been growing rapidly. An overwhelming majority of the Northwest plants are located in the coastal zone, west of the Cascades. In fact, only a few plants are located outside the coastal area. Movement of the geographic center of the industry from Washington in 1939 to Oregon in 1955, appears to have been largely a reflection of interest in the Douglas Fir of Southern Oregon and Northern California.

But there is also the fact that many of the newer plants were in some way tied to firms already established in the coastal zone (agglomeration economies). The independent veneer plant, for instance, locates near potential buyers in order to reduce shipping costs and compete with other veneer producers. By the same token, the plywood layup plant may be dependent upon producers of market veneer and will seek to establish as near to them as possible without sacrificing other considerations such as nearness to markets and transportation facilities. The integrated (combined) plywood mills may be somewhat less dependent on the industry location pattern, but such mills are often financed by enterprises already established in the area with timber of their own, or steady suppliers, and a wish to integrate timber use locally. Furthermore, the sale of waste veneer and cores to pulp mills, board mills, and other chip users invites location near major shipping centers and the coastal

area where such large wood waste users are concentrated.

Plant Size and Scale Economies

The Northwest softwood plywood plants range in size from annual output of 15 million square feet (MSF) to 320 MSF (3/8-inch basis). Relatively newer plants, even those embodying the most advanced and efficient technological improvements, are still within this range. Plants of single-plant firms tend to be smaller than those of multiplant firms. But large companies have plants of varied sizes. The plants of Roseburg Lumber Company, for example, range from 107 MSF to 320 MSF capacity. Sheathing plants tend to be larger than sanded mills, but also come in a wide range of sizes. Industry sources feel there is no agreement on an optimum size for a plywood plant.

A size distribution of the Northwest softwood plywood plants in 1966, 1974, and 1982 is shown in Table X.

TABLE X
SIZE DISTRIBUTION OF THE NORTHWEST
SOFTWOOD PLYWOOD PLANTS, OUTPUT
IN MSF 3/8-INCH BASIS,
1966, 1974, 1982

Size (Output)	No of Mills	Output Share	No of Mills	Output Share	No of Mills	Output Share
SM. (40 & Less)	7	2%	7	1%	3	1%
M. SM (41-80)	47	30%	25	16%	16	11%
M. La (81-120)	44	42%	41	35%	41	40%
La (121 & More)	18	26%	30	48%	30	48%
TOTAL	116	100%	103	100%	90	100%
Source: "Directory of Forest Products Industry", 1966, 1974 and 1982.						

Concentration is noticeable in certain size groups. Medium-large plants accounted for nearly half of the total number of producers in 1982 and their number has been somewhat steady since 1966. This size group of plants also represented almost 40 percent of the total output in both 1966 and 1982, with a small drop in their share in 1974. Large size plants have increased their number and share of the total output substantially since 1966. The number of large size plants increased from 18 in 1966 to 30 in 1974 and remained unchanged in 1982. The biggest losers are the medium-small plants whose number declined from 47 in 1966 to only 16 in 1982. The number of small size plants has also shown a decline; from 7 in 1966 to 3 in 1982.

The major items of equipment--lathes, dryers, hot or cold presses--in efficient sizes are within the reach of plants of all sizes. They are available in different sizes, designs, and prices. Most mills above the small size have

more than one of each item, except perhaps for lathes. A mill of medium-large size has typically two lathes, two dryers, and two hot presses. But some at this size class have only one lathe, or one hot press, or have three dryers, a cold press in addition to hot presses, or other variations in equipment. A fourth major equipment item (not, however, needed in a sheathing operation) is the sander, which may be more expensive than a cold press.

Statistics available for 1955 give a total of 100 softwood plywood plants at that time worth \$220 million, or an average of \$2.2 million each (Cour, 1955). Major items of installed equipment listed were 133 lathes worth an average of \$90,000 each, 185 veneer dryers worth \$120,000 each, 116 hot presses worth \$90,000 each, and 81 cold presses worth \$35,000 each, for a total of nearly \$47.5 million depreciated value. At these figures, an integrated plant with two lathes, two dryers and two hot presses would have a total of \$600,000 in these items and at the same ratio would have a total value of nearly \$2.8 million; with three hot presses it would be worth close to \$3.2 million. The data suggest such a plant as near the top of the size range (large). At the other end of scale a plant with one of each item would presumably be worth about \$1.3 million with a hot press, \$1.1 million with a cold press. The arithmetic mean of \$2.2 million would therefore seem to be close to the middle of the size range (close to

medium-large).

For the present study, no data on equipment costs or capacities could be obtained. These costs and values have most likely increased in the intervening years. However, news stories concerning recent buy-outs of closing plywood plants in the Northwest suggest a present value of 2 to 3 million dollars for a plant of medium-large to large size.⁹ This would indicate no increase in nominal cost since 1955, or even a decrease because of the larger capacity of present plants and the depreciation factor in the 1955 data.

It seems evident that equipment capacities or costs are not the determining factor in plant size. Plant size is probably determined by a balance between the different capacities of different operations. The output point at which this balance is reached will vary and change according to the particular items of equipment installed, the product mix, available raw material, and other factors.

By 1972 veneer and plywood mills employed 115 persons per establishment, compared with 101 in 1958.¹⁰ This might be interpreted as a trend toward larger mills, especially in softwood plywood during the 1960s. In terms of the number of employees, softwood plywood plants may now fall typically in a middle range of 50-350 workers per mill.

FIRM SIZE AND INDUSTRY CONCENTRATION

Although a few firms have acquired a substantial share of the softwood plywood market, and there are other large firms in the industry, no firm has achieved a position of dominance. A few smaller plywood producers were acquired by larger ones in the 1950s and 1960s. However, no real merger movements or large acquisition attempts have developed in the industry in recent years, and there is no indication to believe that such a development is likely to occur in the near future.

Table XI presents plywood plant ownership concentration in the Northwest for 1966 and 1982. The number of single-plant firms declined from 74 in 1966 to 35 in 1982 (a decline of almost 53 percent). An important finding which may indicate the declining trend in the Northwest industry, is the drop in both numbers of firms and mills. From 1966 to 1982, the total number of mills declined by 23 percent while the number of firms dropped by 45 percent. There has not been a significant change in the number of multi-plant firms. However, the number of mills owned by all multiplant firms increased by 24 percent. This shows an increasing trend toward plant ownership concentration by large firms. There is, however, no evidence to support the notion that large firms are more efficient (at least in the present industry situation in the Northwest) than smaller firms despite the market power of

TABLE XI
OWNERSHIP CONCENTRATION OF SOFTWOOD PLYWOOD
IN THE NORTHWEST--1966, 1982

		Mill-Ownership Class					All	Total
		Number of Mills in Firms						Multiple
Number in Ownership Class:		One	Two	Three	Five	Six and More		Ownership
<hr/>								
1966								
	Firms	74	3	2	3	2	84	10
	Mills	74	6	6	15	15	116	42
1982								
	Firms	35	1	5	3	3	47	12
	Mills	35	2	15	15	23	90	55

Source: "Directory of Forest Products Industry"
1966 and 1982.

large firms in the national forest timber markets. This market power is manifested in a significantly lower average cost for national forest timber purchased by these firms relative to small firms (Mead, 1966).

Table XII shows concentration in the Northwest softwood plywood industry by the largest firm, four largest firms, and all multiplant firms in 1966 and 1982. The largest firm accounted for 12 percent of the total output in 1982, up by two percent from 1966.

TABLE XII
CONCENTRATION IN THE NORTHWEST SOFTWOOD
PLYWOOD INDUSTRY, 1966 and 1982.
(PERCENT OF THE TOTAL OUTPUT,
MSF, 3/8" BASIS)

	1966	1982
Largest Firm	10	12
Four Largest Firms	27	37
All Multiplant Firms	40 ^a	68 ^b

a. ten firms

b. twelve firms

Source: "Directory of Forest Products Industry", 1966 and 1982

Concentration in the industry by the four largest and all multi-plant firms is quite noticeable. While the four largest firms increased their share of the output from 27 percent to 37 percent, the multi-plant firms boosted their

share from 40 to 68 percent. Despite the general indications that concentration has increased considerably, the Northwest softwood plywood industry has experienced a reasonable degree of competition for quite some time. Concentration is simply believed to be only one dimension of market structure and is not of itself a measure of monopoly or market power. Due to excess capacity, declining demand and sluggish market conditions discussed earlier, competition has intensified in recent years. This is especially true with respect to the current industry efforts to compete with the Southern producers and ensure its very livelihood.

SUMMARY

The softwood plywood industry exhibits certain significant features that may have influenced the development of the worker-owned co-ops. Among the important industry characteristics are rapid growth in the 1950s and 1960s, geographical concentration close to raw materials in an area distant from major markets, a market dominated by construction industry and hence prices fluctuating both seasonally and cyclically, relatively simple manufacturing processes using semiskilled labor but offering opportunities for superior labor effort, a variable raw material presenting increasing procurement difficulties, increasing firm concentration, and the absence of advantages of size.

The Pacific Northwest segment of the softwood plywood industry has been experiencing a period of decline in recent years. This situation is evident in the continuing decline in output, employment and shrinking markets for this region's products followed by a decreasing trend in the number of firms and plants.

FOOTNOTES

¹"Forest Industries", September, 1984.

²"Forest Industries", March, 1977, p. 86.

³Figures are from the American Plywood Association.

⁴"Monthly Labor Review", 100: 1977, pp. 33-37.

⁵"Monthly Labor Review", September, 1978.

⁶"Forest Industries", April, 1985.

⁷"Forest Industries", April, 1984, p. 28.

⁸American Plywood Association.

⁹In a recent buy-out of a closed Champion International Mill in Gold Beach, the plant was reported to have been assessed at \$2.5 million. In another instance, workers at the newly formed co-op, Anacortes Veneer, Inc., paid a total of \$2.4 million to acquire the closed plywood mill. Both plants were large and had reported annual capacities of 150 MSF and 165 MSF respectively in 1980.

¹⁰"1972 Census of Manufacturers for SIC 2435 and 2436", Bureau of the Census, August 1976, Table 1.

CHAPTER V

PLYWOOD COOPERATIVES IN THE PACIFIC NORTHWEST^{*}

Plywood PCs in the Pacific Northwest are the oldest established organization of producer co-ops which presently exist in the United States. They are also the largest, measured in terms of number of members and the value of production they account for.

Most of the present plywood co-ops were organized in the early 1950s, and by the end of the decade 32 co-ops were operating. They accounted for over 30 percent of the Northwest softwood plywood production by the mid-1960s. But as their number declined to twelve at present, their share of the total production dropped to almost 17 percent.

*Information and materials gathered for this chapter are based, in part, on author's personal investigation and interviews with plywood industry sources such as trade associations and union officials.

The principal major references on plywood PCs are: Berman (1967, 1982); Bellas (1972); Bernstein (1974); Greenberg (1978, 1980, 1981); Gunn (1980a, 1980b, 1984) and Zwerdling (1980).

Plywood PCs have played an important role in production and technological development of the softwood plywood industry. Continuous operation and employment have been a feature of these co-ops in an industry plagued with cyclical unemployment.

This chapter provides a descriptive overview of the plywood co-ops in the Pacific Northwest. A study of the history of plywood PCs--their formation, operation, organizational and decision making structure, finance, sales and raw material supply--is essential for the purpose of the present study. Evaluation of these issues will shed light on questions concerning the longevity and viability of worker-owned plywood mills, and the issues of self-management and worker-control.

