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COORDINATION OF SUPPLY AND DEMAND IN THE DAIRY MARKETING SYSTEM

— with special emphasis on the potential role of farmer cooperatives as coordinating institutions

Selostus: Kysyntä ja tarjonta maidon markkinajärjestelmässä

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SUOMEN MAATALOUSTIETEELLINEN SEURA • HELSINKI

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COORDINATION OF SUPPLY AND DEMAND IN THE DAIRY MARKETING SYSTEM

with special emphasis on the potential role of farmer cooperatives as coordinating institutions

List of abbreviations used

CAF	Cooperative Adjustment Fund.
FMMO	Federal Milk Marketing Order used in the United States.
IOF	Investor Owned Firm. A firm owned by investors as a difference for e.g. cooperative which are owned by customer-members.
M—W-price	Minnesota—Wisconsin Price for B Grade milk.
NBDG	New Product Development Group.
NFNPS	Non Fat Non Protein Solids. The solids in milk except fat and protein.
PSM	Pellervo-society's Marketing Research Institute. Pellervo-Society is the Central Organization of Farmer's Cooperatives.
SOP	Standard Operating Procedures
TRC	Transaction Cost Economics
USDA	United States Department of Agriculture
Valio	Finnish Cooperative Dairie's Association

1 INTRODUCTION

1.1 COORDINATION AS A PROBLEM OF MARKETING ECONOMICS

Marketing economics is a rather undefined field of study with differing perceptions about its contents. The term itself describes its close relation to economics. However, marketing economics is not merely a subcategory of economics.

When economics focuses its attention on production, alternative production costs and economic efficiency, the core of marketing economics is exchange and its implications on production. How are various preferences taken into account in economic activities? Whose preferences are taken into account and in what order? How is the production system able to convert the preferences into products and services offered? How are costs, benefits and risk distributed? In other words, how is supply and demand coordinated? The problems of marketing economics are mostly related to inefficiencies in the systems of exchange. A basic problem often is a poor understanding of the mechanisms in the process of exchange. Thus, understanding the system is the first step.

The system of exchange is always a mixture of society-made rules and some kind of bargaining, i.e., the market. In every so-called free market there are rules defining the difference between a good buy and theft. Even in the most strict planning economies there is some type of bargaining — if not involving money, at least mutual promises. Thus, the economics of exchange, not just marketing economics, could be a more comprehensive name for this field of study.

Like economics, micro and macro levels are found in marketing economics as well. What is meant by marketing is most often the Kotlerian-type of business marketing (KOTLER 1986). This can be defined as ''micro marketing'' which attempts to correct exchange inefficiencies to match the consumers' and producer's preferences in production. Even a field of ''micro-micro marketing'' can be found, called internal marketing (KLEMI 1985, GRÖNROOS 1987, ROPE 1988).

Macro marketing economics is interested in how an exchange system consisting of several economic units is able to convert the preferences over a number of steps. Various exchange institutions, rules of exchange, have differing capabilities to perform the exchange which affect human behavior, giving as an outcome differing distributions of costs, benefits and risk. They in turn have implications on the production circumstances. Macro marketing economics is interested in the various sets of rules for correcting exchange inefficiencies.

The tools of marketing economics draw also from other disciplines besides economics: behavioral sciences in order to understand the behavior of actors and actor groups, political sciences to understand the collectively made rules, legal science to understand the construction of rules, humanistic sciences to understand the cultures, values and preferences involved, etc. Thus, marketing economics is a multi-disciplinary science.

This study belongs to the category of ''macro marketing economics». It attempts to understand the process of converting the preferences of various actors into products and services desired in food production. The empirical environment is the dairy subsector.

1.2 WHAT DO WE MEAN BY COORDINATION?

1.2.1 Exchange economy and transactions

If a person owns something that another person needs more or something he owns, the former person needs less, shifting the ownership of these two items can be said to benefit both. This is a basic example of exchange.

The development of exchange has been perhaps one of the main issues affecting the development of human culture. Instead of making all the needed commodities themselves, exchanging them allowed individuals to specialize. Exchange also provided incentives for social interaction and a sense of community.

Exchange seems to be an essential requirement for the division of labor, which in turn is considered basic for prevailing human culture. SMITH (1961) begins his pathbreaking work, "The Wealth of Nations", as follows:

> "The greatest improvement in the productive powers of labor, and the greatest part of the skill, dexterity, and judgement with which it is anywhere directed, or applied, seem to have been the effects of the division of labor."

SMITH presents the famous example of pin making and concludes:

> "... ten persons, therefore, could make among them upwards of fifty-eight thousand pins in a day. Each person, therefore, making a tenth part of forty-eight thousand pins, might be considered as making four thousand eight hundred pins in a day. But if they had all wrought separately and independently, and without any of them having been educated to this peculiar business, they certainly could not each of them have made twenty, perhaps not one pin in a day ..." (SMITH 1961, pp: 8—9).

The main interest of this study is in finding possible arrangements for transferring intermediate products from one phase to the other as smoothly as possible.

Exchange seems to be closely related to ownership and a change of ownership. In juridical economics the correct term for this is "property rights".

> "Property rights describe the relationship of one person to another with respect to a resource or any line of action. ... Rights are the instrumentality by which any society controls and orders human interdependence and resolves the question who gets what. ... The term 'property right' includes both real and personal property." (SCHMID 1978, pp. 10—19)

Property rights define socially accepted rules regarding the command of particular property in the environment of human interdependence. SCHMID emphasizes that a property right to something cannot exist without the acceptance of the surrounding society. Thus, the property right is a function of social acceptance. This is important in the sense that without rules of the game defined by society, people would have to defend their property rights by fighting, as was the case before the creation of the modern juridical society. Still in some cases in which the opinions of property rights differ, the acquisition of something can mean "taking my own back" to the actor but a theft to the object.

Exchange can, thus, be defined as the shifting property rights of an item in human interchange according to rules accepted by society. In economic literature this kind of exchange is more often called a transaction.

Even when transactions take place under defined rules accepted by the parties, they may occur under different circumstances. SCHMID divides transactions according to the rights of the parties into three categories: bargained transactions, administrative transactions, and status and grant transactions.[1] In the following, each of these is briefly reviewed.

The reason for examining transactions is that transactions, the shift of property rights, occur within the rules set for the transaction, but by changing the rules, the distribution of property rights can be affected. It is a matter of public choice, which one of the transaction modes is chosen as a form of transferring the

[1] He also presents other categorizations such as managerial and rationing transactions by COMMONS (1950, ch. 3) and 1. tradition, 2. command and 3. market by HEILBRONER (1962, ch. 1).

property rights. Property rights in turn define "who gets what and who pays". Thus, by affecting transactions the performance of the system can also be affected.

1.2.2 Towards the definition of coordination

The problem of coordination

Whenever numerous actions have to be taken in order to reach an outcome, coordination between these actions is required. A rowing team needs a mate to coordinate the timing, a choir needs a director and a musical score, and a business organization needs a manager and planning. The efforts of various individuals have to be integrated and synchronized.

As the number of parties involved in transactions increases, the transactions become much more complex. Actually, the initial buyer and seller very seldom see each other for direct negotiations. The goods are often manufactured before the buying decision, and the price is set before the buyer even knows about the existence of the product.

What provides the coordination of these thousands of people working to complete their contribution perhaps years before the final outcome — the product — is consumed? How do they know what to do? How they can be sure that they are doing the right thing? Let us think about a loaf of bread. Before a consumer sees the loaf in a store, somebody has delivered it into the shop, made it, ordered the flour from somewhere, which in turn has been milled by somebody and for which somebody has grown the grain. If the investments are considered, it would be easy to find hundreds of individual decisions — some made many years — before to produce that particular loaf of bread.

How is it possible that all these individual decisions will produce a loaf of bread? How do these decision makers know about somebody's willingness to buy that particular loaf? That is the problem of (vertical) coordination of the exchange system.

All the parties involved in the decision examine the system as a part of their own, individual opportunity sets.[2]. That is why the parties have different needs and wants regarding the system. These needs can sometimes be in conflict with each other.

When all have different preferences, the rules of the system, i.e. the institutions, decide what preferences are taken into account and in what order. As a matter of fact, the particular exchange system is the means of articulating preferences. "The effectiveness of the food system as a mechanism for preference articulation is the key question about the system performance." (SHAFFER 1980)

Market and government can be understood as alternative systems of preference articulation.[3] Public discussion has many value-based arguments about the ability of either markets or government to articulate certain preferences. This discussion is often based on entirely different concepts concerning human beings.

Coordination is a special case of the problem of preference articulation. It can be defined as matching each step of the production-distribution sequence of a good with existing demand. This broadens the question of coordination also to the adjustment problems on the supply side.

MARION (1976) defines coordination as a process by which various functions of a vertical value-adding system are brought into harmony. He presents the following questions as important for the coordination process:

(1) What is produced and marketed (quantity and quality)?

[2] An opportunity set can be defined as the available lines of action open to an individual. The opportunity set of one person is shaped by the opportunities of others (SAMUELS 1972) and restricted by the resources to use the opportunities.

[3] "Government and markets are joint mechanisms for articulating preferences. Government produces the regulatory system shaping the opportunity set of firms and households. This determines what is to be taken into account by participants. The regulatory system sanctions a pattern of private power including facilitating and limiting collective action. In this sense markets deal only with solved political problems, and the market is an instrument of the regulatory system." (SHAFFER 1980)

(2) When is it produced and marketed?
(3) Where is it produced and marketed?
(4) How it is produced and marketed? (What is the efficient use of resources for completing the vertical value-adding task? Unnecessary or inefficient steps and cross-purpose work is eliminated or combined.)
(5) What adjustments and adaptations are needed to respond promptly to changes in demand, new technology, or other shifts in profit incentives?

MARION includes two dimensions into the coordination process: a synchronizing dimension and an adapting dimension. The former considers coordination in the sense of fine-tuning the system by systemizing, routinizing and stabilizing various actors' activities and relationships. The aim is for all the steps in the production-distribution sequence to fit in smoothly with each other in an efficient way. MARION says this leads towards streamlined, efficient systems to satisfy short- and intermediate-period market demands. Such systems, however, according to him, may become relatively rigid and inflexible in a longer time horizon.

MARION further states that coordination in an adaptation sense may involve quite different forces. It leads towards disrupting and remodeling an existing system so that it will be relevant in the long run. Thus, some outcomes of synchronizing decisions may be in conflict with the adapting dimension of coordination. Mechanisms that improve synchronization may stifle adaptation.

The first three points presented above refer mainly to the synchronization dimension of coordination, while the latter two refer more to the adapting dimension. MARION feels that this distinction can lead to two different parts of a continuum called coordination. He fears that concentration on fine-tuning the system so that the parts mesh smoothly together may encourage one to forget that we are also supposed to ask whether we might be able to create a new and superior system.

MARION further emphasizes the distinction between coordination as a process and the mechanisms which influence that process, and presents four categories of decisions affecting subsector coordination. He adds that besides these decisions there are factors beyond the control of subsector participants such as weather and foreign supply. The categories presented by MARION are:

(1) Incentives (economic incentives as reflected in prices, social incentives such as the relationship between the members of the system, security incentives which encourage conventional behavior, etc.)
(2) Flow of information (which affects the level of knowledge, the level of uncertainty and the communication of incentives).
(3) Adequacy of necessary inputs to be able to respond to incentives (i.e., the extent to which decisions are severely restrained).
(4) Management alertness and ability.

As coordination mechanisms MARION mentions such arrangements and institutions as markets of all kinds, private treaties, vertical ownership, bargaining associations, market orders, information systems (including grades and standards), transportation services, credit services, governmental programs, trade associations and cooperatives. Different coordination mechanisms can affect all the four aspects of decisions presented above, but in a different manner.

Levels and modes of coordination

SHAFFER and STAATZ (1985) define four levels of the coordination problem:

(1) Coordination within firms (micro-micro coordination).
(2) Coordination between individual firms (micro coordination).
(3) Coordination of total supply with total demand for commodities or industries in each step of the production-distribution process (macro coordination).
(4) Coordination of aggregate demand with aggregate supply for the economy as a whole (macro-macro coordination).

A theory of coordination must include all these levels. The problems and mechanisms of coordination are interrelated between these levels and, thus, the governance structures of all the levels should be addressed in the examination of coordination problems. The emphasis in this study is on levels 2 and 3.

Coordination and integration

Integration of separable tasks into the same organization has been one way of coping with market imperfections. The coordination of certain activities can be assumed to improve through integration. GALBRAITH (1967) states that integration has been more important in modern corporations than before, e.g., because of the increased complexity and time span of production processes.

Vertical integration is defined by SHAFFER (1986) as the coordination of technically separable activities in the vertical sequence of production and distribution of products under the control of an organization by ownership. Among incentives for vertical integration are: (1) the reduction of production costs and cost of acquiring information; (2) solutions to problems involved in transactions across markets, problems of uncertainty, impacted information, opportunism, and externalities; and (3) economies of scale in allocating lumpy inputs over a set of activities. SHAFFER also includes in the list the growth goals of management. As anvexample of economies involved in vertical integration, SCHERER (1980, p. 78) mentions the integration of blast furnaces, converters and primary reduction mills in the steel industry in order to reduce handling and reheating.

Horizontal integration involves combining within one organization a number of technically separable production-distribution systems of the same product. Incentives of horizontal integration include a potential improvement in the match of supply with demand (macro coordination), potential market power, and generally improved ability to control the environment associated with the economies of scale (SHAFFER 1980 and OLLILA 1984).

Scope integration involves combining within one organization the production-distribution of a number of products or services which are technically separable. An example of this is the Finnish conglomerate, Tampella which manufactures textiles, locomotives and lumber. Incentives for scope integration include potential for economic power, possible economies of scale, especially in selling, and reduction of the uncertainty of changing market conditions. SHAFFER[4] states that few coordination benefits are apparent from scope integration per se. However, very large conglomerate firms may have the capacity to influence the system through the exercise of political and economic power.

1.3 RESEARCH ISSUE — ALTERNATIVE INSTITUTIONAL/POLICY MEASURES TO DEAL WITH COORDINATION

1.3.1 What research can offer to deal with the problem

Probably the most common topic of political discussion has been transactions managed either through market or through administrative decisions. When demand and supply are observed, the market between them has often developed by itself. If exchange through the market has not succeeded, the most common way of improving the situation has been public involvement. If the public administrative system has not performed well, more market has again been demanded. SCHMID (1978, pp. xii—xiii) describes the situation as follows:

> "It is ironical that we seem to go in cycles on many issues of public policy. If we do not like the results in a given area and markets are being used, it is common to hear recommendations that we turn to government enterprises or regulation. If government is already involved, reformers will

[4] SHAFFER, J. 1986, Thinking about Farmers' Cooperatives, Contracts and Economic Coordination, unpublished.

> suggest that markets be tried... With respect to institutional choice, we seem to be acting in ignorance. We go through cycles of reform with great promise of new results only to find failure and some new round of reformers advocating return to where we started. ... They can choose any rule they want but they are not sure what the result will be. How many times have we watched a grouplspend their political capital, obtain a new rule, and then receive no change in performance?''

The food system has always been an especially important exchange system in all societies. The same kinds of cycles as those described by SCHMID are easily seen in all modern societies. As a result, the poor performance of markets has been ''corrected'' with regulations, and the poor performance of administrative exchange with more markets. It can be supposed that there is a lack of sufficient understanding of a sometimes very complex exchange system.