A. FORMATION OF PLYWOOD PCS

All of the present plywood PCs were powerfully influenced by the establishment of the first worker-owned co-op, Olympia Veneer Company, which operated from 1921 to 1954. Formation of the first plywood PC was initiated by a small group of workers in western Washington. Early in 1921, Olympia Veneer was incorporated with 200 shares of capital stock at 500 dollars par value (Berman, 1967). Most of the shareholders were of Scandinavian descent. It appears that the Scandinavian cooperative tradition was a driving force in the establishment of the first plywood co-op. There is, however no indication to believe that

political ideologies and orientations, or some common ethnic and cultural values among workers played any role in the formation of subsequent plywood PCs. When owner-members were asked why they had joined the plywood co-ops, the most important factors cited were the appeal of the financial investment, potential for good income, and job security (Greenberg, 1978). More recent research has substantiated earlier findings that owner-members enter the plywood PCs with individualist, property-holding motivations and that their experience with the cooperative relations of production in these firms does not alter those motivations (Greenberg, 1981).

In its early years, Olympia Veneer developed improvements in almost every phase of the plywood manufacturing process, which was then in its infancy. It was at this co-op, for example, that soybean glue, a superior type of adhesive to the casein type then used, was first developed in 1927.

By the late 1920s, Olympia Veneer owned and operated two more plants in addition to the original mill. But in 1946, as nearby log supplies were becoming scarce, the shareholders approved the sale of the original Olympia plant to a lumber company that had access to good timber. Non-shareholder workers had been employed at the two remaining plants from the beginning, and by early 1950s, there were less than 50 working shareholders in these

plants (Berman, 1967, p. 91.) In 1954 the two plants sold out to U.S. Plywood Corporation (now Champion International Corp.) for 15 million dollars in U.S. Plywood stock. The sale price represented 120,000 dollars for each of the original shares, a sizeable increase in value over the initial investment (Berman, 1967, p. 91).

In addition to providing an example of successful cooperative operation, Olympia Veneer set a number of significant precedents. One precedent established was the principle of equal pay for all shareholder-workers. The method used, which distributed the proceeds of the enterprise to shareholders in the form of bonuses based on the time worked in the plant, was followed by subsequent plywood PCs. The active involvement of Olympia's shareholders in managerial decision making was another example later followed by the cooperative plants.

Despite the success of Olympia Veneer, no additional plywood PC was apparently organized during the first twenty years of Olympia's operation. Most of the plywood PCs were formed in a seven-year period from 1949 to 1956, twenty-one were organized in this period. All together, there have been a total of at least 34 plywood co-ops organized. These co-ops have operated for periods ranging from one year to 43 years.

Although in the mid-1950's, the number of plywood PCs was increasing at twice the rate of fir plywood mills as a

whole, they did not keep pace with the growth of the industry in the succeeding years. In 1966, for example, the plywood co-op plants represented about 28 percent of the total number of softwood plywood mills in the Northwest. By 1982, however, their share of the total number of plants dropped to almost 11 percent.

The initiative of forming plywood PCs as new ventures normally came from three sources: (1) groups of workingmen themselves seeking self-employment; (2) businessmen and other community groups interested in obtaining or preserving a local payroll; and (3) individual promoters hoping to obtain personal gains.

Plywood PCs formed on the initiative of groups of local citizens achieved a more favorable start than those initiated by workers, perhaps because of a better estimate by the organizing group of the capital and organizational needs of the firm (examples of this case are Multnomah Plywood Corp. and Hoquiam Plywood which are still operating today). Individual promoters were also active in the sale of existing conventionally owned companies to worker organizations. Such promoters frequently had no connection or familiarity with the plywood industry and were not necessarily concerned with the viability of the PCs formed (Berman, 1967, p. 110). Objectives of the promoters were varied. Usually the promoters expected to achieve a substantial financial gain from fees, commission on sale of

stocks, or other personal gains. Several cases of fraud developed in the sale of co-op shares and criminal charges were brought against promoters (Berman, 1967, p. 113). The publicity of their trials cast suspicion on worker-ownership proposals; and this may have worked against the formation of additional co-ops. Apparently only one plywood PC (Linnton Plywood Association) which was formed through the efforts of an individual promoter exists today.

B. Plywood Co-Ops No Longer in Operation

Of the total of 34 plywood PCs formed to date, 12 remain. The co-ops that are no longer in existence halted their operations for a variety of reasons, including losses due to fire, unscrupulous activity by business promoters, lack of timber supply and bankruptcy. Only a few plywood PCs are known to have gone bankrupt, and a few others were liquidated. Approximately a dozen were sold to private interests and conglomerates. In the 1970s alone, four plywood PCs were sold to private investors (Gunn, 1984, p. 101). Almost all of these co-ops sold were successful at the time and making profits. Excluding co-ops that have been sold, the plywood co-op's failure rate of 10/34 or 30 percent after operating periods of one to thirty years compares favorably with national business failure rates.¹

Two principal reasons can be pinpointed for the decline in the number of plywood PCs. First, the Northwest plywood industry itself is severely depressed. In 1982 over

40 percent of this region's manufacturing capacity was idle, and those plants still open were operating at 70 percent of capacity.² The second principal reason is "failure by success". Paradoxically, success has led to the transformation of cooperatives into conventional firms. This is partly because of the ages of the co-ops' members. Worker-owners count on the sale of their shares for retirement income. If not enough individuals (new members) are found to purchase the shares, an outside corporation's offer to buy them all at once can seem attractive to the majority of shareholders. It is the successful co-ops, of course, that are most vulnerable to this. The high price of their shares makes it harder for individual workers to buy them, while their success attracts conglomerates (like ITT and Publisher Paper Co., each of which bought a prosperous plywood PC).

Plywood co-ops have recently developed two provisions for ensuring their continuity through the sale of individual shares. In all of the co-op plants it is a basic rule that the company must have first option to buy back a share if a member decides to sell. If the co-op declines the option, and the member finds a buyer, the Board of Directors must approve the new person (Bernstein, 1974).

C. The Operating Plywood PCs

The twelve operating plywood co-ops are all located in the "Douglas Fir region", west of the Cascades. Nine of

these plants are in Washington State, and three are located in Oregon.

Some of the present plywood PCs built their own plants and started worker-owned operations as new producers, while others took over existing plants and began cooperative operations with plants converted from conventional ownership. There are evidently a number of advantages and disadvantages faced by plywood co-ops that have taken over existing plants. For example, plywood plants sold to worker's groups have usually been plants that have ceased to be profitable. The worker group taking over an existing mill has therefore, been disadvantaged by starting operations with an old plant, perhaps technically obsolete or in need of major repairs or replacements, that the former management could not operate successfully. On the other hand, the worker organization taking over an existing concern may benefit from the contracts with suppliers, customers and contractual relationships of the old company.

Plywood PCs have been operating for varying lengths of time (see Table XIII). The oldest of the present group was formed in 1942. One more was organized in 1949. Among this group of co-ops one (Anacortes Veneer, Inc.) began its operation in 1938 and ran successfully until 1969 when it sold out to Publisher Paper Co. (a subsidiary of the Los Angeles Times), This plant was then closed down in late 1981 during the wood products recession. After fifteen

TABLE XIII
PLYWOOD PCs WITH NUMBER OF MEMBERS,
WORKFORCE, AND YEARS
IN OPERATION

State	Name of Co-Op	Members ^a	Workforce ^b	Years in Operation
Oregon:	Astoria Plywood	170	235	34
	Linnton Ply. Assoc.	180	200	32
	Multnomah Plywood	152	302	35
Wash:	Anacortes Veneer ^c	150	150	1
	Buffelen Woodworking	200	215	30
	Ft. Vancouver Ply.	300	310	30
	Hardel Mutual	150	175	33
	Hoquiam Plywood	100	165	30
	Mt. Baker Plywood	182	215	35
	North Pacific Ply.	160	250	36
	Puget Sound Plywood	125	150	43
	Stevenson Co-Ply	160	175	30

Sources:

- a. Gunn, C.E. (1984). Workers' Self-Management in The United States, London: Cornell University Press.
- b. Directories of Oregon and Washington Manufacturers, 1982.
- c. "Oregonian", February 24, 1984.

months of negotiations, the mill was again bought back in April 1984 by its original worker-owners.³

The present plywood PCs have from 150 to 310 employees, counting both shareholders and non-shareholders. Most are in the mid 150-250 size range. None of these

co-ops operate more than one plant, although a few had separate veneer plants in their early years.

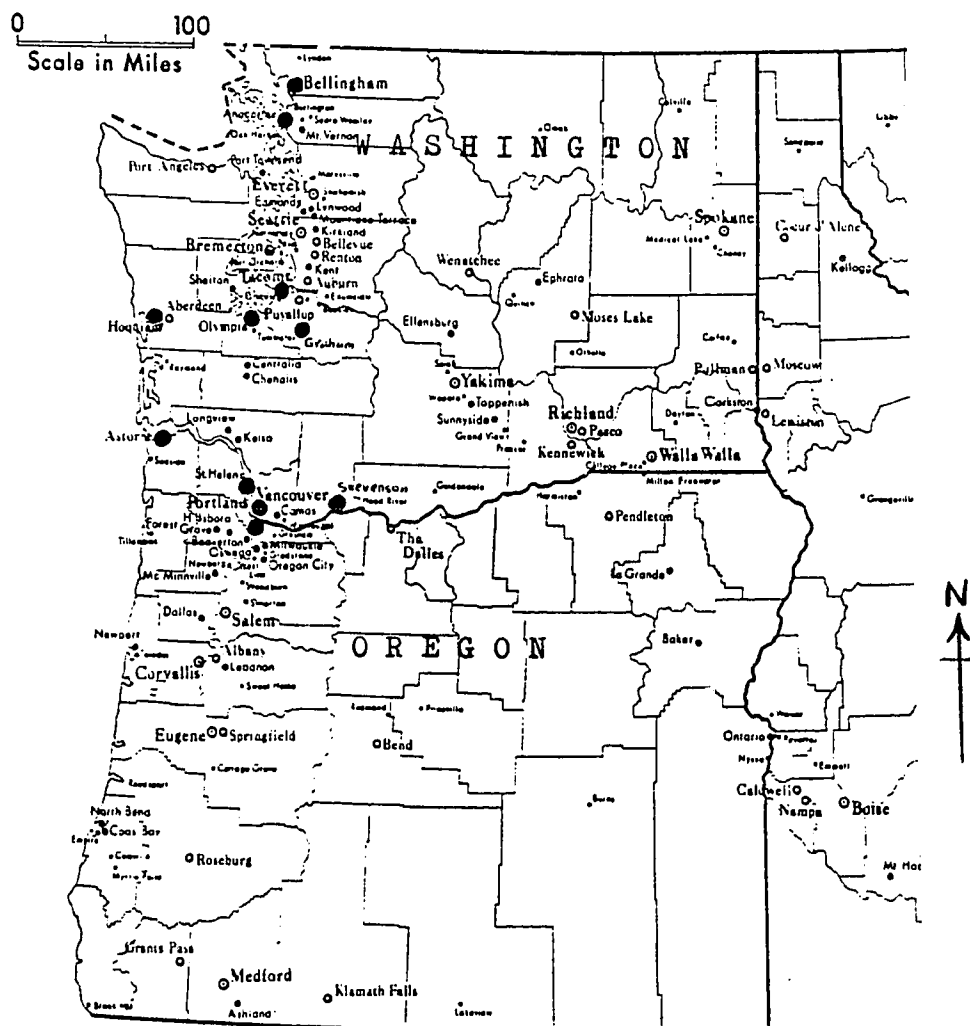
All plywood co-ops plants are located in western Washington and Oregon (see map). These mills are near major transportation facilities. Five are located along the Columbia River which itself is a major waterway.

Six plywood PCs are located in cities with populations of 42,000 persons and more, whereas six others are in cities with populations of 10,000 persons or less (see Table XIV). Tacoma (with a population of over 402,000 persons) and Graham (with population of less than 1,000 persons) are the largest and smallest locations respectively. The average size of cities in which plywood PCs operate is nearly 80,000 (in terms of population). Three co-ops are located in two major metropolitan areas such as Portland and Tacoma. Three more are operating in cities which range in size from 42,000 to 51,000 population.

It may be argued that the social networks of the small cities, in which some plywood PCs are located, have been more conducive in the formation of these co-ops. Residents in such cities may have a greater interest in the viability of PCs formed and this may have provided a supporting mechanism for these firms.

Plywood co-ops are mostly of medium-large (M.La.) size in terms of annual output, ranging from 56 MSF to 150 MSF. Table XV presents the size distribution of co-ops and

FIGURE 1
LOCATION OF PLYWOOD PCs
IN WASHINGTON AND OREGON



● Locations of Plywood PCs

TABLE XIV
LOCATIONS OF PLYWOOD PCs
AND THEIR POPULATION

CO-OP	LOCATION	POPULATION *
Buffelen Woodworking	Tacoma, WA	402,000
Puget Sound Plywood	Tacoma, WA	402,000
Linnton Plywood Assoc.	Portland, OR	363,000
Hardel Mutual	Olympia, WA	68,000
Mt. Baker Plywood	Bellingham, WA	51,000
Ft. Vancouver Ply	Vancouver, WA	42,800
Astoria Plywood	Astoria, OR	9,900
Hoquiam Plywood	Hoquiam, WA	9,700
Anacortes Veneer	Anacortes, WA	9,000
Multnomah Plywood	St. Helens, OR	7,000
Stevenson Co-Ply	Stevenson, WA	1,100
North Pacific Ply	Graham, WA	x

* 1980 Census Population

^x Unincorporated city; population under 1,000 persons

conventional plywood plants in the Northwest. The average size of plywood PCs in terms of annual production level is slightly smaller than the industry average. The co-ops' average size is about 98 MSF compared with 104 MSF for the Northwest industry as a whole. It is, however, important to

note that the largest plants in the plywood industry produce sheathing, which lends itself to greater mechanization. Most plywood PCs product little or no sheathing products.

TABLE XV
SIZE DISTRIBUTION OF THE NORTHWEST CO-OP
AND CONVENTIONAL SOFTWOOD PLYWOOD
PLANTS 1982. (ANNUAL OUTPUT IN MSF,
3/8-INCH BASIS)

Size (Output)	CO-OP [*]		Conventional		Industry Total	
	Number	% of Total	Number	% of Total	Number	% of Total
SM (40 & Less)	0	(0)	3	(4)	3	(3)
M.Sm(41-80)	1	(9)	15	(19)	16	(18)
M.La(81-120)	7	(63)	34	(43)	41	(46)
La.(121 & More)	3	(27)	26	(33)	29	(32)
TOTAL	11	(100)	78	(100)	89	(100)

^{*} New Co-Op, Anacortes Veneer, is not included.

Source: "Directory of Wood Products Industry"

The present plywood PCs have shown an ability to survive in a cyclical and seasonal industry. A number of reasons explain their survivability. First, they are

independent firms that exist to support their members and families, even at reduced incomes. That is the co-op membership has the willingness to take cuts in income during bad times to keep the mill in operation. Second, when production work is slack some co-op members take temporary leave without pay and seek employment elsewhere until the situation improves. Third, the co-ops concentrate production in high-quality sanded plywood, one of the more stable portions of the market. And fourth, in recessionary periods they respond similarly to their conventional counterparts in the industry; laying off their non-shareholder workers.

D. Organizational and Decision Making Structure

The formal organization of plywood PCs is characterized by the democratic and participatory social interactions in every day operations. In the plywood co-ops, employee shareholders meet annually to elect from their number a board of directors or workers council. It is commonly provided, in line with usual cooperative practice, that each individual shareholder may have only one vote regardless of the number of shares owned, and sometimes there is also a limit on the number of shares one person may own. Directors must be shareholders and receive no extra compensation. Directors generally meet bi-weekly, and may meet more frequently, especially in times of distress. The

Board of Directors makes most policy decisions. However, its power is limited by the membership and by co-op by-laws. The Board, for instance, has authority to make capital expenditures up to a maximum (usually 20,000 dollars). (Gunn, 1980b, p. 399). Beyond that figure, a majority of the general membership must approve the expenditure.

Most co-ops' by-laws specifically exclude co-op members who are already in management positions from serving on the Board of Directors. The officers of the co-ops are usually elected by the member-employees for one-year terms. There are often continuing committees of shareholders on various special problems, such as plant expansion, in addition to grievance committees.

The Board of Directors hires the general manager, who is responsible for the daily operations of the company. The general manager may be a shareholder in the co-op or may be hired from the outside. If he is a shareholder, he may be paid at the regular shareholder's hourly wage rate for hours worked, or may be paid a larger amount. With the exception of wage decisions, the normal day-to-day decisions incident to running the business are made, as in other companies, by the general manager and other members of the management team.

The obvious area of greater involvement of employee-owners in the co-op policy making is in setting

wage rates. The wage rate is a matter for determination by the Board of Directors, although members exercise an important influence on the decision, even if it is not formally referred to them (Berman, 1967, p. 147).

Employee-owners of plywood PCs participate in making decisions which affect their jobs or their plants' operations. In his study of these co-ops, Greenberg (1978) found that approximately two-thirds of a sample of 280 co-op members answered "always" or "very often" when asked if there was much discussion and participation in the plant concerning production, investment, and other policies. Although levels of participation vary among members, policy issues are widely debated, information is available, and none of the writings on these co-ops point to a situation in which a small group of employee-owners actually control a co-op plant.

Producer co-ops are generally considered to suffer because an inability to discharge worker-owners results in retention of less-efficient workers who would presumably be fired by a conventional firm. None of the co-op managers interviewed by Berman (1982) felt that this was a problem in their plants. In fact, disobedience of a foreman's orders may lead to dismissal or a lesser penalty.

The relative roles of manager, Board of Directors and the shareholders in decision making are different in the

plywood PCs than the roles of manager, directors and stockholders in conventional firms. Although practices vary in different co-ops, the Board of Directors tend to be consulted and to participate more directly in types of management decisions than is usual in corporate practice. In addition, according to Greenberg (1980), supervision on the shop floor differs markedly between plywood co-ops and conventional firms. While one or two supervisors per shift are the norm in the plywood PCs, the conventional plants Greenberg surveyed used six to seven per shift. Since, in the co-op plants the directors are themselves working stockholders, their interests and viewpoints are similar to those of the shareholder-employees, and they represent the employee-owners quite directly.

Members and Hired Workers

Most plywood PCs specify in their by-laws the requirements that a stock purchaser must meet to qualify as a member. These consist generally of an age limit (most commonly 50), ability to do the work as shown by a physical examination, and approval by the Board of Directors. A shareholder who has been approved has a right to a job in the plant in preference to non-shareholders. In the case of layoffs, non-shareholder employees must be laid off before shareholders.

Almost all of the plywood PCs employ some non-owner

workers. The number of these workers varies from season to season and from mill to mill. It can be, at peak times, as high as one-half of a co-ops workforce, but most often it is around 10 to 15 percent. Many of the plywood PCs with a large percentage of hired workers are companies that took over a failing conventional plant. The number of share buyers in such take-over cases may not be adequate to staff the plant, so non-owner workers are hired to fill the gap. Some of the workers are relatives of members and interested in temporary employment. Others are basically part-time workers hired during peak demand seasons. The members of plywood PCs, therefore, constitute the core of the workforce in these mills who run their businesses and participate in making decisions concerning the operations of their plants.

Payments and Wages

Another distinguishing feature of the plywood PCs is the principle of equal pay to the working shareholders, regardless of the job performed. This was a principle established by Olympia Veneer and has been followed by subsequent co-ops. The principle of equal pay is based on the conviction that deviation from equality creates jealousy and friction that would impair the functioning of the organization. In a number of co-ops, however, exceptions have been made. The most frequent exception is the position of general manager. Exceptions may also be made for other

top management positions such as log buyers, sales managers, plant superintendents, or office manager.

The basic method of pay to members in the plywood PCs is the hourly wage. Some co-ops, however, distribute a substantial share of the members' remuneration by means of profit-sharing allocations. The profit-sharing arrangements are based on hours worked. To ensure equal incomes for all members, equalization of the hours worked is carefully safeguarded.

Pay equalization in the plywood PCs has been facilitated by job shifting and rotating. Members learn to do most jobs in their plants and can be shifted as needed (Berman, 1967, p. 151). Frequently an individual will perform jobs in different pay classifications, such as machine maintenance or plant clean-up when production work is slack. Members also shift principal assignments around by bidding for vacant jobs. These measures, similar to those recommended by management experts for combatting job "alienation", eliminate idle time and improve job satisfaction and performance by relieving the boredom of monotonous work. They are not readily reconcilable with different pay classification.

The effective hourly wage of co-op members has generally been above the union average for plywood workers. The ability to provide continuous employment to members,

along with frequent work in excess of forty hours per week, has meant that annual incomes of members in the plywood PCs to be higher than for plywood workers in general. Gunn (1980b, p. 395) reports that the annual incomes of some members in these co-ops reach 40,000 dollars. He found that hired workers receive pay and fringe benefits equal to or slightly better than those received by workers in conventional mills (Gunn, 1980b, p. 396).

E. PLYWOOD PCS AND THE UNIONS

The existence of plywood PCs has apparently presented a puzzle to organized labor. On one hand, union leaders think higher wages for members in the co-op plants tend to make union members in other plants dissatisfied. On the other hand, unions object that lower wages for the co-ops' members (during bad times) may threaten labor standards.

A number of converted co-op plants have been affected by the previous company's labor contract. It is evident that a conflict arises where a union has a contract in a mill that is sold to a worker-owned group whose members expect to provide all or most of the labor in the plant. Initially worker buyouts were regarded by some union leaders as a way of voiding union contracts.

Union attempts to protect or strengthen their position have affected the operation of a number of plywood PCs. In one instance a co-op plant had to limit its hiring of

non-owner workers to only clerical and supervisory employees who were not covered by the union contract (Berman, 1967). In another instance where a plywood plant was sold to a worker-owned group, the union local demanded to be recognized as the exclusive bargaining agent for the new co-op's employees. The local claimed that some 350 of its members had been thrown out of work to make room for shareholders and that its contract with the old company had been illegally aborted (Berman, 1967, p. 125). After a long period of bargaining the case was taken before the National Labor Relations Board, which ruled for the co-op. As a part of settlement, the shareholders of the co-op mill formed a union which was certified as the official bargaining agent.

Union action would also appear to have been a factor in the failure of at least one attempted co-op and the initial difficulties of at least one existing co-op that came close to bankruptcy (Berman, 1967, p. 127).

In recent years relations between plywood PCs and unions have been varied. At most of the present co-op plants where there are a relatively large number of hired workers, employees are covered by union contracts. Relations of some co-ops with the unions are very good.⁴ The possibility of friction probably still remains. But it does not seem likely to become a serious problem as long as plywood PCs represent a minor fraction of the total industry

employment.

F. Finance and Capitalization

PCs in general are believed to be weakly financed. Several researchers have pointed to the tendency of co-op members to maximize their take-home income at the expense of future investment and income (e.g., Berman, 1967 and 1982). Evidence also suggests that a major difference between successful and unsuccessful co-ops is associated with capital investment (Bellas, 1972).