In the real world, the actors in the economic environment make decisions at different times without perfect knowledge about each others' decisions and about the development of the decision-making environment. The uncertainty that prevails at every single decision causes uncertainty of the future supply and demand of that particular commodity. This results in an uncertain allocation of resources, which in turn causes the sub-optimal coordination of supply and demand.

The uncertainty at each level of the production-distribution chain makes the problem of coordination complex and difficult. According to SHAFFER and STAATZ (1985), the failure in coordination may occur at any step in the sequence but is most obvious when not matching the ultimate consumer demand at prices consistent with cost.

A researcher can contribute to a better understanding of the system. Each person behaves according to his or her own personal opportunity set and, thus, sees only one part of the complex system. A researcher may see the system in a more holistic way, which will help to spot the most critical parts of the system when trying to change its performance. Whatever priorities are given to the system, a better understanding will help to predict the possible outcomes.

1.3.2 A new way of economic analysis is needed

During the past 40 years, economic analysis has been mainly based on the neoclassical tradition. However, alternative views have continuously been presented.

Along with the steady growth of the economy and with the help of the development of mathematical methods and computer technology, it became possible to formalize comprehensive models to explain economic events with great accuracy. As the complexity of models increased, some economists started to question the basic assumptions of the neoclassical economic model. In the opinion of the heterogenous group of so-called institutional economists, traditional economics searched for accurate answers but sometimes not to the most relevant questions. In their view there were many problem areas where no relevant questions even existed, yet.

This study makes no attempt to deny the relevancy and operationality of traditional economic research based on the neoclassical model, but accepts its limitations in questions such as the appraisal of the multigoal performance of the Finnish dairy subsector.

The theory of X-efficiency presented by LIEBENSTEIN (1979) criticizes the basic assumptions of neoclassical economic models such as the maximizing behavior of economic actors including implicit assumptions of complete information and purely rational behavior. LIEBENSTEIN states that in an environment of uncertainty, the continuous maximizing behavior of all the actors involved is unrealistic. It can always be stated that the actors maximize some underlying factors in their behavior. LIEBENSTEIN states that in an operational sense this kind of maximizing behavior does not tell anything else than that people behave like they do. He concludes that the en-

tire concept of efficiency should be supplemented by the concept of X-efficiency, which differs from the former in the following features:

- The cost of a commodity is not independent of the price of the commodity.
- Firms[5] do not minimize costs except in extreme circumstances.
- The cost of production has a tendency to rise toward the price level.
- There is no production function independent of the environment of the firm and the history of the firm.

In most of the studies examining industrial subsectors, efficiency has been taken as a given measure of the performance of the system. Researchers interested in relations among groups of firms adopted a much wider view of performance including aspects such as equity, progressiveness and full employment in addition to technical and allocative efficiency.[6] What may also have relevance in the problem considered in this research is pricing efficiency.

Neoclassical theory had basically two models of interaction: the perfectly competitive market and, to some extent, the monopoly market. Many economists started to develop the oligopolistic theory, because they observed most of the real-world economic interaction to be closest to oligopoly. Among these is the socalled Industrial Organization School,[7] which sees as a basic problem of neoclassical economics the concept of the human being and the difficulties to fit it in with the models in a world of uncertainty.

Some neoclassical economists argue that the criticized questions have already been answered by extensions of neoclassical economics. A counter argument could be that if the complexity of a theory grows more rapidly than its explanatory power, would this not be the right moment to return to basics again? There is an increasing number of economists who doubt the possibilities to model human behavior mathematically. One of the strongest arguments has been given by BOULDING (1981, p. 794) as follows:

> "The social sciences of the twentieth century have been captured by essentially seventeenth-century mathematics, with a little dash of nineteenth-century probability and statistics, much of which is quite inappropriate to the type of real world which is being investigated."

PEACH and WEBB (1983) made an experiment comparing theory-based econometric models with others having independent variables chosen at random. Their conclusion was that "... a large proportion of models generated randomly are indistinguishable from models based on accepted theoretical frameworks and estimated by respected investigators if the usual tests of goodness of fit and statistical significance are the only criteria used." The experiment shows the real trap of using this kind of methodology without having a clear understanding of the underlying assumptions.

The meaning of human behavior in the theories can be considered an initial foundation of criticism of neoclassical economics. Although some economists refer to "human nature as we know it" (KNIGHT 1965, p. 270), it plays a rather insignificant role in their analysis. FRIEDMAN (1953) has considered the realistic assumptions of a theory unimportant but rather sees the fruitfulness of a theory turning on its implications.

The central starting point of institutional economic analysis is, then, to include the human being into economic behavior as well as we know it, although this causes many difficulties in theory construction. "Modern institutional economics should study man as he is, acting with the constraints imposed by real institutions. Modern institutional economics is economics as it ought to be." (COASE 1984)

[5] In this study, the terms "firm", "organization", "bureaucracy" and "hierarchy" will be used somewhat interchangeably.

[6] Various categories of performance dimensions have been provided, e.g., by SOSNICK (1964), BAIN (1968) and SCHERER (1980).

[7] See BAIN (1968), SCHERER (1980), MARION et al. (1986).

1.3.3 Price and institutions in economic analysis[8]

Economic behavior depends on the incentive structure (opportunity set) of human beings and organizations, which consists of individuals with interconnecting rules. Among the fundamental elements of economic behavior, after the basic needs of human beings, are the available technology affecting the input/output -ratio, and the values and ideologies affecting what is desirable, preferable and acceptable.

In order to alter the economic performance in prevailing technological and ideological conditions, two issues can be modified. We can change the price structure, and we can change the rules. The neoclassical economic theory focuses on prices, keeping the existing rules — institutions — constant. Institutional economics attempts to examine the effect of changing the rules on the performance of the system. In such an examination, it is usually appropriate to keep prices constant.

In the conditions of pure neoclassical economics, coordination is conducted by prices, i.e. markets. Prices will allocate the resources, and changes in prices will carry information about changes in circumstances. Institutional economists argue that there are no markets independent of the rules of exchange. The rules, e.g., define the difference between a good buy and fraud. As a matter of fact, there are notable differences in these matters in different cultures.

When a neoclassical economist makes an analysis of how price changes affect performance, the institutional economist considers possible changes in performance when rules are changed. When both affect the performance of the economic system, the two approaches have to be considered as complementary, not exclusive perspectives. Neoclassical economists have also started to emphasize the role of institutions. The well-known agricultural economist, professor Glenn JOHNSON (1988), writes:

> "The agricultural institutions in the Developed Countries, Newly Developed Countries and Less Developed Countries are in such an array that institutional deficiencies impose more important constraints on agricultural production and adjustment than lack of available technologies and biological and physical resources."

The still rather heterogenous group of theories of institutional economics has many roots. The origin of the so-called "old institutional economics" is rooted in the work of COMMONS (1934) and even in the so-called German School. Transaction cost economics, as one intersection of this root, owes a great deal to the work of COASE (1937). The school of old institutional economics examines the effect of different deviations of property rights on what is counted as costs. E.g., the production cost of pigs vary depending on whether any damage caused by the operation to a close-flowing river is included or excluded as a cost for the operator. The literature of old institutional economics examines the allocation of property rights defining what costs are taken into account in an efficient market solution. As a result, many efficient solutions are possible, and the society has to decide which one is preferable.

Another root of institutional economics is known as "new institutional economics". This group of work has been influenced by the works of HAYAMI and RUTTAN (1988), WILLIAMSON,[9] and so-called agency theorists such as FAMA (1983), JENSEN and MECKLING (1974). This body of literature argues that institutions arise along with the economic process of allocating scarce resources to meet human preferences.

WILLIAMSON explains the rise of institutions as a function of transaction costs. HAYAMI &

[8] Before going on, two concepts have to be defined: "Transaction" is the shift of the property rights of a resource for another party. It includes both exchanges and contracts. "Institution" is the set of rules under which a transaction occurs. Institutions include laws, operating procedures, habits and cultural traditions associated with transactions.

[9] The work of Williamson is presented in detail in the following chapters.

RUTTAN explain the changes in instituntions and technology as endogenous to the system. This means that a certain situation is likely to induce a certain kind of a change. Using their "theory of induced institutional innovations", explanations can be found, e.g., for the rise of the paper machine industry, paper processing computer programming and state-of-the-art ice breaker industry in Finland.

The agency theory, in turn, understands an institution as a nexus of contracts made by the participants (agents), each having varying objectives for participating in the system. Among other things, the agency theory looks for stable coalitions as solutions to cooperation problems.

As "new institutional economists" understand it, institutions minimize transaction costs in a similar way as technology attempts to minimize production costs. The connection between institutions and economic performance is not a new idea. STAATZ[10] points out that the Marx had the same idea, but more on a macro level. He also defines the difference between "old" and "new" institutionalism so that new institutionalism sees institutions as parts of factors affecting economic efficiency, while old institutionalism understands efficiency as a function of existing institutions.

Among the behavioral economists coming mainly from business schools are SIMON, CYERT and MARCH. They have also influenced institutional economics by challenging the behavioral assumptions of neoclassical economics such as perfect rationality and perfect knowledge. SIMON's "bounded rationality" (1972), which creates uncertainty, and CYERT & MARCH's "Standard Operating Procedures" (1963), which aims at decreasing the transaction costs, have been important in the work towards a better understanding of the behavior of institutions in real-world circumstances. Still another group of theories called the "Industrial Organization Approach" has had an influence on the development of institutional economics. This approach is discussed in more detail in chapter 2.

Institutional economic analysis is still at an early stage of development. The results of this kind of analysis are not yet at a level of formal presentation comparable to, e.g., econometrics. There is still a gap between the concepts and their empirical application. Even at its present stage, institutional economic analysis is useful in constructing institutional arrangements in which price can then be analyzed in more traditional ways.

1.4 APPROACH AND OBJECTIVES OF THIS STUDY

1.4.1 Approach — application of transaction cost economics

As mentioned above, the problem of coordination involves both prices and rules, i.e., institutions. The approach used has to be capable of deal with both elements. The transaction cost approach seems to provide a bridge between the two elements, and is also well applicable to the problem of organizing the tasks to be coordinated.

In this study one application of transaction cost economics is used. "Transaction cost" can be defined as the cost of all the activities of gathering and processing information, negotiating contracts, administering, monitoring the exchange, and solving possible disputes. In the transaction cost approach, the total costs of production include both production and transaction costs. The institutional setting, or "governance structure", affects transaction costs to a great extent, although the costs and organizations are also interrelated.

ALCHIAN and WOODWARD (1988) present two different dimensions of transaction costs. One emphasizes the administering, directing, negotiating and monitoring of joint productive teamwork in a firm. The other emphasizes the quality of performance of contractual agreements. Where these costs are high, mar-

[10] STAATZ's presentation on "New Agricultural Economics" at the Scientific Agricultural Society of Finland on April 14. 1988.

ket transactions tend to be replaced by internal transactions. Thus, there have to be costs involved in the reliance on markets as well; these are transaction costs.

The characteristics and circumstances of transactions affect the transaction costs. When different institutions have different properties in respect of transaction costs, some will be more suitable for certain kinds of transactions.

1.4.2 Objectives

This study attempts to deal with the problem of coordination in real-world conditions. In a marketing system such as the Finnish multi-goal dairy subsector, coordination cannot simply be considered as a profit maximization problem. The paradigm to be developed has to take into account factors such as political processes, non-market values, etc.

The objective is to develop a tool to help to interpret the problem of coordination, to help to structure the relevant questions to be examined, and to look for evidence to support the conclusions. An attempt will be made to apply the transaction cost approach to the following:

(1) To explain the current structure:
The transaction cost approach argues that the prevailing organizations are not accidentally born, but are an outcome of minimizing the transaction costs. By using this framework, an attempt will me made to explain the current dairy marketing system in Finland.

(2) To suggest hypotheses regarding adjustment processes and constraints to improved coordination:
After understanding the current organization of the dairy marketing system, reasons for coordination problems in transactions will be examined. The most important bottlenecks for each coordination problem will be identified.

(3) To make suggestions for institutional redesign:
After identifying the most significant bottlenecks hindering improved coordination, suggestions for correcting the problem will be made. The ability of the market, of regulative policies and/or of cooperatives to solve each problem will be appraised using the theory developed in this study.

1.5 PLAN OF DISSERTATION

The emphasis in this study is on finding a method capable of dealing with the problem of coordination at macro level. Empirical evidence will be drawn from the dairy subsector, which is among the most difficult agricultural subsectors from the point of view of coordination in most Western countries. The problems of surplus production, component balancing, seasonal variation and adjustment to new consumer demands are causing problems in many countries, not least in Finland. The aim is to come up with evidence supporting the conclusions suggested by the theory.

The study of the dairy marketing system in Finland will be mainly concerned with the cooperative dairy industry, which covers a major part of the processing industry. The dairy producer cooperatives are organized into the Finnish Cooperative Dairies' Association called Valio, which is often taken to represent the entire industry.

This report is divided into eight chapters. Chapter 2 presents the application of the theory in analyzing the problem in question. In chapter 3 the framework is developed by making additions to the theory. Chapter 4 examines the properties of the Finnish dairy subsector as proposed by the framework. Chapters 5 and 6 examine each of the main coordination problems in the Finnish dairy subsector and give suggestions for how to improve coordination with respect to these problems. The effect of the suggestions will not be empirically identified. In chapter 7, the dairy marketing systems in Finland and in Michigan, USA, are compared. Conclusions as well as future research needs are presented in chapter 8.

2 APPLICATION OF THE TRANSACTION COST APPROACH TO ANALYZING ECONOMIC COORDINATION

2.1 BASIC SETTING

One of the objectives of economics is to coordinate between what is in demand and what can be supplied. Scarce resources prevailing, the demanded goods have to be placed into an order of preference.

Different parties have different demands and wishes from an institution, which will here be called "preferences". Preferences combined by the income constraint make up the demand. The problem of coordination boils down to two important questions: (1) how preferences are articulated to the (marketing) system[1] and (2) how the system is capable of reacting to preferences. Thus, coordination is a way of converting preferences so that they get counted by the system.

In this chapter, ways of articulating preferences with regard to their effect on the system will first be examined[2] The properties of transactions able to react to the preferences will be considered next, using transaction cost economics. To be able to apply transaction cost economics to the research problem under consideration, additions to the basic theory will be made in Chapter 3.

[1] The term "marketing system" is used in this study inter changeably with "exchange system", including also other institutions than just the market.

[2] In traditional economic theory, prices and their changes were considered as sufficient means of articulating preferences. Adam SMITHS's "invisible hand" took care of both preference articulation and economic coordination.

2.2 MODES OF PREFERENCE ARTICULATION

2.2.1 Voice and exit

When examining the process of recuperation (to be able to better coordinate supply and demand), HIRSCHMAN (1970) presents the concept of two alternative ways of articulating preferences: "exit" and "voice". Exit refers to the typical market behavior of a buyer choosing one good but not choosing another. If the buyer chooses a competitor's product, the manufacturer should get information about the relative dissonance[3] between his product and the buyer's preference. This information should, after a certain threshold, facilitate recuperation. "Voice" refers to behavior in which the buyer (citizen, administrator, etc.) seeks to bring about favorable changes in the goods offered by expressing his/her opinion to the servicing organization. According to HIRSCHMAN, voice — although it is usually more costly — provides more comprehensive information about preferences than exit.

Voice and exit affect the recuperation process in a different way. Changes will always be more or less resisted. HIRSCHMAN discusses the "management reaction function" as the threshold amount of information and pressure to alert the management of the need for readjustment. Voice may be richer in information but the representativeness of the voiced dissatisfaction cannot be determined and its opportunistic use may always be suspected. Exit provides "exact" information about real behavior but does not tell anything about pos-

[3] Relative dissonance refers to the best available good, not necessarily the best good.

sible alternative behavior outside the existing opportunity set.

It is not uncommon in the practical business world that parties within a firm have differing opinions, e.g., about the causes of a decline in business. There is uncertainty about the real and, perhaps, varying reasons for exit, and it is easy to find causes for decline in circumstances outside the firm's own organization[4] It is not unusual, either, that the management tries to interpret the criticism as the unrepresentative voice of an embittered minority.

Exit requires alternatives to choose from. If alternative product varieties do not exist, voice is the only possible way to influence matters.

HIRSCHMAN (1970, p. 34) states that "voice is in a much more commanding position in less developed countries where one simply cannot choose between as many commodities, nor between as many varieties of the same good ...". In advanced food systems where alternatives are many and the food items are developed and far processed, the use of the voice option as the only means of influence would not be appropriate because it could hardly be based on sufficient, specialized information.

Contrary to the view of traditional economics, HIRSCHMAN does not necessarily consider perfect competition (exit option only possible) as the best or monopoly as the worst market structure in respect of recuperation. The signals of exit in perfect competition may be too weak compared to the management reaction function, and corrective action may start too late and take too long, causing bankruptcy instead of recuperation. It may also happen that no one is able to move away from perfect competition although realizing an alternative and better way to respond to preferences.

[4] In a community development project conducted by the Helsinki Research Institute for Business Economics it was clearly demonstrated in interviews between the entrepreneurs and the author of this study that the entrepreneurs were very eager to find the reason for poor economic performance from outside the firm: bankers unwilling to give out loans, taxation officials, buyers unable to understand their product's superiority, etc.

The exit option in a monopoly situation may cause the most mobile, unsatisfied customers to exit and so decrease the pressure on the management for recuperation. HIRSCHMAN takes an example from the Nigerian railroads where unsatisfied customers, tired of complaining, shifted to the use of trucks, taking the pressure for recuperation off from the railroad management. One of HIRSCH4MAN's discoveries is that different customers exit when the price increases than when the quality of the services decreases. The problem of monopolies is not a problem of price increase but of inability to keep costs down (see LIEBENSTEIN 1979). Thus, a lazy monopolist is not necessarily worried if the most quality-conscious customers exit. In Finland, firms in monopoly-like positions such as the postal service, railroads, many branches of the food system, etc., may not insist on keeping their most quality-conscious customers (demanding fast and reliable postal or railroad service, or luxury foods) by price discrimination and quality services, but rather let them exit. "The best of all monopoly profits is a quiet life." (HICKS cited by HIRSCHMAN 1970, p. 55)

Exit without voice may be capable of coordinating alternatives in a closed system. But when preferences would best be satisfied by a good outside the available alternatives, some kind of voice is always needed to get these preferences articulated to the system. Voice, in turn, may not be effective if exit cannot be used as a threat to get the desired changes counted. If the threat of exit is not possible, the management may, e.g., choose to deal with angry customers or workers rather than change their own behavior.

2.2.2 Cooperatives with respect to preference articulation

HIRSCHMAN considers the combination of voice and exit as the best situation in respect of recuperation. Almost all organizations have these two options available in principle, though not necessarily at equal transaction costs. It is possible to exit from a society either

by moving into another country or by becoming alienated from existing society. It is also possible to use voice in a well-functioning market, but usually the incentive to influence it — once the transaction has occurred — is weak. There is a possibility for social traps (PLATT 1973) if the actor considers it too costly for him to use voice if others are not using it, or considers it not worthwhile after the transaction has been made.

There are many different mechanisms combining voice and exit. Several business firms use customer committees to improve the voice option. Bureaucracies are shortening re-election periods to induce exit. Although there are many kinds of contracting forms combining voice and exit, the cooperative is the only organizational form where both options are organized into the same institution and have an equal status in principle. In a cooperative it should be possible to use either voice (political option) or exit (market option) to affect the recuperation (readjustment) of the institution.

SCHMID[5] defines voice as a means of persuasion without the property rights to do so. Asking for charity or for the supporting opinions of people with prestige when not able to use voice oneself are examples of this. If voice is understood as a way of influencing without property rights, it is not effective without the threat of exit or without the existence of sympathy. Presumably HIRSCHMAN's firm has no conflicts of interests.

SCHMID writes: "It is sometimes said that a co-op member is more likely to use voice in telling the co-op manager what is wrong rather than simply exiting. But, if it were only voice, the member could bring no cost to bear on the manager except scorn. ... Where the owner of the opportunity has objectives conflicting with the voiced request, the voice is likely to be rejected." (SCHMID 1988)

Cooperative members have the property right to use voice. SKÅR (1981, pp. 74—75) states that, in principle, an individual has only three alternative ways to influence decisions. They are political, professional and cooperative alternatives. Despite the observation that the cooperative alternative is the shortest and the political the longest way of influence, he shows that the cooperative is the single institution in which an individual (member) has both influence and contract (voice and exit) inbuilt into the system.

HIRSCHMAN (1970, p. 54) states that the recuperation mechanism may rely too much on exit at the lower end of the quality scale, but suffer from a deficiency of exit at the upper end. This may appear contrary to OLSON's (1965) view that numerous "small" members in a group may utilize a few "large" members. Also KUHN (1974) states that large "quality-conscious" members of a cooperative have a much more powerful possibility to threaten with exit than small members who do not have as many alternatives for exit than large ones. This suggests that the commodity of a cooperative which members respond to is the possibility to get the advantages of large members even though the member is small.

In conclusion, cooperatives having both voice and exit inbuilt into the system should be more effective in preference articulation (and recuperation) than either one of the extremes, the purely political organization or the pure market system.

2.3 PROPERTIES OF TRANSACTIONS IN ECONOMIC COORDINATION

2.3.1 Behavioral assumptions

The most simple traditional economic models assume that actors behave rationally, having perfect knowledge and an unlimited capacity to process information, and that they seek self-interest honestly. The basic difference that has led to transaction cost economics is a different kind of conception of human behavior. WILLIAMSON (1975) considers two basic differences important: bounded rationality instead of full rationality, and opportunistic behavior instead of full honesty.

[5] Personal discussion with A. Allan Schmid. See also SCHMID 1978.

Bounded rationality refers to human behavior that is "intendedly rational but only limitedly so" (SIMON 1961, p. xxiv). Bounded rationality stems from two sources: neurophysical limits of human beings, and language limits. The former restricts the information processing capacity, which may either be too slow or incapable of processing complex information. Language limits may come from the inability of a human being to articulate his or her experiences or intentions, from the limitations of the language itself or from differing perceptions of the symbols used. Because of language limits the sender may convey a false or incomplete message, which the receiver may understand wrong or inadequately, or fail to understand at all. Personal contacts, demonstrations, etc., are ways of avoiding language limits.

Opportunistic behavior includes strategic action towards seeking of self-interest. WILLIAMSON (1975) defines opportunistic behavior as seeking of self-interest with guile. Human beings may provide incomplete, false or misleading information, make self-disbelieved promises for the future, or break earlier promises if new opportunities make it advantageous.

Assumptions regarding bounded rationality and opportunism make analysis much more complex than the alternative of keeping to the traditional assumptions mentioned in the beginning. However, by including bounded rationality and opportunism, the differences of institutions in safeguarding against "real" human behavior come into a new light. One reason for an organization to divide work into small parts is as a safeguard against bounded rationality. Institutions are rules for expected and accepted behavior, which safeguard against opportunism and provide punishment to actors behaving against them.

2.3.2 Basic ways of arranging the marketing system

WILLIAMSON (1975) states that there are two basic ways of arranging transactions: either through the market, or through the hierarchy. By market he means the market transaction by which the property rights of a good shift from the seller to the buyer. By hierarchy WILLIAMSON means the hierarchical structure of a firm.

The coordinating mechanisms of the hierarchy (firm) and the market are different. In the market, the coordinating mechanism is the price. Hierarchy is coordinated by plans, budgets and standard operating procedures.

The question arises: Why does a firm do certain tasks itself and buy others? Or, as COASE (1937) already put it: "Why do we have firms?" The question is illustrated in Figure 2-1, where the production of good "*" involves the tasks represented by dots.

In Figure 2-1, the sequential and parallel tasks to be conducted to obtain the product * can be seen. Circles A, B and C illustrate firms which conduct tasks inside the circle. The questions are: (1) Why is the border (market) between B and C exactly where it is? and (2) Why does firm A cover only those tasks inside its circle? In order to analyze this question, the properties of markets and firm (bureaucracy, hierarchy) will be examined.

Thinking about HIRSCHMAN's definitions of voice and exit presented in earlier section, the exit option for preference articulation is emphasized in markets and the voice option in hierarchies. Exit used in hierarchies prevents the use of voice.

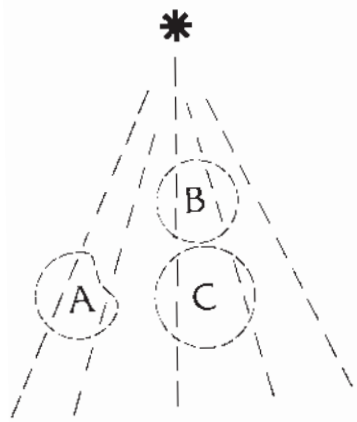


Figure 2-1: The tasks and organization of product "*"

2.3.3 The market as a coordination mechanism

The market can be defined as the point where information about willingness to buy and willingness to sell meet. Thus, information is crucial for the market. Another factor is the property right regarding the good or service to be exchanged. Under prevailing values, nothing can be sold that is not in the seller's control. Even the so-called "free market" is based on current values[6] and cultures and, thus, a value-free market cannot exist.

The availability to all of information about the supply and demand situation and the freedom for anyone to make a bid, leads to competition, which in turn acts as an incentive for efficiency and for a willingness to fulfill the buyers' preferences. The incentive structure for individuals to act in the same direction with the entire system allows a decentralization of information, which in turn leads to a situation in which decisions are made in the same environment as the outcomes of the decisions occur. (VESIKANSA 1976, p. 45)

Within the framework of classical economics, the problem of coordination should be solved by price fluctuations. Price, which is a unified measure for the different goods and services marketed, should coordinate, not just the behavior of the buyer and seller, but also the behavior of the derived supply and demand. Price should carry all the information needed for the "optimal allocation" of resources.

LIPSEY (1972, pp. 62—63) summarizes the reallocation of resources through the market mechanism as follows:

(1) A change in consumers' tastes causes a change in purchases which causes a shortage or a surplus to appear. This in turn causes market prices to rise in the case of a shortage and to fall in the case of a surplus.
(2) Variations in market price affect the profitability of producing goods, the profitability varying in direct proportion with price. Producers will shift their production away from less profitable lines and into more profitable ones.
(3) The attempt to change the pattern of production will cause variations in the demand for production factors. Factors especially suited for the production of commodities for which demand is increasing, will themselves be in heavy demand, so that their own prices will rise.
(4) Thus, a change in consumers' tastes sets off a series of market changes which cause a re-allocation of resources in the required direction and which, in the process, cause changes in the shares of total national income allocated to various production factors.

The above requires, naturally, that price is the only motivation for supply and that the benefits of the product and the buyers' happiness can be measured in monetary terms or are systematically related to the monetary system.

In the 1930's, some additions were made to the framework of classical economics, e.g., the concept of marginal costs and revenues.[7] The profit-maximizing output for production is, thus, the point where marginal cost equals marginal revenues. The utility-maximizing input for a consumer (HICKS 1941) is defined as the point where the utility received with marginal spending is the same regardless of the object of spending. In the case of many buyers and sellers, this would be the point at which supply and demand would be in equilibrium.

If the situation were to change, e.g., because of a change in consumer preferences, the prices of new, preferred goods would rise, which in turn would initiate an increase in the production of the preferred goods. Competition prevents prices from rising, except temporarily, above the true production costs.

Thus, the market system of neoclassical economics will coordinate itself in a self-regulating manner. Almost the only threat is a sit-

[6] REINIKAINEN (1980, Ch:I/6—8) presents an interesting list of the properties of values on the market.

[7] Originally this was presented already in the 1870's by Alfred MARSHALL.

uation in which the number of either buyers or sellers decreases to the extent that the intensity of competition declines and either party starts to obtain monopoly profits.

> "A free-market society gives sovereignty to two groups, producers and consumers, and the decisions of both groups affect the allocation of resources." (LIPSEY 1972, p. 64)

In order to obtain sovereignty, these groups must have the property right to the decisions they make: producers to production capital, and consumers to the goods and services they choose.

WILLIAMSON (1985) states that the efficiency of the market as an exchange (transaction) institution comes from its ability to provide "high-powered" incentives to coordinate supply and demand. Compared to "low-powered" incentives, market incentives have a much closer connection to the economic performance of the parties involved.

SHAFFER sees the market and the government as alternative, although inseparable, means of articulating preferences. He states:

> "The genius of the market as a social institution is that it provides a mechanism for collecting and summarizing an enormous quantity of idiosyncratic information about the environment and preferences in an easily understood form (prices), which at the same time carries incentives to produce and conserve to the participants of the system." (SHAFFER 1980, p. 315)

Thus, the monetary system is able to unify otherwise incomparable information about preferences and alternative means to satisfy them, even in the long term.

As mentioned before, the entire question of coordination and the market's superiority in conducting it is rather irrelevant in the neoclassical economics framework, because the market itself is assumed to take care of coordination. Under the assumption of the rational profit-maximizing behavior of economic agents, the problem of coordination is reduced to that of resource allocation.

An interesting question in neoclassical economic analysis, when examining coordination, is the problem of transfer pricing, i.e., placing a market in a sense inside the firm. Transfer prices are the values at which goods are transferred within divisions of the same firm. Viewing a firm as one profit center and hierarchy, the goods transferred inside the firm seem to be irrelevantly moved "from one pocket into another". This question is briefly examined in Exhibit 1.

> "... the problem of distribution in a free market reduces to the question of the determinants of the demand and supply of factors of production. There is then the problem of the determining the effect of the various departures from a free market caused by monopolistic organizations, government action, unions, etc." (LIPSEY 1972, p. 329)

Neoclassical economic analysis in a competitive market seems to favor market coordination on every occasion. Mismatch in coordination is explained by the departure from the pure market. Thus, the analysis does not seem to contribute very much if problems in coordination are seen as independent of the rate of competition. The limits of reliance solely on market coordination are examined in the following.

2.3.4 Reliance solely on markets as a coordination mechanism

Sources of market failures

There is a vast amount of literature about situations in which the market does not perform in a manner it is supposed to. The failures of neoclassical markets can be categorized as being caused by: (1) the actor, (2) the information, (3) the good or service to be exchanged, (4) the production of the good, and (5) the market environment.