The chief method by which plywood PCs obtained capital was through the sales of shares of stock to the original shareholders in the initial organization of the co-op. The amounts which were received from this source had been restricted by the effort to limit the number of shares to the number of jobs expected in the plant. The initial price of a share of stock, or of the block of shares required to qualify for employment varied from 1,000 dollars to 6,000 dollars in most co-ops (Berman, 1967, p. 130). These values have, of course, increased since the formation of plywood co-ops. In the recent buyout and formation of Anacortes Veneer, for instance, workers had to buy a 20,000 dollar share with a minimum down payment of 5,000 dollars to join the new co-op.⁵

Almost all of the plywood PCs have at some time since their organization appealed to their shareholders for

additional capital. Securing capital from shareholders subsequent to organization has been accomplished in a variety of ways (Berman, 1982): sales of additional common, preferred and special classes of stock, promissory notes, debentures, loan funds, and withheld or deferred pay. Some of these plans have been compulsory and some optional. In addition, some plywood PCs have other plans to acquire needed capital for investment (Gunn, 1980b, 403). For example, all of the net proceeds remaining from operations after all co-op expenses are paid, are considered member's earnings. From these earnings board members determine the size of the two reserve funds: contingency reserves and capital reserves. Contingency reserves are withheld from distribution and credited to the accounts of working members. They represent the equivalent of working capital for the co-ops. A charge is also made each year for the capital reserve fund. This fund is the primary source of new investment capital for the co-ops.

Most of the plywood PCs have also, at one time or another, received long-term loans from outside sources. Some loans by the federal government through agencies such as the Small Business Administration have been provided to these co-ops (Berman, 1967, p. 134).

Although short-term credit from outside sources appears to have been available, markets for long-term

capital have not adequately served the plywood PCs needs (Gunn, 1980b, p. 407). Loans have been infrequent and are not usually available when most needed. Real financial problems are usually aggravated by the conventional lender's distrust of worker management. Two reasons are cited for this contention: (1) the co-ops are an unconventional organizational form, one in which lenders cannot easily identify "the person in charge"; and, (2) given the co-op's complex accounting system, commercial banks are less able to assess the magnitude and legal status of owners' equity to be used to provide security for major loans (Gunn, 1980b, p. 404).

Plywood PCs record over the years, however, have helped diminish the above problems. Loan capital is now available for co-ops with records of success. Those plants which are major employers in a small city or town tend to have close working relationships with local lenders.

It seems difficult to make any useful generalizations about the financing and capitalization of the plywood PCs. Most researchers (e.g., Berman, 1982; Gunn, 1980b and 1984) agree that the lack of capital has been a major problem for the plywood PCs. But it is difficult to judge to what extent the problem has been more acute for worker-owned co-ops than for conventional firms similar in size, age and other factors.

G. Sales

Plywood PCs sell their products by a variety of methods. While at one time the majority of these co-ops probably sold through sales agents under contract, this is no longer the predominant method. Sales agency contracts were undoubtedly of great benefit to many of the plywood PCs in their early years, and in some instances the ability to dispose of their products without difficulty and obtain prompt payment may even have meant the difference between survival and bankruptcy. In recent years, however, five of the plywood co-ops have formed the Plywood Marketing Association (PMA) to lease railroad cars in order to ensure that the member-firms can deliver their products to customers. The PMA ventured into railroad car ownership by establishing a Plywood Marketing Transportation Corporation (PMTTC). This corporation purchases railroad cars that are used to ship PMA plywood (Gunn, 1980b, p. 397). By the summer of 1979 it owned or held purchase agreements for 900 cars that were used solely for the shipment of PMA plywood (Gunn, 1980b, p. 397).

The plywood PCs have formed few linkages beyond those mentioned above. There is some evidence that they have lent funds among themselves, and they have occasionally shared management personnel. They have also formed a Worker-Owned Plywood Association to study their tax situation and lobby

on their behalf. Although they have the potential to share other administrative, marketing, and financial services, they have not developed further linkages.

Since selling problems are often considered crucial for PCs and in view of the prevailing shortage of working capital experienced by the plywood PCs, one may conclude that the sales-agency system and the Plywood Marketing Association have been the reasons co-op plants in the plywood industry have not appreciably been handicapped by sales difficulties.

H. Raw Material Supply

A discussion of timber supply for the co-op plants is important because raw material procurement is a problem for the entire Northwest plywood industry and especially for independent producers. Raw material supply is not generally considered a particular problem of producer co-ops and is not, in the plywood industry, a problem peculiar to the plywood PCs. But it has probably been relatively more serious for the co-ops than for conventional firms, since almost all of the present plywood PCs are located in depleted "old growth" areas. Furthermore, procurement problems may be aggravated by co-ops' financial difficulties. It is of interest to inquire how the plywood PCs have attempted to cope with the increasing difficulty of raw material supply.

The plywood PCs are, in general, dependent on outside sources for their logs; few of the co-op plants own timber lands. When logs are obtained from outside sources, they may be bought under contract or in individual lots in the open market. A number of plywood PCs are dependent on the log markets for their supplies.

The chief source of raw material for the co-op plants has been timber sold by the U.S. Forest Service from government lands. Raw material has also been obtained from timber sold by states and other public agencies. The plywood PCs bid on timber offerings of the U.S. and local agencies, frequently contracting out the actual logging when they are successful bidders.

Like the rest of the plywood industry, co-op plants in recent years have had to adjust to the increasing cost and lower quality of timber in the Pacific Northwest. By one estimate the price of timber increased 400 percent between 1974 and 1981 (Gunn, 1980b, p. 400). Other figures indicate a 1000 percent increase in the stumpage price for Douglas Fir in the ten years between 1971 and 1981.⁶ Some co-ops have experienced severe difficulty in maintaining the supply of logs to their mills at any price. Financing log inventories has also become very expensive in periods of high interest rates. None of the present operating co-ops have had the capital to invest in timber land at a level

that would assure their own source of supply. Federal government programs to set aside timber from national forests for small businesses have been inadequate (Nagle, 1979).

For the plywood PCs as for the rest of the industry, the change in the raw material situation has resulted in changes in the products. The co-ops now produce more plywood made from other western softwood besides Douglas Fir. A number of co-op plants have also moved toward upgrading the product and increasing the degree of processing or fabrication. The more highly finished plywood products provide a greater margin between costs and selling price, and the effect of high wood cost is minimized in the high priced products. One of the changes made by some co-ops was to shift away from sheathing to a higher percentage of sanded production. Such a change involves increases in patching and sanding operations, and usually requires new equipment. Acquisition of sanding equipment has been the most common capital investment made by the plywood PCs (Berman, 1967, p. 145).

Plywood co-ops have reacted to the raw material situation in much the same way as the rest of the industry. The important exception is the movement away from sheathing operation. The reduction of sheathing and concentration on higher value added products is consistent with the objective

of the worker-owned co-ops to maximize labor intensity along with continuous employment.

SUMMARY

The cooperative model of the plywood PCs embodies a viable structure for implementation. Despite the lack of ideology, a general determination among the plywood PCs to remain cooperatives seems evident. Although these co-ops conform to the cooperative principles, there are some problems with this model. The use of hired labor and the vesting of control in owners of stock distinguish these plywood PCs from the model of full self-management and ownership. Not all of the workers who work in the plywood co-ops take part in the governance process. Self-management is, therefore, not complete because participation rights are linked to ownership and hired employees do not have the responsibilities or rights of worker-owners. As a part of the workforce, the hired workers in the plywood PCs are also deprived of profit sharing.

In the best of cases, however, plywood PCs do offer evidence that workers can effectively operate their own firms, and in doing so achieve the income, secured employment, output, and quality of products that are at least on a par with conventional firms, and in some cases superior to them. They are also unique among worker's

co-ops in their number, their presence in their industry, and their longevity. The plywood PCs provide a working example for further development and refinement of production that is fully controlled by all of its workers.

FOOTNOTES

¹Small Business Administration data indicates that 80 percent of new businesses fail within their first five years of operation.

²American Plywood Association.

³For more details on the formation of Anacortes Veneer, Inc., see: Oregonian, April 4, 1983; February 24, 1984. Also see Forest Industries, July 1984, page w.5.

⁴This is based on a personal interview with a union official.

⁵Oregonian, February 24, 1984.

⁶Alaska Consulting Group, Inc. (1981). "Report on General and Northwest Plywood Industry Trends, Methods for Evaluating Worker Acquisitions, and A Review of the West-Fir Acquisition Attempt", paper, Anchorage, Alaska, September.

CHAPTER VI

METHODOLOGY

The subjects of the present study are two groups of softwood plywood plants operating in the states of Oregon and Washington. A group of eight plywood co-op plants is compared with a group of eight conventional plywood mills in terms of worker productivity. Both groups of plants are engaged in manufacturing similar products, mainly sanded softwood plywood. None of the conventional plants under the study are known to have practiced any schemes of industrial democracy. This group of mills can, therefore, be regarded as conventional industrial organizations (i.e., capitalist manufacturing plants in a system of collective bargaining).

SAMPLING

For the purpose of this study it was intended to include as many conventional plants in the sample as possible. To this end, the following procedures were conducted:

- 1) An annual list of softwood plywood plants in the United States was obtained for 1982 (there were 167 plants listed for this year).*
- 2) Any softwood plant which was not operating in Oregon and/or Washington was excluded from the list (90 plants remained on the list).
- 3) All eleven operating co-op mills were singled out and separated from the list of (remaining 79) conventional plants.
- 4) Any plant for which no sufficient or reliable data were available during the 1960-1982 period was dropped from the two lists.

Eight conventional plants remained to be compared with eight co-op mills. Of the total of eleven operating co-op plants, one was dropped from the sample since it was primarily a hardwood plywood producer. Two more co-ops were excluded because of the lack of sufficient data.

As Table XVI indicates, the sample of conventional mills selected by the above procedures is representative of the total population of conventional softwood plywood plants in the Northwest. The eight conventional plants represent approximately 10 percent of the total number of conventional mills in the region. This sample group also represents

*The annual list of softwood plywood plants is published in the "Directory of Forest Products Industry" which contains approximately 90 percent of all plants in the U.S.: and 1960-82 is a period for which such lists could be obtained.

TABLE XVI

SIZE DISTRIBUTION OF THE SELECTED
SAMPLES OF CONVENTIONAL AND
CO-OP PLANTS, ANNUAL
OUTPUT IN MSF,
1982

Size (Output)	Co-Op Group		Conventional Group		Northwest Industry *	
	Number	(% of Total)	Number	(% of Total)	Number	(% of Total)
Sm. (40 and Less)	0	(0)	0	(0)	3	(3)
M. Sm. (41-80)	0	(0)	2	(25)	16	(20)
M. La. (81-120)	6	(75)	3	(38)	35	(43)
La. (121 and more)	2	(25)	3	(37)	28	(34)
TOTAL	8	(100)	8	(100)	82	(100)

*Co-Op samples are excluded

Source: "Directory of Forest Products Industry"

the population of conventional mills in all but one class-size category. No small-size conventional mill is included in the sample. It should be noted, however, that the number of small-size softwood plywood plants has always been small, and has recently been declining rapidly in the Northwest. In 1982 there were only two small conventional mills in this region.

The group of conventional plants selected for this study represents some of the more technologically advanced softwood plywood mills in the Northwest. This sample group includes, for instance, some giant firms' plants such as Boise Cascade; Champion International; Willamette Industries; and Georgia Pacific. Only two of the conventional plants in the sample are independent single-plant firms; this in turn coincides with the concentration of plant ownership pattern in the Northwest softwood plywood industry.

The two sample groups of plants differ from one another in respect to a number of important factors. The conventional mills are larger than the co-op plants in terms of both employment and output (see Table XVI). The average age of the co-ops is substantially greater than that of the conventional mills. All of the eight conventional plants were built during the 1950s. Whereas four of the selected co-ops were constructed in the 1950s, others began their operations in the earlier decades.