In the neoclassical market model, as mentioned above, the actors are supposed to behave rationally and seek maximal utility honestly. Everybody has power in proportion to his/her purchasing power. Rationality is a proposition of logical behavior, which means behavior according to a rule known by the observer. Without this, rational behavior cannot

be defined. According to WINCH (1979, pp. 99—101) "... it is not sensible to judge a not-logical behavior as either logical or illogical as well as it is not sensible to say that a state outside the concept is either little or large." LIEBENSTEIN (1979) states that it is not to be expected that all the actors maximize something all the time. Also GALBRAITH (1967) questions whether the profits of a firm are maximized in a way that an increase is no more possible. Power, i.e., the ability of an actor to affect the behavior of another, cannot be equal because of differing information as discussed later. The neoclassical model also assumes that the actors do not learn, but that they behave in a similar way in a similar situation ("loyalty", HIRSCHMAN 1970 and SCINNER 1969). The model does not allow actors to make mistakes, either.

According to the neoclassical market model, information is obtainable at no cost, understandable to all and instantly computable. This assumption ignores the limitations and differing capacity of the human brain to compute information, as well as the problem of language. BARTLETT (1982) has examined the effect of partial and selective information on behavior. The neoclassical model further assumes that the information is costless, which in turn leads to costless transactions. Even a well-functioning market provides information only about the existing environment, not, e.g., about preferences outside the range of the prevailing supply structure.

Property rights define who is entitled to participate in the bargaining process. The property rights regarding the information or resources to be exchanged have a direct effect on the representativeness of the preferences and alternatives among which to choose from in the market.

Goods may also have properties that cause market failures. Public and "joint-impact" goods have high exclusion costs causing market failures in the form of free or unwilling riders. "Free riders" are persons who benefit from others' actions, e.g., from scale economies, without the related contribution to achieve the benefit. The problem of unwilling riders is common in making collective rules, since some members of the group may receive costs they feel no willingness to pay. SCHMID (1978) examines goods whose cost to the marginal user is negligible, causing problems in defining the profit maximizing point. The external effects of other goods may also cause market failures.

The production process may require assets which cannot be converted for other kinds of production without cost at given time. The immobility of assets as a function of past decisions causes opportunity costs, which, in turn, may cause a market failure. The market environment may also be uncertain and have externalities causing undesired and unexpected interdependencies.

The fundamental transformation

All economists acknowledge the influence of a large number of bidders in preventing collusion in bidding. "Small numbers" are a sign of having to watch out for a collusion and monopolistic features in the market. According to WILLIAMSON (1985, p. 61) "transaction cost economics fully accepts this description of ex ante bidding competition but insists that the study of contracting be extended to include ex post features." (Figure 2-2)

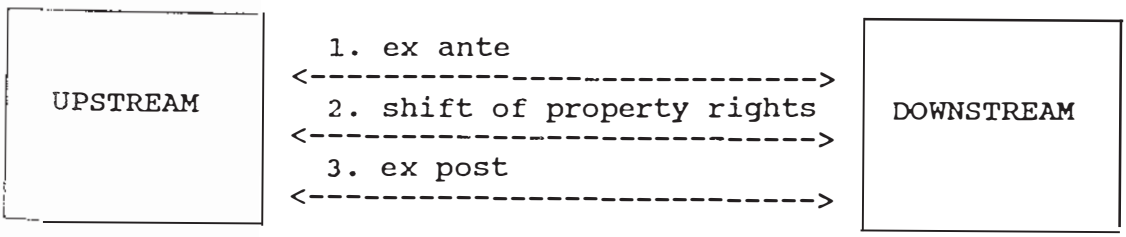


Figure 2-2: The phases of a transaction.

WILLIAMSON states that a large number of bidders does not necessarily guarantee that large-number bidding conditions will prevail after the transaction. If asset-specific investments are made during the contract execution time, the competitive bidding conditions can be affected. In the next bidding competition, the winner of the former bid enjoys an advantage over the non-winners because of transaction-specific investments. Thus, there is a tendency that ex ante competitive conditions will develop into a bilateral monopoly. WILLIAMSON calls this "the fundamental transformation".

There are other features supporting this kind of development. The development of standard operating procedures (SOP's) and transaction-specific terminology strengthened by the personal knowledge of the parties in transacting organizations probably supports development into idiosyncratic exchange conditions.

Idiosyncratic exchange relations can effectively prevent parties from behaving opportunistically. This can be considered an advantage in a situation where transaction-specific assets are substantially involved. But in standard transactions of a recurrent kind, where large numbers of bidders keep the market self-controlling, the development of idiosyncracy can be serious for the market performance (WILLIAMSON 1979, p. 241). HANSMANN (1986, pp. 8—9) states that the ownership of a firm by patrons reduces the incentives for opportunism in such a situation.

2.3.5 Bureaucracies as coordination mechanisms

Properties of bureaucracies as coordination institutions

A bureaucracy is an institution in which tasks are divided and allocated to several individuals in an organized manner. A bureaucracy allows specialization coordinated by planning, which in turn decreases the uncertainty of its functioning.

Bureaucracies can be found both in private and in publicly-owned organizations. Along with the increase of complex, long-term tasks, the need for operations requiring the coordinated effort of several specialists is growing (GALBRAITH 1967).

The tools of governmental coordination are preference articulation through political processes and the implementation of these through central planning according to the order of preferences collectively agreed upon. This kind of coordination requires delegated authority. Thus, someone has to know, to a certain extent, what the "right" order of preferences is at the given time. If the variation of preferences is high and changes rapidly, knowledge about the preferences can be very limited. Besides, the value of a good is often different to different individuals.

There is reason to argue that as a coordinating institution, "the market is a marvel", as some have expressed their fascination. However, very often it has become necessary to "correct" the functioning of the market by supplementing institutions such as governmental regulations (antitrust rules, etc.), long-run contracting, parastatals, etc.

In the mixed coordination system with both market and governmental planning, the supporters of the market claim that the reason for inadequate performance is the lack of freedom of the market to work, while the supporters of central planning blame the lack of central discipline in implementing the plans.

Limits of bureaucracies

Most of the features presented above support integration in transactions. It was found that by shifting the transactions from the market into the hierarchy, the effects of both bounded rationality and opportunism could be reduced in transactions involving transaction-specific investments. Why is it that two firms which merge and thus are able to exploit more fully the economies of scale without increasing uncertainty — rather on the contrary — and place decisions selectively on the most appropriate decision-making level, do not grow forever? There is reason to ask the ques-

tion posed by WILLIAMSON (1985, p. 131): "Why can't a large firm do everything that a collection of small firms can do and more?" Why don't we have just one firm to do things?

It was mentioned above that in standard transactions the cost of safeguarding against the possible hazards of market transactions was lower than the cost of internal transactions. Why is this so?

Because of bounded rationality and opportunism, a control loss may occur (WILLIAMSON 1967). The effect of bounded rationality in transmitting messages and images in hierarchical organizations is demonstrated by an experiment by BARTLETT (1932, pp. 180—181). He draws a figure describing an owl on the paper. He then asks eighteen persons to redraw one after another the image from the Figure drawn by the immediate predecessor. BARTLETT reports that the image resembled the original always less the more times it was redrawn. After 18 redrawings it ended up as a recognizable cat!

Each individual in an organization considers his own opportunity set as a framework into which he associates the incentives for behavior provided by the organization where he works. A certain competition of interests can be imagined to take place between the different behavioral incentives from the organization and its other members, and the personal incentives originating from one's home, from various reference groups and from personal needs. If the incentives to behave according to the organizational needs become weaker than other incentives perhaps reinforcing conflicting individual conduct, opportunistic behavior can weaken the performance of the entire organization. Therefore, if personal and organizational interests conflict, the incentives to individuals to behave towards organizational goals have to be stronger than the incentives to obtain individual goals.

WILLIAMSON explains the situation by dividing incentives into two categories: high-powered (marketlike) incentives and low-powered (firmlike) incentives. Marketlike incentives usually provide stronger motivation to safeguard against opportunism inside the organization than do firmlike incentives.[8] Thus, if transactions between organizations are to be safeguarded against bounded rationality and opportunism by intervention, there is a danger that the hazards shift inside the organization.

WILLIAMSON (1985, Ch. 6) provides several illustrations in examining the possibilities to maintain marketlike incentives after merging two organizations. His conclusion is that "selective intervention, whereby integration realizes adaptive gains but experiences no losses, is not possible." Therefore, the usual message after a merger, stating that the firms will continue business without other change than that the owner is different, turns out to be impossible to fulfill in practice.

WILLIAMSON presents some selected tasks to demonstrate his argument. *Asset utilization losses* occur when a former owner-manager becomes, after the merger, a manager of a formed division in the new firm. If he no longer has to bear the cost of assets, neither will he have an incentive to utilize the equipment with equivalent care or to arrange preventive maintenance. If incentives to increase the net income of the division are included in his salary, this may provide a motive to act myopically to increase short-term income at the cost of long-term performance.

Accounting contrivances are a very difficult problem in preventing marketlike incentives after a merger. Transfer prices can be manipulated (Exhibit 1). Cost determination according to pre-merger regime accounting practices is difficult to maintain. The new owner, now having the responsibility for accounting procedures, may even act opportunistically and keep two books to present differing results to different divisions of the firm. Marketlike in-

[8] It might be possible that Hirschman's argument about the quality of information between voice and exit is also relevant in examining low and high powered incentives. Firm like (low powered) incentives may be richer in information compared to market like (high powered) incentives.

centives are very difficult to maintain after a merger.

Incentives for innovations when a bilateral trading relationship is formed, are distorted as well. Although modern innovations usually require organized technical expertise, innovations are produced more effectively through marketlike incentives. "Administrative boundaries are much easier to breach than are market boundaries when demands for reason are expressed." (WILLIAMSON 1985, p. 141). If innovations, however, are born and implemented in a hierarchy, the new division in the organization founded as a result of the merger is apt to demand its "fair share" of the success. This kind of ex post weakening of incentives will degrade marketlike incentives in the future. SHAFFER (1986) mentions that economies of scale as limit the growth of organizations. He states, e.g., that a food processing plant would have to be very large to achieve the economies of scale of a steel plant to produce the raw material for tin cans.

2.3.6 Conclusions regarding basic coordination mechanisms

Instead of production, the exchange of goods — the transaction — was taken as the central focus of the production process in this analysis. While neoclassical economics examines economic behavior through the production function (firm) and the utility function (individual demand), institutional economics examines it as a governance structure with different abilities to deal with problems caused by the environment and by human behavior.

The market and the hierarchy were defined as basic ways of coordinating transactions. The market was considered a superior coordinating mechanism in the absence of bounded rationality and opportunistic behavior.

WILLIAMSON's major argument is that neither uncertainty nor small numbers (reasons for monopoly behavior and the distortion of market performance), individually or together, occasion market failure. It is rather a combination of these factors with bounded rationality on the one hand, and opportunism on the other, that gives rise to exchange difficulties.

The schematic Figure 2-3 presents WILLIAMSON's organizational failures framework. On the left-hand side are the human factors, and on the right—hand side environmental factors. The interaction of human beings with their environment takes place within a trading atmosphere, which is denoted by the bro-

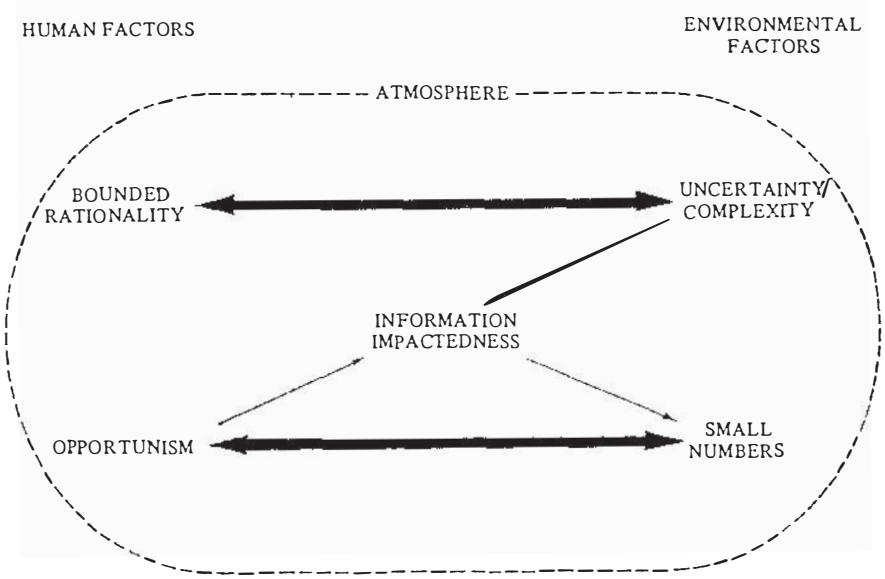


Figure 2-3: The organizational failures framework. Source: WILLIAMSON 1975, p. 40.

ken line around the human and environmental factors.

The following statements can be drawn from the framework:

(1) If the environment is not uncertain or complex, bounded rationality is not harmful for transactions. The market prevails.
(2) If there are numerous trading actors, there is no possibility for opportunistic behavior. The market prevails.
(3) In a complex, uncertain environment, opportunistic behavior can cause a situation in which the information among the parties involved in a transaction is unevenly distributed, and the bias cannot be corrected without cost. Information impactedness can occur before, during and after the transaction. There is a tendency to depart from the market.

Which of the two basic ways of coordinating the marketing system is superior to the other, depends on the nature of the transaction. Transaction cost economics, presented in the next chapter, examines the nature of transactions in order to appraise the ways of organizing them.

It may be concluded that the market is the most effective way of conducting transactions, if there are no sources of distortion. If distortions exist, moving from the market towards bureaucracies is likely. The advantages of bureaucracies include the following:

(1) When the circumstances of transactions are complex, sequential decision-making and the coordinated use of experts in a bureaucracy may economize bounded rationality significantly.
(2) Tasks guided by planning may reduce uncertainty when an organization is working towards a given goal, even despite temporary changes in the environment.

The two basic modes of transactions and coordinating mechanisms, i.e. markets and hierarchies, were discussed above. The market was considered to have superior coordinating properties in supplying information in a comparable form (prices) and in providing high-powered incentives for the optimal allocation of resources. But all this required well-functioning markets, where opportunism and bounded rationality could not significantly increase transaction costs.

Because of the uncertainty and complexity involved, it is important to coordinate separable tasks through planning. Markets — e.g. spot market prices for already produced goods — provide a poor basis for this; rather, they reflect all the mistakes in planning the production in past periods based on unrealistic expectations (SHAFFER and STAATZ 1985, p. 55).

Hierarchy has properties by which to coordinate activities through internal organization and planning. When tasks can be coordinated through positions of authority, the transaction costs of safeguarding against uncertainty and opportunism can be considerably decreased. Substituting market transactions with internal transactions reduces uncertainty in the coordination of supply and demand. According to SHAFFER and STAATZ (1985, p. 56), vertical integration facilitates the coordination of inputs in the production-distribution sequence. Horizontal integration, which involves market power, facilitates the coordination of supply and demand. Gaining market power is, thus, a means of reducing uncertainty outside an integrated organization.

Integration, in turn, causes problems in providing incentives to prevent dysfunctional pursuits. The cost of the control system, i.e. bureaucracy, is likely to grow faster than the gain from the reduction in uncertainty. A small firm, therefore, cannot do what a big firm can, and a big firm is not necessarily able to do what a small firm can. What is possible and what is not, depends on the circumstances and on the production in question.

2.3.7 Cooperatives with respect to markets and hierarchies

The cooperative is a special kind of transaction and coordination mode. The members of the cooperative, who, in principle, rule the cooperative, have a relationship with it which is close to integration, at least as a group.