TABLE XVII
EMPLOYEES, OUTPUT, AND AGE OF THE
SELECTED GROUPS OF PLANTS
(AS OF 1982)

	Co-Ops	Conventionals
Average Total Employees	232	323
Average Annual Output (MSF)	89	111
Average Age	37	27

METHOD

Any comparative study of worker productivity on a mill-to-mill basis encounters certain problems, and should thus be treated with caution. Problems could arise when there are different types of products with different man-hour requirements. More importantly, there are also questions of technology employed and raw materials (i.e., quality and size of logs) used in production. This in turn affects worker productivity and may be different from one mill to another. Considerations of the effects of those factors on productivity requires, among other things, detailed data pertaining to plant technology, raw materials and types of products produced which are hard to come by. The lack of such data and information necessitates the

imposition of a number of restrictions and leads to certain limitations surrounding the results of this study which will be dealt with later.

For the purpose of the present study a combination time-series and cross-section approach is adopted. The model allows the comparison of the performance of the two groups of plants in question with respect to changes in annual output per employee over time. Such a model is depicted in equation (1).

$$Q = f(E, YB, E.T, E.T.D) \quad (1)$$

Where:

Q = plant annual output

E = number of plant employees

YB = year in which a plant is built

$E.T$ = variable E multiplied by a time (T) variable

$E.T.D$ = variable $E.T$ times a dummy (D) variable (D equals 1 for co-ops, and 0 for conventional plants).

The model permits the estimation of changes in annual output per employee over time for the two groups of plants, as shown in equation (2).

$$\frac{\partial^2 Q}{\partial E \partial T} = d + eD \quad (2)$$

Where d and e are the estimated coefficients associated with the variables $E.T$ and $E.T.D$. Therefore:

$d + e$ = change in output per employee per year for co-ops,

d = change in output per employee per year for conventional mills.

A number of assumptions are needed in estimating equation (1) and in comparing the economic performances of the two groups of plants. The assumptions are: (1) homogeneous labor inputs; (2) homogeneous product outputs; (3) equal man-hours worked per group of plants per year; (4) constant capital/labor ratios across plants.

Assumptions (1) and (2) are usually made in a comparative study as such and seem plausible here. The narrow range of tasks and labor skills required in the plywood industry and the production of standard products such as sanded plywood in the sample plants make these two assumptions realistic. Assumption (3), though may appear less plausible (since the co-ops might have a different behavior from their conventional counterparts), seem to be a likely situation on an aggregate level across the two sample groups. The assumption of constant capital/labor ratios implies that the available technologies are taken to be fixed over time across plants. It further implies that there are no scale economies. The technical justifications of this assumption are: (1) much of the technological changes which are made in the softwood plywood industry have been difficult to incorporate into existing plants; (2) as it was discussed in Chapter IV, one of the features of the softwood plywood industry is the absence of advantages of plant size.

VARIABLES AND MEASUREMENTS

Q

Plants output in the two sample groups are measured in terms of total annual production in million square feet, 3/8-inch basis.

E

E is defined as the reported average monthly number of employees per year for each plant. The relationship between Q and E, as postulated in the model, is a positive one, meaning that output is expected to rise as input of labor increases.

YB

YB is the year in which a plant was built or actually began its operation. As it was noted earlier, the relationship between technology employed and output (or productivity) is an important one. The insertion of variable YB in the same model can loosely account for the effects of technological factors on output levels independent of labor inputs. Newer plants are assumed to have employed production technologies more suited to changes in raw material situations (i.e., smaller logs) discussed in Chapter IV. This leads to the expectation of finding relatively greater output in newer plants than in older ones.

E.T

Variable **E.T** is composed of the interaction of number of employees (**E**) for each plant and a time variable (**T**). The time variable takes the value of (1) for the first observation and ends with the value of (23) for the twenty-third observation. **E.T** permits the estimation of changes in annual output per employee over time, as depicted in equation (2).

E.T.D

This is a variable designated to (a) distinguish the co-op plants from the conventional ones; (b) account for the changes in annual output per employee over time independently in each group of mills (as shown in equation 2). **E.T.D** is composed of the multiplications of variable **E**, the time variable (**T**), and the dummy variable (**D**).

DATA

Secondary data pertaining to the annual output, number of employees, and years of construction of the sample mills were obtained from the following sources:

- A. Directory of Forest Products Industry--plants' annual output.
- B. Oregon Directory of manufacturers --number of employees.
- C. Washington Directory of Manufacturers--number of employees and plants' years of construction.

- D. Oregon Department of Economic Development--number of employees and plants' years of construction.
- E. International Woodworkers of America (IWA)--number of employees and plants' output.

Information and data obtained from source A through E were originally gathered by those organizations and sources in mail questionnaires which were directly sent to the general managers of plywood plants throughout the United States. IWA is a union organization representing employees of a number of plants in the two sample groups.

Data for a number of plants were not available, and several mills had missing data for a significant number of years. This situation resulted in the exclusion of the concerned plants from the samples. In addition, a careful inspection of some plants' data, and an examination of residuals (as measures of the error component) revealed serious "outliers" or "deviant cases" visible in the scatterplot. This examination led to the exclusion of the affected mills from the samples.

CHAPTER VII

RESULTS AND INTERPRETATIONS

Regression estimates are presented in equation 3 (with t-statistics in parentheses). All of the estimated coefficients are statistically significant at 0.01 level.

$$Q = -1045 + 0.118E + 0.555YB + 0.00789E.T. + 0.00144E.T.D \quad (3)$$

(9.6)	(4.2)	(14.4)	(2.08)
N=368	R ² =0.65	F=170	

Output has shown to be positively associated with the number of employees indicating, for example, that plants' annual production levels would increase by 118 thousand square feet (TSF) as an additional worker is employed. This is equivalent of the marginal output per employee. The positive coefficient of YB reveals that newer plants tend to be more productive than older ones by 555 TSF per year in age difference. This may be interpreted that newer plants have likely employed better and newer technologies which helped to produce greater output. The average output per employee (or average product of labor) for all plants combined is found to be 359 TSF.

Using equation (3), the growth in annual output per

employee per year in the co-op and conventional plants are derived as follows:

$$\text{Co-Ops: } \frac{\partial Q^2}{\partial E \partial T} = 0.00789 + 0.00144 = 0.00933 \quad (4)$$

$$\text{Conventionals: } \frac{\partial Q^2}{\partial E \partial T} = 0.00789 \quad (5)$$

That is, while annual output per employee increased each year by an estimated 9,330 SF in the co-ops, it did so only by 7,890 SF in the conventional mills. The co-op plants have shown an almost 18 percent greater growth in annual output per employee per year than their conventional counterparts.

In order to explore other differences in performance between the two groups of plants three separate pooled time-series cross-section regressions are run: (1) a regression for the co-op plants; (2) a regression for the conventional mills; (3) a regression of combined co-ops and conventional plants for a Chow-test of equality between two sets of equations. For this purpose the variable E.T.D (which was to distinguish the co-ops from those of the conventional mills) is dropped from the model. The estimated equations (with t-statistics in parentheses) and a summary of the statistical findings (shown in table XVI) are presented below:

$$\text{Co-Ops: } Q = -1059 + 0.185^*E + 0.555^*YB + 0.0089^*E.T. \quad (6)$$

(8.9) (4.9) (13.4)

$$N = 184 \quad R^2 = 0.69 \quad F = 139$$

$$\text{Conventionals: } Q = -5220 + 0.099^*E + 2.691^{**}YB + 0.008^*E.T \quad (7)$$

$$(5.7) \quad (1.5) \quad (11.2)$$

$$N = 184 \quad R^2 = 0.56 \quad F = 77$$

$$\text{Combined: } Q = -748 + 0.109^*E + 0.405^*YB + 0.00838^*E.T \quad (8)$$

$$(9.4) \quad (3.7) \quad (16.8)$$

$$N = 368 \quad R^2 = 0.64 \quad F = 223$$

* Significant at 0.01

**significant at 0.1

TABLE XVII

SUMMARY OF THE STATISTICAL FINDINGS
(derived from equations 6, 7, 9 and 10)

	Co-Ops	Conventionals
Average Output Per Employee (TSF)	383	343
Marginal Output per Employee (TSF)	185	99
Growth in Output per Employee per Year (SF)	8,900	8,000

The estimated growth in annual output per employee per year in each group of plants can be derived from equations (6) and (7) as follows:

$$\text{CO-Ops: } \frac{\partial Q^2}{\partial E \partial T} = 0.0089 \quad (9)$$

$$\text{Conventionals: } \frac{\partial Q^2}{\partial E \partial T} = 0.008 \quad (10)$$

That is annual output per employee grew by 8,900 SF per year in the co-ops compared with 8,000 SF in the conventional plants. These findings are consistent with productivity results obtained earlier in equations (4) and

(5). A comparison of the estimated coefficients of E's in the two sample groups (equations 6 and 7) suggests that the relationship between output (Q) and number of employees (E) is much stronger in the co-ops than in the conventional plants. Each additional worker employed in the co-ops results in an estimated 185 TSF increase in annual output compared with 99 TSF in the conventional mills. That is, the co-ops' estimated marginal output per employee is almost two times greater than that of the conventional plants. It is also found that the average output per employee is to be 383 TSF and 343 TSF in the co-ops and conventional plants respectively. Variable YB has shown to have a significant positive effect on output in both groups of mills, although this effect appears to be much greater in the conventional group. The coefficients of YB's in the two groups of mills indicate that: (1) newer co-ops are more productive than older ones by 555 TSF for each year in age difference; (2) newer conventional plants are more productive than older ones by 2,691 TSF for each year in age difference. This implies that the differences in technologies used in the co-ops are, on a mill-to-mill basis, less pronounced than the differences in technologies employed in the conventional plants.

As the results suggest, the two groups of plants have shown differences in their performance. Whether those differences are statistically significant or not requires a Chow-test of equality between sets of coefficients in

equations of co-ops and conventional plants. The intent is to test the null hypothesis that the set of coefficients in equations (6) and (7) are equal to the set of coefficients in equation (8). The Chow-test is given as the following:

$$F_{K+1, m-2k-2} = \frac{ESS_{cm} - (ESS_{cp} + ESS_{cv})/k+1}{(ESS_{cp} + ESS_{cv})/m-2k-2} \quad (11)$$

Where k = number of variables in the model

m = sum of observations in the two sample groups

K+1, m-2K-2 = degrees of freedom

ESS_{cp} = error sum of squares for co-op equation (6)

ESS_{cv} = error sum of squares for conventional equation (7)

ESS_{cm} = error sum of squares for combined equation (8)

As parts of the regressions output it is found that

$ESS_{cp} = 37698$; $ESS_{cv} = 86010$; and $ESS_{cm} = 128450$

Therefore,

$$F_{5, 358} = \frac{128450 - (37698 + 86010)/5}{(37698 + 86010)/358} = 2.74$$

Since the value of the F-statistics is greater than the critical value of the F distribution at the 0.05 level, we reject the null hypothesis. That is the differences in performance of the two groups of plants (found in this study) are statistically significant. The implication is that the co-op plants differ in their operation or behavior from the conventional mills.

DISCUSSION

This study has provided evidence of the extent cooperative and conventional plywood plants differ in their performance. The important question which arises here is: what accounts for the apparent differences in these plants' operations? Ideally, such a question could be answered with more certainty if the estimated production functions of the two groups of plants were compared. Therefore, explanations and interpretations presented here should be treated with caution.