Thus, the cooperative has obligations toward its members. But the obligation is not reciprocal. The cooperative usually has no authority that it can exercise over its members (RHODES 1985). This means that it is not a question of vertical integration between member firms and the cooperative. Nor is the cooperative a mode of horizontal integration — although a bargaining cooperative may be close to it. The member firms are independently owned, represent independent profit centers and act independently, except when they have agreed on the joint ownership of the cooperative's firm(s) or have negotiated agreements to act collectively (SHAFFER 1986).

The cooperative has, in a way, markets and hierarchies within the same organization. Transactions between the cooperative and its members are internalized, but the members are still allowed to make market transactions. Figure 2-4 describes this dual feature of the cooperative as a coordinating institution.

Cooperatives as transaction mechanisms have properties similar to both modes of transactions discussed above. Which one is prevailing, depends on the rules of the cooperative.

The cooperatives are organizations which have internalized transactions between a member and the organization. The members are, however, independent of each other. Thus, it is possible to reduce the transaction costs and uncertainty through the cooperative and maintain the entrepreneurial incentives through the market at the same time. According to SHAFFER and STAATZ (1985, p. 56), "the cooperative has a good deal of potential flexibility as a coordinating institution".

There are also problems involved with cooperative organizations, especially concerning micro-micro coordination. The more dominant a cooperative is in a market, the greater the scope for it to use its coordinating potential effectively. If the market is large, the cooperative is more effective if it is large as well. Large cooperatives face the same kind of bureaucratic problems as other large organizations. The potential for opportunism moves inside the organization. As operations become more complex, the impact of bounded rationality and information impactedness may shift the power to the hired managers. When the number of members increases, the heterogeneity of the members' goals also increases. In addition, the relative position of an individual member decreases. To prevent such problems from becoming even more serious than in investor-owned firms (IOF's), the rules of representation are extremely important.

Although profit maximization as a goal is

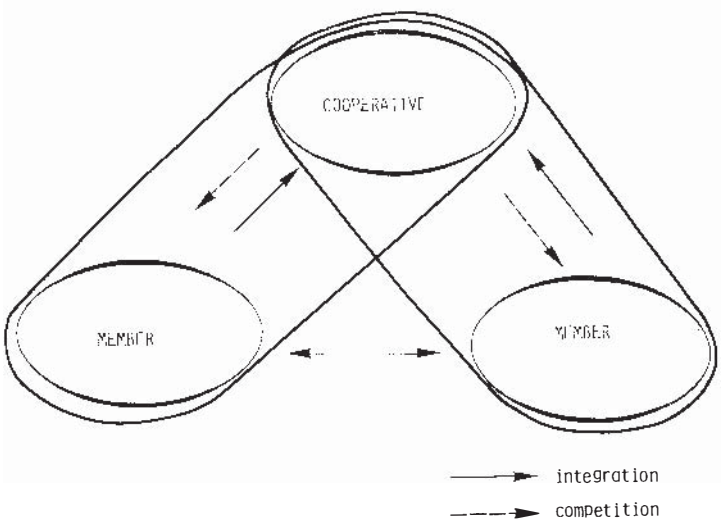


Figure 2-4: The cooperative's dual role as a coordinating institution.

much criticized (BAUMOL 1959, p. 10, LANZILOTTI 1958, p. 129, WILLIAMSON, 1964, p. 32), the performance appraisal in IOF's seems to be much more unambiguous than in cooperatives. Often the performance measures of IOF's such as profit, when used in a cooperative do not, in principle, tell anything about the performance of the cooperative. If profits are created, members can complain about deferred patronage refunds. If losses are created, they can be explained by excessive patronage refunds.

Let us think, e.g., about a dairy cooperative whose members make a collective decision to "provide home" for all the milk produced by the members. Instead of maximizing profits by restricting the intake of raw milk, the cooperative performs well by receiving all the milk, although this leads to sub-optimal economic performance (OLLILA 1986a). Dairy cooperative systems have sometimes been almost discontinued because of this kind of uncertainty caused by attempts to restrict the milk intake (Anon. 1986c).

According to HENZLER (1967), the meaning of cooperative is to "advance the welfare of its members". KUHN (1974) asks what the "advance of welfare" is. How is it measured? With welfare units? He concludes that this measure is not operational and, thus, cannot advance cooperative theory.

KUHN states that, literally taken, the purpose of a cooperative is to continuously maximize the profits of the members' economies. But the cooperative has to be an independent competitive unit as well. Therefore, according to FLEISCHMAN (1974), "the long-run increase of sales volume of the cooperative is used as a substitute measure. If during a certain year the sales volume of a cooperative is more than that of its private competitors and if the cooperative has earned profits that allow it to continue at the same rate, one can conclude that the cooperative has provided its members better service than have other firms."

If there are two firms operating in the same manner, of which the other is an IOF and the other a cooperative, the IOF has to pay interest to its (third—party) owners, while the cooperative is able to transfer it as improved services to members. Thus, if an IOF and a cooperative are operating at the same efficiency, the cooperative should be a more competitive alternative for its members.

There are no reliable and operational measures for appraising the performance of cooperatives that take into account their special features. "Research on the performance criteria from members', management's and society's points of view is perhaps one of the most important but still neglected topics in cooperative research ..." (OLLILA 1985, p. 126). This problem affects other problems that concern cooperatives, e.g., member influence, recuperation, operational efficiency, etc.

2.4 THE TRANSACTION COST APPROACH (TRC)

2.4.1 The concept of the transaction cost approach

The evaluation of modern economic organizations is much more difficult than before. WILLIAMSON (1981) states that the attempts to evaluate a "bewildering variety of market, hierarchy and mixed modes", conducted by economists, organization theorists, public policy specialists and historians, lack a coherent and merged view. This has led to the following conceptual barriers for understanding modern economic organizations:

(1) The neoclassical theory of the firm, which is the main referent to which economists appeal, is devoid of interesting hierarchical features.
(2) Organization theorists, who are specialists in the study of internal organization and unencumbered by an intellectual commitment to neoclassical economic models, have been preoccupied with hierarchy to the neglect of market modes of organization and the healthy tension that is between markets and hierarchies.
(3) Public policy analysts have maintained a deeply suspicious attitude toward

nonstandard or unfamiliar forms of economic organization.

(4) Organizational innovation has been relatively neglected by business and economic historians.

Transaction cost economics (TRC) is to be seen as an attempt to analyze the modern economic system, acknowledging the limits mentioned above. Markets and hierarchies can be understood in TRC as far ends of the continuum from the "pure" markets to various contracting forms, partnerships, joint ventures, cooperatives, etc., and finally to "pure" bureaucracy.

According to WILLIAMSON, the total cost of production consists, in addition to production costs as traditionally assumed by economists, also of transaction costs. As defined in Chapter 1, transaction costs are the costs of planning, adapting and monitoring the tasks under consideration, i.e. "costs of running the economic system" (ARROW 1969, p. 48).

Transaction costs vary in different organizational arrangements. Thus, "if transaction costs are negligible, the organization of economic activity is irrelevant, since any advantages one mode of organization appears to hold over another will simply be eliminated by costless contracting" (WILLIAMSON 1979, p. 233). Supposing that transaction costs are relevant, the total production costs can be affected through the governance of transactions.

Organizations are structured to minimize production and transaction costs. The organizational setting which is most successful in this sense prevails over other organizational arrangements.

WILLIAMSON says that in order to study transaction costs "the firm as production function needs to make way for the view of the firm as governance structure if the ramifications of internal organization are to be accurately assessed" (WILLIAMSON 1981, p. 1539). Different governance modes can be assumed to be evolved in order to minimize transaction costs. If the circumstances of transactions change, an adjustment of the transactions is required.

The importance and complexity of studying governance structures has connections to the complexity of human nature as we know it. The assumptions of human behavior, bounded rationality and opportunism have already been discussed. "Taking these two behavioral assumptions into account, the following compact statement of the problem of economic organization is suggested: assess alternative governance structures in terms of their capacities to economize on bounded rationality while simultaneously safeguarding transactions against opportunism." (Williamson 1981, p. 1546)

The two basic alternative governance modes are: to make a good oneself or to buy it from the market. The former can be called internal governance and the latter market governance. To express it in a simplified manner, if internal governance is emphasized, uncertainty is reduced but the governance cost increases. If market governance is emphasized, uncertainty increases but the governance cost decreases.

The concept of transaction cost economics presented above is not new. The basic arguments were presented by COASE (1937). Compared to most approaches having their origins in neoclassical economic theory, the use of TRC has been rare. This is partly because TRC does not fit well into the principles of neoclassical economics[9] and partly because the operationalization of transaction costs has been incomplete. These can be considered the main obstacles to testing TRC's ability to explain prevailing economic organizations.

An application of TRC can be used for two somewhat different purposes, i.e. to explain the current structure and to make predictions about an appropriate marketing system. In the former, the dimensions of transactions in describing the nature of transactions are important. In the latter, the principles of organizational design play a key role.

[9] However, it can be stated that transaction cost economics is still within the neoclassical economics framework; only the behavioral assumptions are different.

2.4.2 Dimensions of transactions

The problem of finding meaningful and comparable attributes for transactions can be considered one of the key questions in the examination of transactions in order to explain economic organizations. WILLIAMSON (1965, p. 1548) identifies three attributes of special interest in a transaction: (1) the frequency with which transactions occur, (2) the uncertainty to which transactions are subject, and (3) the degree to which transactions are supported by durable, transaction-specific investments. WILLIAMSON states that the first is the most important attribute, which most distinguishes transaction cost economics from other treatments of economic organizations, but the other two play a significant role as well.

Asset-specificity

WILLIAMSON (1971) reported "lock-in" effects caused by transaction-specific investments while examining the reasons for vertical integration. Asset-specificity refers to an investment whose value for alternative uses is significantly lower than in its intended use. Investment into specific assets is risky in a situation where the circumstances change during the duration of the investment. Thus, the investor has to evaluate whether the prospective savings in costs afforded by the special-purpose technology justify the strategic hazards that arise as a consequence of their non-salvage character (WILLIAMSON 1985, p. 54).

WILLIAMSON distinguishes four different types of asset-specificity: site-specificity, physical asset-specificity, human asset-specificity, and dedicated assets. As an example of site-specific assets can be mentioned a gas station whose resale value after the construction of a new road far away from the site of the station, is close to nothing. Physically specific assets can be illustrated by considering a special-purpose machine, say a forest tractor, in contrast to a regular tractor. Although a forest tractor may be much more efficient in its intended use, its properties are less suitable for agricultural work than a regular tractor's properties for forest work.

Human asset-specificity becomes more and more important as production becomes more complicated. Specific human assets, either special education or special knowledge through experience, are a major issue in the development of modern economic organizations (GALBRAITH 1967). It is not unusual to hear about a "locked-in" worker whose special skills are so much less valued in other firms that he has no comparable alternative employers. Asset-specificity caused by dedicated assets occurs when something has to be reserved in advance for a certain purpose and, thus, alternative "opening" purposes have to be denied. E.g., if a farmer takes broiler chickens into an "all-purpose" building, he will have to dedicate the building for at least one growing period for that purpose, despite attractive bids afterwards to rent that same building for grain storage. These kinds of transaction-specific assets are actually immobile. JOHNSON (1972) defines this as the difference between the acquisition and salvage values of the investment.

STAATZ (1985) describes a situation in which a farmer invests in specialized fruit production equipment and fruit trees to supply to a processing firm that enjoys some degree of monopoly. The assumption is that the annual rental-equivalent price of those assets (calculated with respect to their acquisition price) is 300 000 US$. It is further assumed that the variable costs to the farmer are 100 000 US$ per year. These investments were based on the processor's promise to pay 500 000 US$ per year for the fruits, yielding a 100 000 US$ profit to the farmer. It is also assumed that most of the assets can yield an annual gross revenue of 100 000 US$ in their next best alternative use. Once the farmer has invested in the special equipment, the processor may be tempted to act opportunistically and lower his price strategically in succeeding years, knowing that as long as he offers at least 200 000 US$ it will still pay the farmer to deliver fruit to him, even though his action imposes a capital loss of up to 200 000 US$ to the farmer. Although this kind of situation

cannot go on for a long time, the example has much relevance in the planning of production contracts and as an argument for collective action.

For accounting purposes, costs have traditionally been divided into fixed and variable costs. For the purposes of transaction cost economics, it is much more relevant to distinguish which assets are redeployable and which are not (KLEIN & LEFFNER 1981).

Purpose-specific assets are necessary in most present production. They can decrease certain production costs, but simultaneously increase the transaction costs. Since the initial purpose of transaction economics is to examine the sum of production and transaction costs, both have to be included in the examination. WILLIAMSON observes the situation as described in Figure 2-5.

ΔG is the difference between the cost of internal governance (bureaucracy) and that of market governance (reduction of the effects of uncertainty, etc.). When asset-specificity (k) is low, the cost of internal governance is higher than the cost of market governance (up to point $\bar{k}$). When asset-specificity increases, internal governance costs become relatively lower compared to those of market governance.

ΔC is the steady-state production cost difference between producing an item that is needed by oneself and buying the same item from the market.

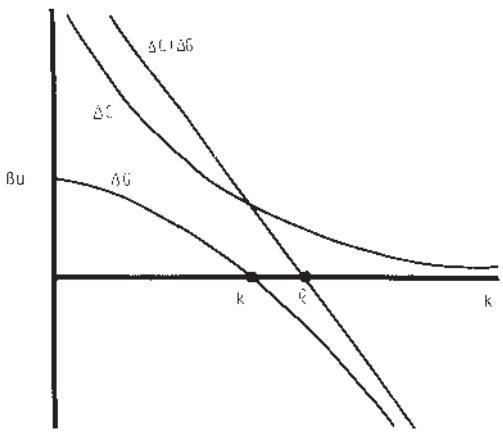


Figure 2-5: Comparative production and governance costs. Source: WILLIAMSON (1985, p. 93).

The penalty of using internal organization in standardized, low asset-specific transactions is considerable. The cost disadvantage decreases when asset-specificity increases. As k grows very much and, thus, services become highly unique, the realization of aggregation economies becomes very costly.

The optimal level of asset-specificity is the minimum difference between governance and production cost. In Figure 2-5 this vertical sum, $\Delta G + \Delta C$, is presented as well.

The crossover value of the sum $\Delta G + \Delta C$ becomes negative at point $\hat{k}$, which value exceeds $\bar{k}$. WILLIAMSON concludes from this that the economies of scale and scope, therefore, favor market organization over a wider range of asset-specificity values than would be observed if steady-state production cost economies were absent.

> "The importance of asset-specificity to transaction cost economics is difficult to exaggerate. ... Asset-specificity only takes on importance in conjunction with bounded rationality/opportunism and in the presence of uncertainty. It is nonetheless true that asset-specificity is the big locomotive to which transaction cost economics owes much of its predictive content. Absent this condition, the world of contract is vastly simplified: enter asset-specificity, and nonstandard contracting practices quickly appear. Neglect of asset-specificity is largely responsible for the monopoly preoccupation of earlier contract traditions." (WILLIAMSON 1985, p. 56)

Because some ambiguity exists between the meaning of transaction-specific assets and simply immobile assets, the term "fixed assets" will be used in this study to cover both.