Labor input (E) is found to have a much stronger effect on output (Q) in the co-ops than in the case of conventional mills. The explanation may be that the co-ops follow a labor-using expansion path whereas their conventional counterparts follow a capital-using expansion path. This means that while the co-op plants might increase their output more through the use of labor, the conventional mills may expand their production more by the use of capital (e.g., new machines or equipment). The use of temporary and seasonally hired workers in the co-ops has likely provided the means of expanding output in these plants whenever needed without much investments in new machines. This flexibility and frequent adjustment of labor inputs may not have been available in the conventional mills (perhaps because of union contracts). It is, however, not very clear as to why marginal output per employee is greater in the co-ops. One explanation may be that the production processes

are more capital intensive in the co-ops than in their conventional counterparts. A second explanation arises from the differences in wage rates in the two groups of plants. One may argue that any additional worker who would be employed in the co-ops would most likely be a nonowner-employee who does not receive the same financial benefits as an owner-employee does. Such a hired employee may then have less incentive to work as hard as an owner-employee does. However, wage rates of hired employees in some co-op plants are generally known to have been higher than those received in the conventional plants. The greater wage rates in the co-ops may have provided the hired workers the incentive to work comparatively harder and better than employees in the conventional mills. This situation probably has resulted in a higher marginal output/worker in the co-ops.

The technological factor (variable YB) has shown to have a more profound impact on output (Q) of the conventional plants than that of the co-op mills. This means that the extent of technological differences, on a mill-to-mill basis, is less pronounced in the co-op plants than in the conventional group despite the fact that the co-ops have a greater age variance. This can be explained by the age difference between the two groups of plants. The co-ops are significantly older than the conventional mills. All samples of conventional plants were built between 1955 and 1959. Technologies which were available to plywood

plants in that period were most likely more advanced than the ones which could have been obtained in earlier decades (in which some co-ops were established). The age pattern effects concerning the two groups of plants has likely contributed to a lower marginal product of capital in the co-op mills.

The growth in output per employee per year is found to be greater in the co-ops than in their conventional counterparts. This could be attributed to the general belief that owners work better and harder than non-owners. Employee-members in the plywood co-ops, who in essence own and run their enterprises, are more likely to work harder and take better care of their plants or equipment since they have a stronger motivation, reinforced by both participatory atmosphere and incentive of direct financial gain (in the forms of share profits and/or higher wages as their companies prosper). Such a situation has likely contributed to the higher labor productivity found in the co-op plants. This is a proposition which has been supported by a number of studies concerning PCs.

Productivity in the plywood plants is generally affected by three major factors; technology, raw material, and labor efforts. It is important to discuss the findings of this study in respect to situations in which two of the crucial assumptions made in this research are altered.

- Breaking the assumption of equal man-hours worked. Annual output per employee, which is used as a measure of

productivity, does not account for the differences in man-hours worked in each plant (or groups of plants). One may simply attribute the higher output per employee ratio of the plywood PCs to a greater number of hours worked in these mills. If that is found to be the case, it could still be regarded as an indicator of success for the co-ops since it is consistent with the objectives of the worker-owned firms: mainly steady employment and higher income. In such a situation it may then be viewed that the co-ops rely on members' hard work and sacrifices (such as longer work hours with perhaps no additional payment) to achieve greater output. The results of such sacrifices may show up in the form of higher annual shared-profits for the co-ops' members.

- Breaking the assumption of fixed technology. If technology has changed over time in the sample plants and given all other assumptions held, the higher worker productivity of co-ops may imply the adaptation of better (or more capital intensive) technologies by these mills. In the case of changing technologies, marginal output per employee cannot be estimated (as it was in this study) independent of technological factors.

If the two groups of plants have used entirely different species of timber in their production, then the greater productivity found in the co-ops may imply the use of higher quality logs (or more suitable technologies) in these

mills. This, in turn might have resulted in a greater log recovery ratio (output per input of logs) in the co-ops. Such a case may then be regarded as an indicator of better performance on the part of log buyer or management of the co-op plants.

It seems evident that even under some hypothetical conditions presented above, the outcomes tend to suggest better economic performance by the plywood co-op plants. The results and interpretations reported here indicate that the higher worker productivity in the co-ops is probably the result of the combined effects of better production processes; more suitable raw materials; and more importantly, better labor efforts.

Concerns and reservations should be expressed about the use of annual output per employee as a measure of worker productivity in this study. This measure of productivity does not permit for the separation of production workers from nonproduction employees. It is likely that the conventional sample plants, especially the larger ones, to have employed more of nonproduction employees compared with the co-op mills where some nonproduction tasks may be performed by a production worker on a day-to-day basis. In such a situation, the use of annual output per employee would automatically result in a lower worker productivity figure for the conventional mills (since the output has been produced by a relatively smaller number of production

workers). Another issue arises from the adaptation of an aggregate method of comparing worker productivity in the two groups of plants. The aggregate approach does not allow the comparison of the two groups of plants on a mill-to-mill basis. In other words, it is not clear whether worker productivity is greater on an individual basis for all eight co-op plants than in every other conventional sample mill. In general, results reported here should be taken cautiously.

It seems appropriate to add a discussion on how a comparative study as such could be undertaken under a situation where no limitations were present on the data.

As it was mentioned earlier, a standard approach to looking for differences in efficiency (and productivity) between two groups of plants is that of estimating production functions. A typical statistical form is the Cobb-Douglas equation which can be transformed into a log-linear form with three inputs of labor, capital and logs (as a source of raw material).^{*} For the purpose of analyzing factor productivity, it is necessary to measure all inputs in terms of their physical quantities, assuming that they are homogeneous resources. Physical capital in the form of fixed investment in plant and equipment can be

^{*} $\text{Log } Q = \log a + b \text{ Log } L + c \log K + d \log G$

measured in constant dollars. Manhours worked may be a valid measure of change in real labor services. It is a superior measure (against manhours paid), since the trend toward more vacation, sick time, and other fringe benefits does bias the hours paid data (since it is not productive time). One of the important questions to be asked is whether the labor input should include all workers or only those actively engaged in production. It seems appropriate to embody only production workers for this purpose. Physical raw material may be measured by the volume (board feet) of logs consumed in production.

The estimated production sets for the two groups of plants can be compared on an input-by-input basis as well as for overall productive efficiency for any level of resource use, to establish productive claim by type of plants. Several useful information pertinent to the operations and performances of the two groups of plants can be inferred from the estimated parameters of their production functions. Marginal products of labor and capital in the two sample plants can be compared for the purposes of inputs intensity and productivity. It can be learned, for example, that which group of plants (PCs or conventionals) are more labor or capital intensive. The estimated technical coefficients may then be used to estimate returns to scale in order to evaluate efficiency (and its relation to plant size) in the

two groups of mills. Coefficients of raw material (logs) in the two production functions pertinent to each group of plants would also allow the comparison of log recovery ratios (as a measure of wood utilization) for efficiency purposes.

CHAPTER VIII

CONCLUSIONS AND POLICY IMPLICATIONS

The major conclusion that emerges from this study is that worker-owned plywood cooperatives are a viable and productive form of economic organization that utilize labor inputs efficiently and in doing so can achieve higher worker productivity than conventional enterprises. In general, the findings reported here refute those propositions such as that of Vanek's (1970) which maintain that with an equal pay system employees in PCs have less incentive to work hard, and the resulting situation is lower worker productivity compared with conventional organizations. Although the levels of employment and output, as Vanek has hypothesized, are lower in PCs of the plywood industry, this has not evidently resulted in a misallocation of labor inputs in these enterprises.

With eleven co-ops having existed for periods ranging from thirty to forty-five years, plywood PCs have met the test of survival and demonstrated that they can perform the necessary functions of business enterprise in a competitive economic society. The co-ops have not only coped with the

usual problems of business but, in some cases, have done so under additional handicaps not part of normal market hazards, such as unrealistic or even fraudulent promotion, inadequate capitalization, obsolete plant at the start of operation, or restrictive nonbeneficial contractual relationships. The variety of policies and practices pursued by some co-ops indicates that the worker-owned organizational form has flexibility. Adaptability has been shown by the ability to meet changing situations, a capacity necessitated to an unusual extent by the significant development in the plywood industry since the mid-1950s.

To say that worker-owned cooperatives are a viable form of business organization is not to say that this form automatically guarantees success of an enterprise. A close review of the experience of plywood PCs suggests that good business operation is required for the success of PCs no less than for that of conventional enterprises. Adequate capitalization, plant and equipment and raw material supply, and sound policies with respect to finance, job management, sales and supply as well as production are as necessary for the success of a worker-owned co-op as for that of any other manufacturing organization. Even the higher worker productivity that is found in the plywood PCs is not automatically achieved but requires solid hard effort, work discipline, and efficient management.

The rather unusual concentration of co-ops in the softwood plywood industry may suggest the possibility that

this industry is peculiarly favorable to cooperative enterprise. Whether the industry is so uniquely suited to worker-owned operation that the experience of plywood PCs cannot be considered relevant elsewhere is a question that must now be considered.

There are evidently a number of characteristics inherent in the softwood plywood industry that may be considered as both favorable and unfavorable to production by worker-owned co-ops. One favorable (though changing) feature of the industry is perhaps the relatively low capital requirement. The ability of a group of workers to raise adequate capital for a manufacturing venture from their own resources is limited. A plywood plant representing an investment of three million to five million dollars and employing 50 to 350 workers is likely more promising for a cooperative venture than say, a petroleum refinery with 65,000 dollars invested per worker.¹ But in relation to the whole array of manufacturing enterprise, plywood plants do not appear uniquely small in terms of capital requirement. The great bulk of the United States manufacturing corporations have assets of less than five million dollars. With respect to capital requirements in relation to labor, the plywood industry is close to the average for manufacturing as a whole.² And plywood plants are not significantly below the norm in number of workers. In 1977, for instance, there were approximately 78,000 manufacturing units with total employess of 20 to 99 per

establishment.³

Another feature of the softwood plywood industry that may be favorable to cooperative ventures is the comparatively low-skilled nature of jobs in a plywood plant and the comparatively narrow range of skills required, and hence the relative narrow range of pay differentials. But in relation to the whole array of manufacturing activities, skill requirements in the plywood industry are not uniquely low. In 1983 there were nearly 28 million manufacturing occupations in the United States classified as semi-skilled.⁴

Comparative lack of highly trained and highly paid skills is probably favorable to cooperative operations in several ways. Perhaps the most important result is a widening of the market for working shares in co-ops. Since plywood plant skills can be learned on the job, the plywood PCs have not been limited in their membership to workers already in the industry or people with certain specific skills. They have been able to draw members from all those physically able to work who have the necessary capital and desire to join. However, in more skilled industries, arrangements could probably be made for assigning unskilled new members to unskilled jobs while they were training to acquire the needed skill, as is done in the plywood co-ops. Finally, a narrow range of skills probably makes more acceptable the practice of equal pay for all jobs that has been considered a cooperative principle in the

plywood PCs. It should be recalled that plywood plants do require a certain range of skills sufficient to warrant pay differentials.

Although a wide range of skills might pose problems for PCs, a process requiring only unskilled labor would perhaps be unsuitable for cooperative operations. PCs evidently rely on higher labor productivity in manufacturing to overcome difficulties they may have in other departments such as finance or marketing. In unskilled jobs there will be less opportunity for superior productivity to be achieved. In the plywood industry, although most jobs are classified as only semi-skilled, some care and judgment are required, and productivity can show up in improved quality as well as greater quantity of output.

The major disadvantage of the softwood plywood industry for cooperative production stems from two characteristics of the industry: the nature of its markets and the nature of its raw material. The entrepreneurial problems faced by a PC in dealing with an unstable market and unstable raw materials supply counteract the simplification of the entrepreneurial job derived from a relatively standardized product and simplicity of the manufacturing operation.

PCs, with their interest in continuous operation, would seem likely to flourish best in an industry with a stable demand. But because softwood plywood is used largely in construction, demand for plywood products is highly

seasonal and also subject to strong cyclical variation. Furthermore, the products are difficult to store so that production is commonly for immediate sales. In the face of the variable demand, continuous operation is more difficult for a PC to maintain. In addition, price fluctuations resulting from the demand situation makes it difficult for worker-owned operations to achieve the steady income required to meet the need of their members for steady pay.

Some of the difficulties in connection with raw material supplies have already been mentioned: the increasing scarcity of high-grade supply, especially for independent producers, and the resulting price rise and quality decline. But even aside from these difficulties, the problems connected with log supply in the plywood industry are such as to suggest unfavorability of this industry for cooperative manufacturing enterprise. There are no regular sources of supply or known prices for the raw material. The continuous decline in quality has forced on the producers major changes in products and manufacturing techniques. This raw material, which is the largest share of plywood manufacturing costs, is variable, uncertain, and to a large extent unknown in quality and quantity yield.

Technological changes may also be regarded as another characteristic of the plywood industry that is unfavorable to cooperative operation. Rapid technological change in the plywood industry began just after most of the plywood PCs were established. Rapid mechanization poses problems for

existing concerns. The problems are difficult, particularly in a growing industry where new plants are constantly being built to utilize the latest developments and particularly where, as in the plywood industry, the new technical developments are difficult to incorporate into existing plants. Mechanization requires large amounts of additional capital, and obtaining capital is difficult for PCs. It seems evident that PCs would fare best in an industry with stable technology.

An assessment of the characteristics of the softwood plywood industry reveals that in the period when the plywood PCs were established, the plywood industry may be judged to have been comparatively--although not overwhelmingly--favorable to PC ventures. But the cluster of co-ops in the plywood industry is to be explained, not by unique features of the industry, but by a perhaps unique coincidence of certain other factors of an historical nature with a relatively favorable industry opportunity. Industry characteristics facilitated the establishment of the co-ops, but other factors supplied the impetus of their organization.

The chief factor accounting for the formation in the 1950s of the bulk of the plywood PCs was undoubtedly the force of example--the example provided by the successful functioning of the plywood co-ops organized before World War II. The successful pilot demonstration provided by the prewar plywood PCs was at least aided by the accident of

timing: the entrance of these PCs into the industry just before the wartime boom and the postwar demand for plywood. Plant closures that supplied part of the impetus in the 1950s for organization of worker-owned co-ops that took over conventional plants reflected in many cases another historical factor--the instability of the industry geographically, its migration in search of raw material supplies (from Washington to Oregon).

The location of the early plywood industry in western Washington was another factor: producer cooperation was known there, particularly among lumber workers. The prevalence of men of Scandinavian origin among the Northwest wood workers was probably also a factor. These people were acquainted with the Scandinavian tradition of cooperation, as well as with the habit of saving, which yielded their capital to start co-ops, and ethnic homogeneity perhaps helped them to work together successfully.

The establishment of the unusual cluster of co-ops in the plywood industry is, therefore, to be explained in terms of historical factors with favorable industry characteristics, not in terms of an industry uniquely predisposed to cooperative operations. But the most significant fact for assessing the relevance of the plywood experience to other industries is the survival and success of the plywood PCs in the period since 1955. This achievement cannot be explained in terms of a favorable industry, even if it is considered that the co-ops had the

advantage of a relatively favorable industry situation at the time they were established. It seems clear that the present softwood plywood industry does not on the whole present a situation especially favorable to cooperative activity, despite a number of favorable features. If the plywood PCs can prosper in the industry at present, as most are now doing, it would seem safe to conclude that possibilities of success of PC ventures exist in other industries as well.

Suggestions for Further Study

A number of areas pertinent to the subject of the plywood PCs have not been dealt with in the present study for lack of time and data. One suggestion for further study would be an attempt to assess industrial areas offering possibilities for successful operation of worker-owned co-ops. Perhaps to develop criteria for judging suitability for cooperative operation and suggestions for specific public or philanthropic private action that would aid PCs and extend the possible areas of their operation. The question of why and how the plywood PCs have been able to achieve greater productivity is obviously of great practical significance to management and has implications for many fields from economic growth to mental health. More comparative studies of co-op and conventional organizations are needed to explore the possible differences in organizational behavior and performance.

On a different level from these factual inquiries would be a study of the plywood PCs from the viewpoint of economic theory. This would involve both application to the plywood co-ops of the analytical apparatus of production and organizational theories and exploration of possible implications of the experience of the plywood PCs for theoretical economic concepts and relationships.

PUBLIC POLICY

Worker-owned co-ops provide an alternative form of economic organization. They can preserve features such as decentralized decision making and remuneration according to effort. At the same time they mitigate the dehumanizing tendencies of a wage system that sees labor merely as a productive service. PCs enlarge the area of individual responsibility and choice and give the person status and dignity in his role as a producer.

While producer co-ops may not provide the means of solving all of our economic problems, they show enough promise to be included in a public policy agenda for the United States. This final section considers how governments can best use and strengthen the efficiency and employment potentials of PCs.

Implications for Federal Government

Political arguments regarding the role of government tends to run in extremes: either the federal government is so clumsy and inefficient that it cannot do much of anything

useful and the solution is to "get the government off our backs", or the federal government is called upon to solve every important social and economic problem. Neither of these extreme views provides useful guidance for addressing the nation's problems. The laissez-faire philosophy closes off opportunities for government intervention in problems that promise to do more things for more people.

Out of this clash of extreme views, a new participatory ideology is emerging. This ideology recognizes the inherent limitations of national government in running programs in local areas, but also recognizes the great potential for federal leadership in stimulating and supporting locally based efforts (Whyte, et. al., 1983). There are important financial needs in facilitating social and economic readjustments that the federal government can finance without becoming committed to pump funds into every depressed region or company. Consider, for example, the experience of Economic Development Administration (EDA) and Small Business Administration (SBA) which since the 1960s have been two of the major government agencies dealing with problems of distressed regions and companies. There have been a number of cases in which agencies such as EDA and SBA provided technical and financial assistance to employee buy-out attempts. In this regard, establishment of employee-owned co-ops is viewed as a viable policy option to many plant shutdowns to preserve local employment and avoid

community disruption. The need for such a policy was already felt during the 1970s, resulting in the beginnings of federal government response. The United States Senate passed a bill that would authorize the Small Business Administration to guarantee loans to employee-owned businesses and to organizations seeking to purchase their businesses. Also was the establishment of a Producer Cooperative Bank by Congress, and the passage of various employee stock ownership plan bills. However, the recent and continuing federal budget cuts have substantially reduced the amount of funds available to EDA and SBA. The Producer Cooperative Bank which is to provide loans to employee buy-out attempts is virtually eliminated under the current budget. The present federal government apparently embraces a doctrine of industrial Darwinism, which dictates that government should not bail out a company whose existence is threatened by financial losses or support a region in a depressed condition. The theory is that a weak company should be allowed to die and a depressed community should not be more than minimally supported so that its citizens will be motivated to move elsewhere. It puts all faith for economic growth and expansion in employment in the growth of existing, profitable firms. Unfortunately, this doctrine ignores the positive outcomes of varieties of programs that agencies like EDA and SBA have supported. For example, in the 1970s EDA provided more loan money to more cases of employee buy-outs of closing plants than all other federal

agencies combined, making possible the saving of thousands of jobs. To this date, the agency has been recovering all loan money that went into direct support of those projects.

A major controversy arises from the use of public funds in converting closing plants into employee-owned co-ops. On one side of the controversy are those who believe workers have, or should have, a right to substantial job security and place a high value on policy measures that mitigate the effect of job loss. On the other side are those who believe the use of public money in employee buy-outs of closing plants (1) results in the retention of inefficient operations since they have already ceased to be profitable; and (2) drains national funds which could be used in other areas of concern. The argument that employee buy-outs of closing plants lead to the retention of inefficient operations lacks merit. Bluestone and Harrison (1980, 1982) have investigated cases of plant closures and found that not all closing operations are inefficient or unprofitable. It is also true that not all employee buy-out operations have been successful. But the number of failures has usually been small when compared with numerous cases of successful employee ownership operations. Furthermore, governmental support for employee buy-outs is found to be a cost-effective means of creating and retaining employment (Quilligan, 1986). Many of the closing plants do not need to be bailed out. What they need is assistance in setting up autonomous, decentralized, locally owned operations. A

public policy aimed at employee buy-outs of closing plants must take into consideration the future viability and efficiency of a closing concern. After assurances are made (through a feasibility study, for example) that a closing plant could become viable and productive, then conversion into employee-ownership will take place.

There are several areas of governmental activity in which public policy could encourage the formation and growth of employee-owned cooperatives. The most obvious area is that of finance. In the past, for example, SBA provided assistance in this area to several plywood co-ops, enabling them to survive, expand or modernize. But much more could be done along these lines. In particular, provision of capital from public sources (in form of loans or guaranteed loans) in the initial organization of PCs would encourage their formation and lessen the danger of failure due to capital starvation because of the inadequate financial resources of workers seeking buyouts. Also, use of public funds or guarantees to aid the transfer of shares from present worker-owners wishing to sell to prospective members would be of benefit to cooperative producing ventures, facilitating their formation and their continuance as co-ops.

Perhaps of equal benefit to PCs would be an informational and education program designed for the particular needs of co-op members. Workers who buy into producing co-ops are not usually acquainted with basic

accounting techniques and with the fundamental principles of management in varied fields of capital, production and sales. As active owners, they need some familiarity with these operating tools. An informational and educational program to make available to worker-owners the knowledge they need could be provided by the appropriate government agencies at small cost. Specialized individual assistance to employee-owned co-ops could be on a consultant basis.

It is evident that the activities suggested for public agencies could also be provided by private groups. Those would be particularly appropriate activities for organizations devoted to promoting cooperative methods and also for those devoted to strengthening the participation and status of the individual in our society. Unions can also take an active part in local initiatives toward employee buy-outs.

Implications for Local and State Governments

There is an ongoing competition among states to attract companies into their communities to increase local employment. The often unproductive nature of these efforts suggests that the considerable resources devoted to such programs could be reduced with little sacrifice by the citizens of the states and local communities. Funds could be then shifted into the development of technical and financial assistance for working with companies, unions, and interested people in helping economic transition of their

regions, cushioning the effects of layoffs and plant shutdowns, and developing new jobs and new companies. Any state has some funds to be allocated to economic development projects. These funds can be more effectively spent if officials give special attention to local projects involving participation by concerned groups (such as management, union leaders and community workers).

State and local support of worker ownership seems a most appropriate vehicle in combating the continuing epidemic of plant closings and for economic development. In 1982 Michigan passed the Economic Development Authority Act, providing the first state authority for financing employee ownership. The Act provides a special priority for employee buy-out efforts and requires that employees have full voting rights on all allocated and unallocated shares. The most far reaching proposal for state action to date is under consideration by the Pennsylvania state legislature. A proposed law would create a Steel Valley Authority, with powers of eminent domain to acquire closed and closing plants in order to facilitate worker buyouts (Sacks, 1986). Such laws would pave the way for the establishment of state-owned and employee-managed enterprises to preserve jobs or create new ones. A few other states have followed Michigan's lead in legislating programs to support employee ownership. While the laws vary in detail, all of them at least require a state agency to provide information about employee ownership and to provide some technical assistance

to organizations seeking to establish this form of ownership.

The revitalization of our depressed regions and communities must come through strengthening local initiatives and responsibilities. Employee-owned cooperatives can play significant roles in this process. These initiatives, however, cannot yield their potential benefits without financial support and technical assistance from the national and state authorities. Governments can stimulate and support locally based programs and help to empower people to make better use of the material and human resources in their communities. The characterization of the American economic system as "industrial democracy" could take on new meaning with a significant expansion of the worker-owned manufacturing cooperative form of enterprise.

FOOTNOTES

¹Census of Manufacturers, 1983.

²The Census Bureau figures for 1977 indicate that there were over \$16,000 of net capital stock for every employee in the softwood plywood industry compared with an average of nearly \$19,000 for manufacturing in general.