Uncertainty

Uncertainty seems to have connections with bounded rationality and opportunism as well. Bounded rationality makes it difficult to prepare in advance for all the possible alternatives and consequences in the decision-making process. Instead of exact knowledge, approximations have to be made (SIMON 1972). Both

limited human "computing" capacity and language problems prevail. Opportunistic behavior can bring incomplete, distorted or intendedly wrong information into the decision-making process ("information impactedness", see Chapter 2.3.6).

Usually it is not possible to see all the actors' plans for affecting the decision-making environment. Even if they were known, the lag between the action and its possible effect could mislead from seeing the true consequences.

Transaction cost economics states that "governance structures differ in their capacities to respond effectively to disturbances" (WILLIAMSON 1985, p. 56). When asset-fixity is absent, market governance has advantageous properties to quickly respond in an adapting way to uncertainty. If the rate of asset-fixity increases, firms reduce the uncertainty about opportunism by integrating new parts of production into the same organization. The effect of bounded rationality on uncertainty is decreased by means of dividing complex tasks into small portions conducted by experts.

Uncertainty causes serious problems for neoclassical resource allocation:

> "Although equating marginal cost with marginal revenue maximizes profit, equating expected marginal cost with expected marginal revenue, when expectations are as uncertain as a random number table, will produce a random distribution of profits and random allocation of resources. Expectations regarding the economy are clearly not as uncertain as a random number table, but they are far from certain." (SHAFFER & STAATZ 1985)

The more efficiently the harmful effects of uncertainty are reduced, the better the governance structure is able to control the decision-making environment. Thus, both governmental and private organizations have an inbuilt desire to expand their control as much as possible into their environment (OLLILA 1987a). GALBRAITH (1967) considers promotion measures such as advertising as a way of decreasing uncertainty in sales. Advertising is also a means of reducing the buyer's uncertainty after a transaction. Quite often advertisements function as certain reinforce ments for already made transactions (PIISPA 1987).

Frequency

According to WILLIAMSON (1985, p. 60), Adam Smith's famous theorem stating that "the division of labor is limited by the extent of the market" can also be understood from the point of view of transaction cost economics. It can be said that specialized governance structures are more sensitively attuned to the governance needs of nonstandard transactions than are unspecialized structures, ceteris paribus. Thus, specialized structures are more beneficial in transactions supported by considerable transaction-specific assets. Think about dairy farmer devoting himself to the dairy business for at least 15 years by making the decision to build a cowshed (which is a very transaction-specific investment). There is no way he can make a production contract for 15 years. The difference in the frequency of the production periods and the contract period has made the special arrangements such as cooperatives likely to appear. Similarly, a milk producer is not apt to make a telephone round every morning to find the highest bid for his milk on that particular morning. Besides having to pay a high transaction cost, the producer is vulnerable to opportunism because the product may have no value any more in the evening or the next day, when it is spoilt.

The remaining issue is whether the volume of the market is large enough to utilize the specialized governance structure. Utilization is more easy if the transactions are of a more recurring kind. Hence, frequency is, according to WILLIAMSON, a relevant dimension.

Even in complex governance structures, standard operating procedures (CYERT & MARCH 1963) can be constructed to decrease transaction costs. The learning process may produce new ways of doing things. The Boston Consulting Group considers experience an important factor in the profitability of firms (ABELL & HAMMOND 1979).

Summary

Institutions economizing transaction costs have to safeguard the needed transaction-specific assets against opportunism and uncertainty. The frequency of a transaction is important in that it reduces the transaction costs by developing special institutions for recurrent kinds of transactions. The institutional structure of transacting organizations, their incentive system and the beliefs and values of the personnel are the outcome of past events (ROBERTS 1981) in the sense of transaction cost economizing. In Figure 2-6, the decision environment in time T is restricted by decisions made by others as well as by decisions made by oneself for the future. The further we look into the future (time T + 1), the less the restricting decisions prevail. Thus, the scope of decision freedom is smallest at time T. Uncertainty is also smallest at time T, but lags in obtaining and processing information about the current situation (information impactedness, bounded rationality) may make it difficult to reach decisions based on real facts. At time T + 1, the scope of decision freedom is larger as well as the knowledge of factors at time T affecting the decisions at T + 1. Possible changes in the environment increase the uncertainty.

Uncertainty about the future brings along risks and opportunities (MERISTÖ 1982). Transaction-specific assets may cause costs concerning both: costs of preventing the impact of threats (opportunity costs) and costs of missed opportunities. In spite of this, the transaction-specific assets necessary for specialized production and the opportunity costs have to be paid because of time lags between the decision and its execution. The scope of decision freedom is a compromise between market and hierarchy.

2.4.3 Principles of organizational design

Transaction cost economics aims at economizing the total production costs, which are assumed to be the sum of production and

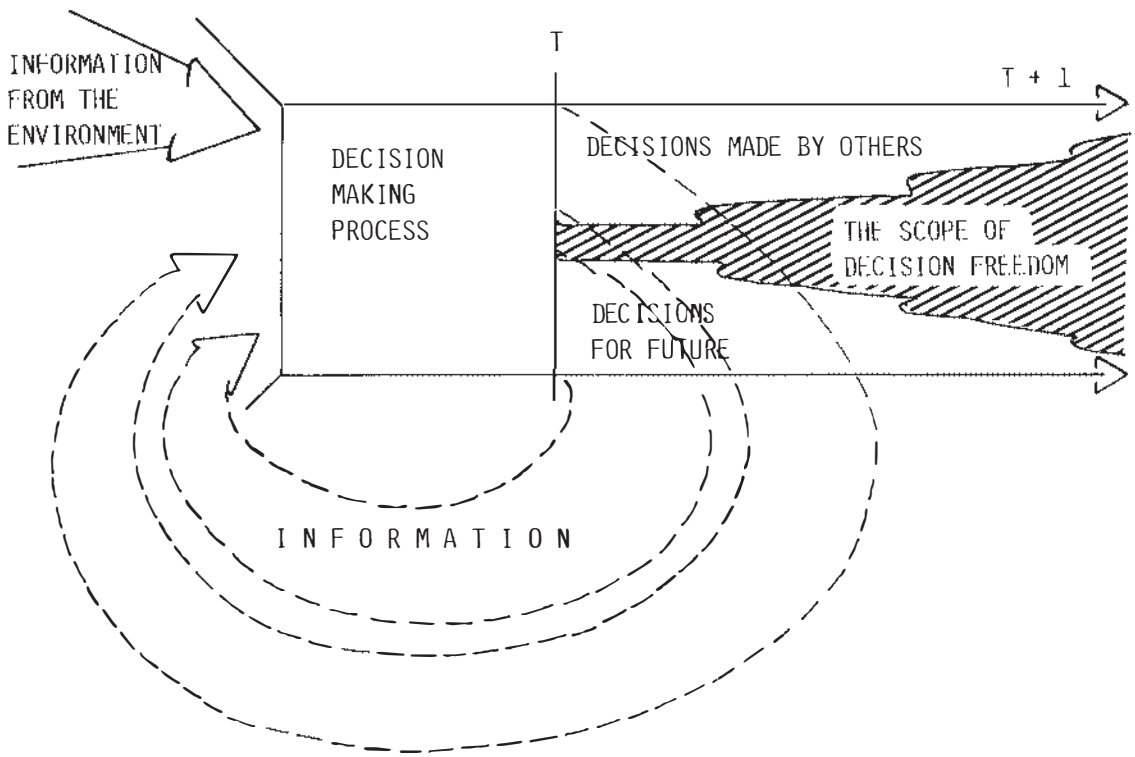


Figure 2-6: The time dimension in the decision-making process Source: OJALA 1987.

transaction costs. The governance structure is assumed to affect both.

The principles of organizational design are many-sided and complex. WILLIAMSON (1981, p. 1547) states that (1) the asset-specificity principle, (2) the externality principle and (3) the hierarchical decomposition principle reported by CHANDLER (1977) offer considerable explanatory power. Of these, only the asset-specificity principle is linked to transaction cost dimensionalizing. The first two principles are relevant in deciding whether a transaction will be made in the market or in the hierarchy. The third one is important in examining the organization within which the trans action is possibly transferred, thus recognizing that organizational form is meaningful from the point of view of transaction cost economics.

It is assumed that transactions are arranged through markets unless serious transaction cost problems occur. The market is superior in preventing bureaucratic distortions (WILLIAMSON 1975, Ch. 7), and it has advantages related to production costs as well.

> "The production cost advantages of market procurement are three: static scale economies can be more fully exhausted by buying rather than making if the firm's needs are small in relation to the market; markets can aggregate uncorrelated demands, to thereby realize risk pooling benefits; and markets may enjoy economies of scope in supplying a related set of activities, of which the firm's requirements are only one." (WILLIAMSON 1981, p. 1548)

WILLIAMSON's conclusion from the above is that transactions will be organized in markets unless transaction cost disabilities appear.

Asset-specificity principle

> "... the normal presumption that recurring transactions for technologically separable goods and services will be efficiently mediated by autonomous market contracting is progressively weakened as asset-specificity increases." (WILLIAMSON 1981, p. 1548)

As demonstrated in Figure 2-5, the relative advantage of markets decreases if assets become more transaction—specific. Investments which do not have considerable value in other purposes than that intended, can be more fully utilized if they are commanded by the initial user of the service and, thus, safeguarded against bounded rationality and opportunism.

The process of fundamental transformation (Chapter 2.3.4) in ex post competition will also support bilateral trading conditions developing into an internal transaction. The incentives for shifting a bilateral trading relation from markets into a hierarchy increase as uncertainty increases, "since the costs of harmonizing a relation among parties vary directly with the need to adjust to changing circumstances" (WILLIAMSON 1981, p. 1549). Asset-specificity is, therefore, a very relevant concept in examining the coordination problem, especially from the adapting dimension's point of view.

In special transactions without developed SOP's and trading practices, negotiating a good contract covering all the necessary features (complexity, bounded rationality) and safeguards against all kinds of hazards (opportunism) may involve such high costs that it will be cheaper for the firm to make the good itself anyway.

The advantages of internal organization according to WILLIAMSON are as follows:

- Common ownership reduces the incentives of the trading units to pursue local goals.
- Internal organization is able to invoke fiat to resolve differences, whereas costly adjudication is needed when an impasse develops between autonomous traders.
- Internal organization has easier and more complete access to the relevant information when disputes must be settled.

Externality principle

> "... the normal presumption that exchange between producers of differentiated goods and distribution stages will be efficiently mediated by autonomous contracting is progressively weakened as demand exter-

nalities increase.'' (WILLIAMSON 1981, p. 1549)

E.g., when a vegetable broker handles the produce carelessly in order to operate more quickly, this can cause unintended quality deterioration of the produce, which is not observed until in the distributor's shelter. It is too costly to meter this kind of deterioration at the proper stage.

WILLIAMSON states that this condition does not require the transformation from large to small numbers discussed earlier. He says that externalities are more common at the distribution stage and with differentiated products.

Narrowly understood, externalities are technical failures of the market. It is technically difficult and/or costly to isolate the costs and benefits for only those parties involved in a trans action. E.g., if a dairy producer allows his spoiled milk to go into a collection container, the spoilage of the entire tankful of milk will cause expenses also to the other producers having poured their milk into the same container. Inspection of every milk batch can, therefore, be considered as an exclusion cost of such risk in that particular transaction.

Environmental problems such as smoke, noise, pollution, etc., are typical situations where externalities prevail. The rules made by the community define who bears the cost of such problems. In some cases the exclusion costs may be high; e.g., people living close by to an airport will either have to suffer the noise or move away. In both cases the airport imposes external costs on parties not involved in the initial transaction.

The rules (legislation) concerning transactions define who bears the external costs.[10] The institutional design of a transaction determines which costs are internalized and which remain externalities. Thus, externalities are relevant factors in institutional design. This includes the problem of free riders and unwilling riders, both of which are common problems in transactions made through cooperatives. E.g., 49 per cent of the members of a cooperative may not be willing to pay for a service needed by 51 per cent and decided upon according to the majority rule.

BUCHANAN & TULLOCK (1962) examine external costs and benefits when an activity is arranged collectively instead of individually. Interdependence costs are relevant especially in situations when new collective action such as a cooperative is being organized. SCHMID (1978, Ch. 9) explains externality effects to be caused by such interdependence which cannot be ''internalized'', i.e., included as a variable into a particular interaction. We can speak about technical externality if, e.g., our cattle produce a disagreeable smell in the neighborhood causing, perhaps, a decrease in the value of the housing property. ''The impact of A's choice on the opportunities of B is pecuniary when the exchange value of a good is affected by A's market choices'' (SCHMID 1978, p. 72). Thus, market signals can be explained as pecuniary externalities. The third category of externalities presented by SCHMID are political. If a government (cooperative) is collectively gathering resources (deferring refunds), based on a collective decision, which an individual member does not need, this member suffers because of a political externality. A reverse political externality occurs when an individual is in serious need of a service but cannot bring about large enough collective action to accomplish a favorable decision about procuring this service collectively.

Externalities also have a close connection to social traps (PLATT 1973). An individual whose short-run costs compared to long-run costs, or individual costs compared to total collective costs, differ considerably, may act in a direction leading away from the initial goal. If, e.g., an employee gets individual benefit from careless handling (salary according to kilograms of produce handled), his small gain may mean a big loss for the retailer and the consumer. Even if the employee realizes this, he may think that careful handling will

[10] It can also be said that a person moving from a retroacting rural area is imposing external costs on people remaining in that area, while getting external benefits from the urban area he moves to.

not benefit anyone before all the other employees do the same thing. The avoidance of social traps and unfavorable externalities seems to be important in organizational design.

Hierarchical decomposition principle

> "... internal organization should be designed in such a way as to effect quasi-independence between the parts, the high frequency dynamics (operating activities) and low frequency dynamics (strategic planning) should be clearly distinguished, and incentives should be aligned within and between components so as to promote both local and global effectiveness." (WILLIAMSON 1981, p. 1550)

The two principles mentioned earlier are mainly concerned with the choice between the market and the hierarchy. The hierarchical decomposition principle concerns the effective organizing of tasks inside an organization where bounded rationality and opportunism also prevail. As WILLIAMSON (1981, p. 1550) says, "... a complete theory of the value will recognize that firm structure as well as market structure matters."

SIMON states that because of bounded rationality, the organizational division of decision-making labor is as important as the neoclassical division of production labor:

> "... from the information processing point of view, the division of labor means factoring the total system of decisions that need to be made into relatively independent subsystems, each one of which can be designed with only minimal concern of its interactions with others." (SIMON 1973, p. 270)

The hierarchical decomposition principle aims at alleviating the problem of an increase in bureaucracy costs along with organizational growth by arranging the hierarchy into "entrepreneurial firm-like" units.[11] It is advantageous to break the organization both horizontally and vertically into relatively independently working sub-units. Horizontal boundaries can be drawn between individuals and tasks having only little interaction with each other. According to this principle, high-frequency (or short-run) operations should be separated from lower-frequency, strategic (long-run) operations. Decomposition has to occur in a way that both low- and high-frequency incentives and information flows are aligned to promote the same direction of action.

Summary

The objective of each of the principles of organizational design is to cope with bounded rationality and opportunism. Asset-specificity would not be a problem if comprehensive contracting were possible. Because of bounded rationality, this is not the case. Comprehensive contracting would not matter if the winning bidder could be trusted to behave in a reliable and trustworthy fashion. The externality principle is mainly a reflection of opportunism but can also be caused by bounded rationality. Technical externalities can sometimes be corrected with exclusion costs. Externalities could be decreased and social traps avoided (opportunism) if information were free and all possible outcomes could be internalized into the transaction (bounded rationality).