³Bureau of the Census (1985), "Statistical Abstract of the U.S."

⁴Bureau of the Census, (1985), "Statistical Abstract of the U.S."

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APPENDIX A

SELECTED SAMPLES OF CO-OP AND
CONVENTIONAL PLANTS

CO-OP PLANTS

<u>PLANT</u>	<u>NAME</u>	<u>LOCATION</u>
#1	Astoria Plywood Corp.	Astoria, OR
#2	Linnton Plywood Assoc.	Portland, OR
#3	Multnomah Plywood Corp.	St. Helens, OR
#4	Hardel Mutual Plywood Corp.	Olympia, WA
#5	Mt. Baker Plywood, Inc.	Bellingham, WA
#6	North Pacific Plywood, Inc.	Graham, WA
#7	Puget Sound Plywood, Inc.	Tacoma, WA
#8	Stevenson Co-Ply, Inc.	Stevenson, WA

CONVENTIONAL PLANTS

<u>PLANT</u>	<u>COMPANY</u>	<u>PLANT LOCATION</u>
#1	Boise Cascade Corp.	Independence, OR
#2	Boise Cascade Corp.	Valsetz, OR
#3	Champion International Corp.	Gold Beach, OR
#4	Champion International Corp.	Roseburg, OR
#5	Champion International Corp.	Willamina, OR
#6	Simson Timber Co.	Albany, OR
#7	Willamette Industries	Dallas, OR
#8	Willamette Industries	Foster, OR

APPENDIX B

DATA BASE

Plant #	<u>1960</u>					
	Conventional			Co-op		
	Q	E	YB	Q	E	YB
1	100	375	1959	72	233	1951
2	60	360	1959	72	204	1953
3	70	400	1959	90	300	1950
4	76	435	1957	45	164	1947
5	70	241	1957	50	185	1950
6	61	269	1957	60	250	1921
7	90	400	1957	120	325	1942
8	100	365	1957	40	175	1949

<u>1961</u>						
1	100	374	1959	72	233	1951
2	66	360	1959	72	204	1953
3	95	400	1959	90	300	1950
4	95	447	1957	45	164	1947
5	77	241	1957	60	185	1950
6	61	269	1957	60	250	1921
7	108	443	1957	120	325	1942
8	100	365	1957	43	175	1949

<u>1962</u>						
1	100	374	1959	60	265	1951
2	72	360	1959	72	204	1953
3	120	400	1959	96	325	1950
4	129	459	1957	36	164	1947
5	84	241	1957	60	185	1950
6	61	246	1957	55	250	1921
7	125	486	1957	120	325	1942
8	100	365	1957	46	175	1949

<u>1963</u>						
1	100	374	1959	60	265	1951
2	70	360	1959	72	204	1953
3	78	400	1959	96	325	1950
4	96	480	1957	36	164	1947
5	72	241	1957	60	175	1950
6	61	246	1957	55	250	1921
7	110	486	1957	120	325	1942
8	110	365	1957	48	175	1949

Plant #	<u>1964</u>					
	<u>Conventional</u>			<u>Co-op</u>		
	<u>Q</u>	<u>E</u>	<u>YB</u>	<u>Q</u>	<u>E</u>	<u>YB</u>
1	100	374	1959	75	265	1951
2	72	360	1959	72	200	1953
3	120	400	1959	96	325	1950
4	129	502	1957	39	164	1947
5	84	241	1957	60	175	1950
6	61	246	1957	55	250	1921
7	125	486	1957	120	325	1942
8	125	365	1957	60	175	1949
<u>1965</u>						
1	132	313	1959	80	250	1951
2	72	295	1959	75	200	1953
3	120	387	1959	100	321	1950
4	115	492	1957	54	175	1947
5	86	236	1957	60	175	1950
6	64	246	1957	60	250	1921
7	145	517	1957	120	325	1942
8	125	353	1957	65	175	1949
<u>1966</u>						
1	108	253	1959	80	235	1951
2	72	295	1959	75	200	1953
3	90	375	1959	100	317	1950
4	115	482	1957	66	175	1947
5	72	230	1957	70	175	1950
6	64	246	1957	75	250	1921
7	150	548	1957	120	325	1942
8	125	340	1957	60	175	1949
<u>1967</u>						
1	116	257	1959	80	235	1951
2	72	210	1959	75	200	1953
3	90	377	1959	100	324	1950
4	125	462	1957	70	175	1947
5	72	233	1957	70	175	1950
6	64	239	1957	75	250	1921
7	150	488	1957	144	325	1942
8	135	345	1957	66	175	1949

Plant #	<u>1968</u>					
	<u>Conventional</u>			<u>Co-op</u>		
	<u>Q</u>	<u>E</u>	<u>YB</u>	<u>Q</u>	<u>E</u>	<u>YB</u>
1	116	260	1959	80	235	1951
2	72	220	1959	75	200	1953
3	90	380	1959	100	330	1950
4	125	443	1957	70	175	1947
5	72	235	1957	72	175	1950
6	64	231	1957	75	250	1921
7	150	428	1957	144	325	1942
8	120	350	1957	68	175	1949

	<u>1969</u>					
	<u>Conventional</u>			<u>Co-op</u>		
	<u>Q</u>	<u>E</u>	<u>YB</u>	<u>Q</u>	<u>E</u>	<u>YB</u>
1	120	260	1959	82	235	1951
2	80	200	1959	93	200	1953
3	115	340	1959	120	315	1950
4	130	443	1957	60	175	1947
5	85	235	1957	86	175	1950
6	65	231	1957	75	250	1921
7	140	427	1957	97	325	1942
8	102	350	1957	72	175	1949

	<u>1970</u>					
	<u>Conventional</u>			<u>Co-op</u>		
	<u>Q</u>	<u>E</u>	<u>YB</u>	<u>Q</u>	<u>E</u>	<u>YB</u>
1	110	260	1959	70	235	1951
2	70	180	1959	85	200	1953
3	117	300	1959	75	300	1950
4	125	443	1957	38	175	1947
5	86	235	1957	64	175	1950
6	65	231	1957	67	250	1921
7	129	425	1957	90	325	1942
8	114	350	1957	60	175	1949

	<u>1971</u>					
	<u>Conventional</u>			<u>Co-op</u>		
	<u>Q</u>	<u>E</u>	<u>YB</u>	<u>Q</u>	<u>E</u>	<u>YB</u>
1	118	260	1959	81	235	1951
2	72	180	1959	84	200	1953
3	118	300	1959	96	300	1950
4	130	443	1957	51	175	1947
5	96	235	1957	87	175	1950
6	70	231	1957	72	250	1921
7	120	425	1957	90	325	1942
8	135	288	1957	60	175	1949

Plant #	<u>1972</u>					
	<u>Conventional</u>			<u>Co-op</u>		
	<u>Q</u>	<u>E</u>	<u>YB</u>	<u>Q</u>	<u>E</u>	<u>YB</u>
1	136	260	1959	90	235	1951
2	79	180	1959	100	200	1953
3	125	300	1959	100	300	1950
4	145	443	1957	66	175	1947
5	112	235	1957	84	175	1950
6	68	231	1957	80	250	1921
7	140	425	1957	110	325	1942
8	120	225	1957	60	175	1949

Plant #	<u>1973</u>					
	<u>Conventional</u>			<u>Co-op</u>		
	<u>Q</u>	<u>E</u>	<u>YB</u>	<u>Q</u>	<u>E</u>	<u>YB</u>
1	154	255	1959	99	235	1951
2	86	180	1959	100	200	1953
3	116	300	1959	100	300	1950
4	156	509	1957	70	175	1947
5	110	272	1957	100	175	1950
6	73	256	1957	84	250	1921
7	144	443	1957	108	325	1942
8	140	225	1957	76	175	1949

Plant #	<u>1974</u>					
	<u>Conventional</u>			<u>Co-op</u>		
	<u>Q</u>	<u>E</u>	<u>YB</u>	<u>Q</u>	<u>E</u>	<u>YB</u>
1	154	250	1959	100	235	1951
2	86	180	1959	100	200	1953
3	130	300	1959	120	300	1950
4	155	575	1957	80	175	1947
5	110	310	1957	90	175	1950
6	68	275	1957	80	250	1921
7	143	460	1957	102	325	1942
8	140	225	1957	76	175	1949

Plant #	<u>1975</u>					
	<u>Conventional</u>			<u>Co-op</u>		
	<u>Q</u>	<u>E</u>	<u>YB</u>	<u>Q</u>	<u>E</u>	<u>YB</u>
1	120	250	1959	90	235	1951
2	86	180	1959	100	200	1953
3	140	300	1959	120	300	1950
4	160	575	1957	80	175	1947
5	114	310	1957	82	175	1950
6	62	275	1957	92	250	1921
7	152	460	1957	130	325	1942
8	140	225	1957	80	175	1949

Plant #	<u>1976</u>					
	Conventional			Co-op		
	Q	E	YB	Q	E	YB
1	120	250	1959	96	235	1951
2	84	180	1959	100	200	1953
3	140	300	1959	120	300	1950
4	161	575	1957	80	175	1947
5	122	310	1957	95	200	1950
6	62	275	1957	84	250	1921
7	152	460	1957	130	325	1942
8	140	225	1957	84	175	1949

	<u>1977</u>					
	Conventional			Co-op		
	Q	E	YB	Q	E	YB
1	120	250	1959	95	235	1951
2	85	180	1959	100	200	1953
3	135	300	1959	140	287	1950
4	164	575	1957	90	175	1947
5	117	305	1957	90	200	1950
6	75	238	1957	84	250	1921
7	144	460	1957	109	325	1942
8	151	225	1957	80	175	1949

	<u>1978</u>					
	Conventional			Co-op		
	Q	E	YB	Q	E	YB
1	123	250	1959	112	235	1951
2	81	180	1959	100	200	1953
3	154	300	1959	150	325	1950
4	166	575	1957	100	175	1947
5	151	300	1957	115	200	1950
6	62	200	1957	98	250	1921
7	154	460	1957	148	325	1942
8	151	225	1957	84	175	1949

	<u>1979</u>					
	Conventional			Co-op		
	Q	E	YB	Q	E	YB
1	123	250	1959	112	235	1951
2	81	180	1959	110	200	1953
3	154	300	1959	160	325	1950
4	166	482	1957	120	175	1947
5	170	300	1957	90	200	1950
6	72	200	1957	147	250	1921
7	156	368	1957	120	325	1942
8	150	350	1957	102	175	1949

Plant #	<u>1980</u>					
	<u>Conventional</u>			<u>Co-op</u>		
	<u>Q</u>	<u>E</u>	<u>YB</u>	<u>Q</u>	<u>E</u>	<u>YB</u>
1	123	250	1959	110	235	1951
2	81	180	1959	110	200	1953
3	150	300	1959	150	375	1950
4	165	390	1957	120	175	1947
5	170	300	1957	118	225	1950
6	72	200	1957	104	250	1921
7	155	275	1957	120	325	1942
8	150	475	1957	108	175	1949

<u>1981</u>						
1	123	250	1959	110	235	1951
2	81	180	1959	110	200	1953
3	150	300	1959	150	340	1950
4	170	390	1957	120	175	1947
5	170	300	1957	100	215	1950
6	72	200	1957	104	250	1921
7	150	275	1957	120	325	1942
8	142	475	1957	108	175	1949

<u>1982</u>						
1	123	250	1959	110	235	1951
2	81	180	1959	110	200	1953
3	150	300	1959	150	305	1950
4	170	390	1957	120	175	1947
5	78	300	1957	95	215	1950
6	72	200	1957	104	250	1921
7	150	275	1957	120	325	1942
8	142	475	1957	108	175	1949