Hierarchical decomposition attempts to cope with bounded rationality by arranging the complex operations into manageable units, simultaneously safeguarding itself against opportunism (local and individual dysfunctional pursuits) through manageable control and incentive units as well.

The asset-specificity and externality principles are relevant when deciding whether to buy or to make a good. The presence of either of these favors the decision to make, which in turn has to be considered against the limits of firms and hierarchies (Chapter 2.3.5). The hierarchical decomposition principle is relevant after the decision to make has been reached.

[11] WILLIAMSON (1981) describes a long history of the development of business organizations and sees the "20th-century organization", M-form organization, as an organizational innovation realizing hierarchical decomposition.

2.4.4 Cooperatives in the light of transaction cost economics

Cooperatives have been very dominating in many marketing systems, especially in the economic activities connected with agriculture. Transaction cost economics states that there has to be a reason for this rise of cooperatives in agriculture. Cooperatives have somehow been able to reduce transaction costs and been more efficient than other organizational arrangements in the fields where they have operated.

Brief explanations for this as provided by TRC are given below. Further implications of the potential role of cooperatives as predicted by TRC are presented more in detail in Exhibit 2.

Cooperatives have potential to economize the asset-fixity problem without losing all the high-powered incentives. Since the owners of a cooperative are also the customers, the cooperative has no incentive to act opportunistically towards them.

Members of the cooperative gain market power by joining together. This market power is likely to prevent trading partners further in the chain from acting opportunistically against the cooperative and its members. The "competitive yardstick" feature (NOURSE 1922) also disciplines other firms competing with the cooperative from acting opportunistically.

In addition to gaining market power, cooperative members gain economies of scale by together buying services such as marketing, product development and processing as well as expertise. The hierarchical decomposition of tasks allows the members to concentrate on tasks closest to their own expertise.

The increase in size of the economic entity tends to decrease the uncertainty about sales and price fluctuations as well. The larger size makes it easier to resist drastic fluctuations in price. The residual claim feature of the cooperative is likely to prevent temporary variations within the patronage refund period. The risk of unpredicted events is pooled among the members.

The cooperative is also a special kind of exchange institution for economizing the frequency of transactions. Instead of recurrent bargaining, members making a contract with the cooperative may allow the cooperative to bargain collectively.

3. BEYOND TRANSACTION COST ECONOMICS: MARKETING SYSTEMS ANALYSIS FRAMEWORK FOR STUDYING ECONOMIC COORDINATION

3.1 LIMITS OF THE TRANSACTION COST APPROACH

3.1.1 The issue of property rights

WILLIAMSON, the major developer of transaction cost economics, himself admits that TRC is not able to explain the entire complexity of transactions and that "our understanding of transactions is yet terribly imperfect" But according to him, despite its limitations, TRC has a relatively strong explanatory power regarding current organizational structures.

Some scholars such as SCHMID and MARION[1] argue that the major deficiency of TRC is the avoidance of power issues as affecting factors in the analysis. Market power is a central issue in defining who is able to participate in market processes.[2] Since markets deal only with solved political problems (SHAFFER 1980), the essential question is who is able to establish the rules, i.e., what rules are applied in making rules for transaction institutions.

WILLIAMSON's TRC does not cover the rights of firms with regard to power issues. If a firm fails to continue its activities in a remote area with no alternative employment opportunities, to what extent is the firm entitled to transfer the costs of unemployment to its former employees and to society? The issue of the rights of firms becomes very essential in dealing with pollution problems. E.g., to what extent is a dairy plant entitled to pollute downstream water?

TRC in its traditional form does not ask whose preferences get counted in transactions. Transaction costs are defined within a given set of property rights. TRC merely states that an organizational arrangement exists because it is efficient. If a marketing system becomes efficient only by distributing benefits unevenly, the system's efficiency is a function of the present, uneven distribution of property rights. Changing the property rights in such a situation would change the content of efficiency as well.

Alternative transaction rules create a different distribution of costs and benefits. WILLIAMSON's TRC does not define whose costs are taken into account as transaction costs. The costs of a decision to internalize a "technically separable interface" of work from a remote area (location-specific assets) into a town are different depending upon whether the costs of employee families are taken into account or not. Thus, redefining the boundaries of the parties that are affected and that benefit, changes the nature of transactions and transacting organizations. This obscurity of the theory is not such a drawback in explaining the development of prevailing organizations, but difficulties occur in attempts to predict the properties of alternative future organizations. There is uncertainty regarding institutional innovations which the theory cannot deal with.

According to TRC, another goal of organizational structure is to economize trans-

[1] Personal discussions with A.Allan SCHMID and Bruce MARION.

[2] One could argue that in order to participate in agricultural discussion, considerable transaction-specific mental assets are needed. High transaction costs have long prevented people outside agriculture from participating in the discussion.

action costs. But these costs are also instruments of peoples' opportunities, as they may define who is able to participate and also who is not able. E.g., if somebody owns a house and enjoys an open scenery over a block which is now on sale for a factory, he would prefer a high transaction cost for getting the building permits, etc., because a factory in the next block would significantly lower the value of his house.[3] On the other hand, a low transaction cost may also act as a hindrance. An example from the environs of Helsinki has shown that the possibility to claim for a negligible cost about 12 square meters of the corner of a house block has prevented the construction of an access to the highway, thus delaying the commuting of perhaps 10 000 people by 20 minutes a day. Thus, there are instances where econimizing TRC may not be a purely positive solution.

TRC maintains that the productivity of labor is fixed and that shirking only needs to be prevented. THUROW (1984) argues that labor productivity is a factor of fair treatment. Motivation, dignity and people's sense of fairness are factors that do not easily fit into Williamsonian TRC.[4]

WILLIAMSON (1985, pp. 236—237) relates the drastic change that took place in meat packing in the United States, when Gustavus Swift realized that, instead of transporting live animals to the markets in the east, it was cheaper to slaughter them in the west, once the new, refrigerated railroad cars allowed their transport to the east coast. Both the railroad companies having special animal transportation cars and the meat packers with slaughterhouses in the eastern cities rigorously opposed Swift. Finding one railroad company outside the railroad association that was taking care of the present live animal transportation, he could start his business. WILLIAMSON's conclusion is that "efficiency thus evidently swamped the resistance of entrenched power interests..." This case can also be seen as a property right issue. Swift was able to make the existing system pay the cost of outmoded fixed assets, i.e., animal transport cars and city slaughterhouses.[5] Despite its effectiveness, this innovation would probably not have been implemented by someone already having fixed assets in the prevailing system. Thus, property rights do matter.

When considering TRC with the problem of coordination, performance measures have to be reconsidered as well. The minimum total production and transaction costs may not reflect the performance requirements of the participants. Coordination depends upon one's concept of a well-functioning society. Thus, good coordination is a different task for those who think that agricultural exchange systems have to enhance rural settlement in remote areas, compared to those who do not take this task into consideration. "Good" coordination may also vary over time. Changing preferences tend to change both organizations and transaction costs.

Determining whose costs are taken into consideration in defining transaction costs seems to be crucial in predicting the performance of new institutions. Property rights define whose costs get counted and according to what rule the benefits are distributed. They are a function of common acceptance reflected by the prevailing value structure. Thus, by including property rights into the analysis, also the current opinions about good and accepted performance are reflected in the analysis.

The implications of the property right issue on cooperatives include the following:

(1) The costs of a member unit are "internalized" in the decision-making. A worker-owned cooperative firm in a ru-

[3] This example has been drawn from a discussion with A.Allan SCHMID.

[4] WILLIAMSON (1985, p. 272) recognizes the limitations concerning the issues of power and of labor productivity in TRC. "...For one thing, the matter of power is underdeveloped. Additionally, while the importance of dignity is admitted, the calculative/efficiency-oriented approach maintained by transaction cost economics cannot encompass the full set of issues that a concern for dignity introduces."

[5] The strategic use of property rights (externalities) is the leading idea of Michael PORTER's famous book "Competitive Strategy" (1980).

ral area is more likely to develop its activities in the present location if the costs of, e.g., labor housing are taken into account. An IOF is able to transfer these kinds of costs to the workers and withdraw.

(2) The property right of having the option to use a joint-impact good may be important for a large membership, even if only a few would actually need it. If the cost, e.g., of an occasionally needed spare part service for a combine harvester spare part service were billed only from the unlucky user-member who happened to break the machine, the cost may be so high that it will be impossible for a needy member to use the harvester. The joint sharing of the cost and the property right to the option may provide a service that otherwise would not be possible to arrange. The decision to provide home for all the products the cooperative membership produce is another example of the same type of service.

The issue of property right is closely connected to the question of externalities also discussed by WILLIAMSON. However, property rights broaden the view to aspects such as the division of transaction costs, the ability to create such costs, and the appraisal of efficiency in a broader sense. Property rights define what are to be considered as externalities. Thus, externalities have to be taken into account when explaining the current structure, and when designing new institutional arrangements, property rights also have to be analyzed.

3.1.2 Evolution of institutions

Institutions do not emerge by themselves but are functions of the past, taking into account ideologies, values, culture, and already existing institutions. TRC does not place much emphasis on the effect of past decisions in the formation of organizations. The current structure can, however, be better explained by adding a number of evolutionary features into the analysis. For this purpose, an extension of the so-called structure-conduct-performance (SCP) paradigm will be discussed below.

Especially in the examination of food systems, the group of disciplines of the price theory called "industrial organization" (IO) studies has been widely used especially in the United States. The basic IO paradigm holds that market structure (S) strongly influences the competitive conduct (C) of firms within the market, which in turn strongly influences the market performance (P). BAIN (1968) and SCHERER (1980) may be mentioned as its main developers. The research group called North Central Regional Committee (NC 117) has published extensive literature on the applications of the paradigm to agriculture and food systems since 1974 (MARION ed. 1985).

Modifications of the basic SCP paradigm have been developed for various applications.[6] Significant additions also relevant to this study include environment-behavior-performance (EBP) by SHAFFER (1980) and situation-structure-performance (SSP) by SCHMID (1978). The EBP paradigm emphasizes the dynamic role of past performance[7] in reinforcing the evolution of institutions. SHAFFER sees institutions as evolutionary processes learning from experiences in the past and making changes to the past system accordingly. Former rules and experiences can thus be similar to transaction-specific assets in that they hinder the adaptation process.

The SSP paradigm by SCHMID states that situation in which the interdependence of actors in prevailing technological and psychological conditions affects the structure of participants able to take part in decisions on the use of resources, which in turn affects performance, whatever it will be. The SSP paradigm emphasizes that property rights set the rules of interdependence. This idea has close similarities with the transaction cost approach, which also examines the effect of various in-

[6] PORTER's (1980) competitive strategy can be categorized as an industrial organization approach. It examines the strategic use of transaction costs in corporate strategic planning.

[7] See SCINNER (1969), further developed by PLATT (1973), for Shaffer's theoretical basis for his evolutionary theory of institutions.

stitutions on performance. SSP supplements the property right feature discussed above in 3.1.1.

An attempt to combine the situation-structure-conduct-performance (SSCP) sequence with feedback to the situation and TRC will be made in the general framework below. Giving more emphasis to the past decisions affecting the current organization is consistent with basic TRC, which considers the rise of fixed assets as an outcome of the past. As pointed out before, TRC regards efficiency mainly as given, whereas the SSCP also structures the value system.

3.2 THE MARKETING SYSTEMS ANALYSIS FRAMEWORK

The problem of coordination is related to human behavior. Earlier in this study it was found that opportunism and bounded rationality were basic assumptions of human behavior in examining transaction costs. While studying coordination in a dynamic environment, learning by contingencies of reinforcement as presented by PLATT (1973) will also be assumed.

TRC states that the conditions of transactions define how the marketing system is organized. Thus, they will explain much of the existing economic structure.

In order to make predictions concerning organizational changes, some modifications and extensions to this approach have to be made. When changes to coordinating systems are suggested, the existing structure has to be taken into account. In this study, the framework for the analysis of coordination is rooted in the works of BAIN and SCHERER (structure-conduct-performance paradigm), SHAFFER (environment-behavior-performance paradigm) and SCHMID (situation-structure-performance paradigm). The analysis is divided into four categories: situation, structure, conduct and performance.[8]

Situation:	Asset-specifity Uncertainty Frequency Property rights/externalities
Structure:	Market structure Trading structure Legal structure
Conduct:	Actors SOP's Price vs. regulation Voice vs. exit
Performance:	Syncronization coordination Adaptation coordination Distribution of costs, benefits and risk

Situation, i.e. the dimensions of transactions supplemented with property rights, defines the market structure in the context of existing trading and legal structures. Structure, in turn, defines the parties entitled to participate in transactions, their opportunity sets, the developed standard operating procedures and the composition of coordination and preference articulation modes. Synchronization and adaptation coordination (MARION 1976), as well as the distribution of (transaction) costs, benefits and risk, are outcomes of structure and conduct.

Especially when examining coordination beyond one market period, all the categories are interrelated. E.g., conduct affects structure, which in turn affects conduct. The performance of the coordinating mechanisms affects transaction costs by decreasing the effects of sources for these costs, i.e., the situation. Thus, the process is evolutionary.

The situational factors have already been discussed above. In the following, factors describing structure, conduct and performance will be dealt with.

Factors describing structure

Structure illustrates the interdependencies of actors with each other and the environment. Here, structure is divided into three subcategories:

— *Market structure* refers to the market system between production and consumption.

[8] See also HOJJATI & STAATZ 1987.

The main dimensions are: (1) number of individual business units, (2) number of buyers and sellers in each stage, and (3) possible organizations coordinating either horizontal or vertical units.

- *Trading structure* denotes customs, contracts, ideals, or other relations between the parties involved.
- *Legal structure* has been separated from the previous categories because it includes the rules imposed by the government that shape the opportunity sets of the transacting parties (Hojjati & Staatz 1987).

Factors describing conduct

Conduct denotes the actual behavior of the system, in this case the behavior of coordinating activities and functions in the framework of the structure.

- *Actors* are the main parties entitled to participate in the conduct. They are defined by the structure. Conduct includes the coinciding and conflicting goals of all actors.
- *Standard operating procedures* comprise the rules and other customary ways of making decisions that affect coordination. SOP's include delegation of decision making, division of responsibility areas, budgets, plans, habits, etc.
  Price vs. regulation describes two alternative coordinating functions. E.g., trading practices may define which one is to be used to alter a certain task of coordination.
- *Voice vs. exit* contains two alternative ways of articulating the preferences of the tasks being coordinated.

Factors describing performance

- *Synchronization coordination* refers to the fine-tuning of the system in order to perform the current tasks as well as possible.
- *Adaptation coordination* changes and remodels the system in order to adjust as well as possible to changes in preferences and environment.
- *Distribution of costs, benefits and risk* refers to the fact that alternative institutional arrangements for coordination produce a different distribution of costs, benefits and risk. In addition to the coordination of the system, possible other objectives are taken into account at this point. E.g., monitoring of other than agricultural goals of the Finnish dairy subsector such as rural settlement, food security, and their interrelationships with the system, falls under this category.

The two first-mentioned performance criteria can be normatively judged as "good" or "bad" performance. The third dimension has to be based on somebody's perception about the right and fair allocation of costs, benefits and risk.

The performance of the system again affects the situation, changing the effect of various dimensions of transactions. The performance will also directly affect the structure and conduct. E.g., the performance may be satisfactory for one actor but unsatisfactory for another, who in turn may wish to change the relation between price and regulation, legal structure, etc. The situation in transactions may remain relatively stable, but various structures and conduct may make different tasks as hindrances for solved problems.

Transaction costs economics is inductive in nature. It sets out from details and proceeds towards the general. In examining the coordination problems of marketing systems, one has to start from the general and come down to details, i.e., a more deductive approach must be used. In this study, the Marketing Systems Analysis framework is operationalized by beginning with problem determination and working backwards towards the circumstances of transactions.

3.3 OPERATIONALIZATION OF RESEARCH AND EXPERIMENTAL DESIGN

As already mentioned, the objectives of this study are:

(1) to explain the current dairy marketing structure and the problems in the ad-

justment process of the exchange system by using the developed framework, Marketing Systems Analysis;
(2) to pinpoint the problem areas to be analyzed by more traditional means;
(3) to suggest new institutional designs to improve coordination; and
(4) if possible, to make predictions concerning exchange arrangements for improved coordination of supply and demand in real-world circumstances.

From the theories discussed above, leading to the Marketing Systems Analysis framework presented in this study, the following hypotheses can be made:

(1) The institutions that coordinate supply and demand are not born by accident, but are an outcome of past events. Coordination institutions are organized to minimize transaction costs, which means:
   — The higher the degree of transaction asset-specifity, the more difficult it is to rely on market coordination.
   — The greater the degree of uncertainty, the more integration in these transactions can be found.
   — The greater the ability to impose externalities on other parties, the more integrated structures can be found.
   — The greater the frequency of transactions, the more specialized institutions in these transactions can be found.
(2) Given the nature of the product, similar problems of coordination exist even in different environments and institutional arrangements.

In this research study, the framework presented in the earlier chapters will be applied to the dairy subsector. The dairy marketing system, which is the most important in Finnish agriculture, experiences major problems in coordination.

First, an attempt will be made to explain the current milk marketing system using the Marketing Systems Analysis framework. The explanation will contain a description of the system. The four major coordination problems in the dairy marketing system will be analyzed, and solutions proposed by the framework to solve the problems will be presented. Also a comparison between the dairy marketing systems in Finland and in Michigan, USA, will be provided.

As typical in this kind of pragmatic research, the "test" of hypotheses is to a great extent their workability in analyzing given problems (Johnson 1980, p. 67).

4 THE FINNISH DAIRY SUBSECTOR AS VIEWED BY THE TRANSACTION COST APPROACH

4.1 AGRICULTURE AND DAIRY PRODUCTION IN THE FINNISH ECONOMY

The changes that have taken place since 1960 in the number of people working in each of the employment categories in the Finnish economy is shown in Figure 4-1.

''Natural resources'' was by far the largest category of employment in 1960, with over 800 000 people working mainly in agriculture and forestry. A sharp decline in that category took place with the increase of industrial and service employment, which changed the picture completely in 20 years. In 1985, only about 179 000 people were employed in agriculture and about 52 000 in forestry (Anon. 1987e).

The proportion of the population employed in agriculture declined from 30 per cent in 1960 to less than 10 per cent in 1985. During the same time, the share of agriculture and forestry in GNP fell from 11 to 4 per cent. This rapid structural change caused major problems for rural communities. According to the ''Agriculture 2000'' committee report (1987e pp. 38—39), the areas most dependent

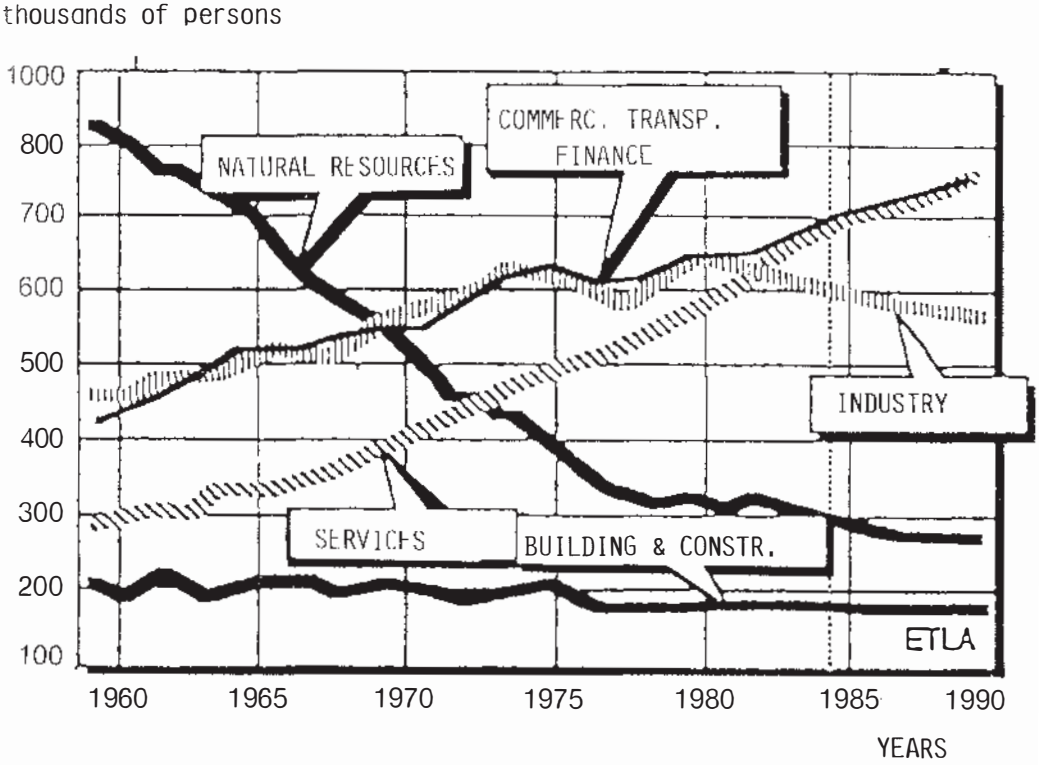


Figure 4-1: Active population by employment category in 1960—90.
Source: Research Institute of the Finnish Economy.

on agriculture and forestry are now in central Finland. Northern and central eastern Finland are already to a great extent depopulated.

As will be examined in more detail in Chapter 6, a partial reason for this development was the shift of agricultural tasks from the farms to either up- or downstream industries. Because of the multiplier effects on these industries, the total number of people employed by agriculture is 350 000 to 500 000, depending on the calculation method.

The number of Finnish farms and the average field size are presented in Figure 4-2.

Figure 4-2 shows that the number of farms, as well as the average field area, remained relatively steady throughout the 1930's. A significant change took place at the beginning of the 1940's, when Finland lost about 11 per cent of its arable land area to the Soviet Union. More than 400 000 people moved from the ceded areas (Karelia) to the remaining parts of Finland. Most of them were farmer families, who were given a small portion of land for farming. This large-scale refugee settlement operation increased the number of farms while reducing their size, as seen in Figure 4-2.

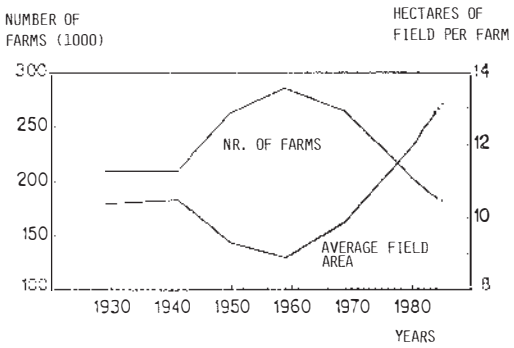


Figure 4-2: Number of farms and average field area in 1930—80.
Source: Central Union of Agricultural Producers.

The settlement of the Karelians has had a significant effect on the Finnish farm structure. The small farm was enough for a family to make a decent living with the 1940's technology. After that, the field area that could technically be cultivated by one family has increased faster than the actual farm size in practice, which reached the 1930's average only in the mid 1970's. In 1987, the average Finnish farm had 12 hectares of arable land.

When examining farming in Finland it must be remembered that an average Finnish farm includes about 40 hectares of forests. When the income from agriculture in 1987 was about 6 billion Fmk, the farm-owned lumber sales amounted to an additional 2 billion Fmk.

The division of Finnish farms by ownership is presented in Table 4-1. As can be seen, Finn-

Table 4-1: Farms with over 1 hectare of arable fields by ownership in 1986.
Source: Finnish farm register 1986 and Central Union of Agricultural Producers.

Ownership category	No. of farms	%	Average size (ha.)
Principal profession (over 75 % of income)	71 000	35	17.3
Secondary profession (50—75 % of income)	26 000	13	12.4
Part-time farmers (less than 50 %)	65 000	32	8.0
Individual farmers	162 000	80	12.5
Heirs, family enterprises	39 000	19	9.1
State, communities, congregations	1 000	0.5	20.8
Corporations, coops, foundations, etc.	500	0.5	22.9
Total farms	202 500	100	11.95

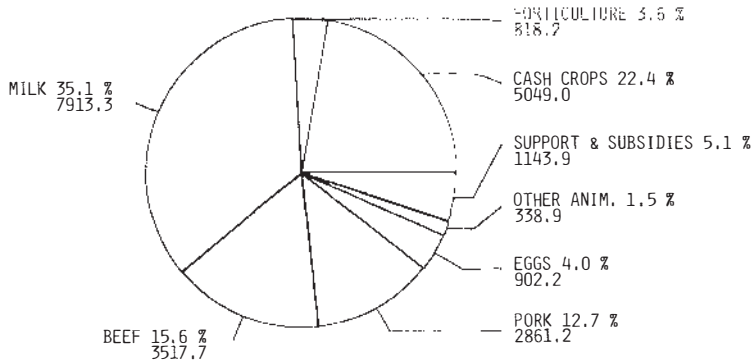


Figure 4-3: Division of agricultural incomes by productionlines in 1987. Source: Anon. 1988d.

ish farms are almost entirely so-called "family farms". It is noteworthy that the proportion of full-time farmers is only 35 per cent of all farm operators, and their category is expected to diminish further along with an increasing number of part-time farmers

The division of farm incomes by the main products is presented in Figure 4-3. It may be noted that milk and beef together represent more than a half of the income from agricultural production. Dairy farming is by far the most important line of production in Finnish agriculture.

4.2 POLICY AIMS AND CONSIDERATIONS

The overall guidelines of Finnish agricultural policy have been formulated in numerous committees and working groups. Although they have not been confirmed as special agricultural programs, they form the basis of agricultural policy in Finland. These general aims of agriculture in Finland as presented by HEMILÄ (1987) are:

(1) to secure self-sufficiency in the main agricultural products;
(2) to secure a fair income to the farmers;
(3) to maintain the base settlement in rural areas; and
(4) to secure the supply of food to the consumers at reasonable prices.

According to the self-sufficiency policy, agricultural production in Finland should be on a level with domestic consumption. Moreover, the agriculture and food industry should be able to ensure a sufficient food supply also in the event of abnormal and crisis situations. This aim has been strongly emphasized in Finland because of difficulties in this respect during the present century, especially during the two wars. Up to the 1950's, the main goal was to increase production quantity and efficiency. From then on, the balance between supply and consumption has been the primary concern.

According to the committee report "Agriculture 2000" (Anon. 1987e, p. 7), the aim, as defined in various official reports, is to secure full self-sufficiency in basic food items, taking into account normal seasonal as well as random fluctuations. Apart from self-sufficiency, the security of the food supply and the quality of food have increased in importance.

The northern geographical location of Finland makes the circumstances for agricultural production very different from those of almost any other country. Therefore it is difficult to maintain the income of farmers at a level comparable to other professional groups. There has been explicit political resolve to affect the income level of farmers by administrative means. Reducing the differences in farmers' incomes has been another goal, as well as the attempt to decrease the uncertainty of farm incomes from one year to another.

This has meant that the agricultural income policy has also had a role in social policy.

Agriculture has traditionally been considered a basic profession in rural areas. Maintaining the rural areas populated by promoting the "base profession" of these areas and by providing opportunities also to other professions and services even in the most remote regions has been considered a major goal, especially because of the forest industry.

It is widely accepted that these aims incur costs to the rest of society, but also bring along benefits related to a healthy regional population structure, military defence, etc. There is also a cost to be paid for not polluting nature, for maintaining the production potential of the fields, etc. From the consumer side, the expected benefits include a secure food supply and a high quality of basic food items at reasonable, stable prices.

LUUKKO[1] has calculated that the total sum of subsidies coming to agriculture is about 6.9 billion Fmk, and the gross revenues from agriculture about 7.2 billion Fmk. Public opinion and an increasing number of scholars have begun to ask what an accepted "tolerable cost" of agriculture to the rest of society would be. WAHLROOS (1986) has argued that import barriers against worldmarket food create a welfare loss of 15 000—20 000 Fmk per Finnish consumer per year. Regardless of the validity of such calculations, there is a strong opinion towards separating the income, social and production policies of agriculture. A similar debate has been going on in Sweden (BOLIN et al. 1984).

In examining the performance of the milk marketing system, it is essential to base the analysis on certain assumptions concerning the following political questions:

(1) What is the accepted level of production leading to food security in dairy products?
(2) In what kinds of units and where should production occur?
(3) How much solidarity is there among producers considering milk pricing?

In this study, it is assumed that the main objectives are self-sufficiency in milk products and maintaining the rural areas of the country populated by using dairy policy as a means, and that total price discrimination in the short run is not possible or acceptable.

4.3 CHARACTERISTICS AND COORDINATION ISSUES

4.3.1 Dimensions of transactions

Fixed assets

At the milk producer level, three main components can be considered: feeds, cattle and the producer. As mentioned earlier, most of the feed is produced on the farm. Grassland is the most important source of feed, consumed either as hay or as silage. The decision-making period regarding field allocation for feed is from 1 to 3 years. Because cattle feed is a relatively well- marketable product, asset-fixity is not very high, but on-farm production is favored in governmental resolutions. Hay may be considered the most critical element of cattle feed.

Many fixed assets act as hindrances in milk component coordination. The basic site-specific problem in the Finnish dairy industry is due to the country's location in a climatical area where the number of production alternatives is very limited. In addition, the large size of the country and its sparse population causes regional differences regarding milk production and consumption.

The consumed feeds affect the composition of the milk produced. In Finnish climatical conditions, the protein content of feed is the limiting factor. Supplementary protein usually has to be bought, thus providing an incentive to the commercial feed industry to support demands for higher milk protein.

Seeding grassland and pasture can be considered a dedicated asset decision, because

[1] LUUKKO, U. Presentation at the Scientific Society of Finland on 23 March 1988 in Helsinki.

field use is fixed for 2—3 years by the decision. The "lock-in" effect is strengthened by the fact that the market for hay and silage is not very developed, partly because of the difficulty of transporting these products.

In hay and silage making, there is an opportunity cost incurred by allocating a field for hay production, usually for 3 years. Both hay and silage making require specific equipment whose exchange value is often lower than their value in the purpose for which they were acquired, i.e., feeding the farm's own cattle. Asset-fixity in the use of fields for alternative production increases from south to north because of climatical circumstances. In the northern most parts of Finland, the alternative to hay production is to produce nothing.

Investing in a cowshed and a feed storage system is transaction-specific investment for at least 15 years. The value of the investment for alternative uses is low. When increasing the number of cows in order to raise production, the cowshed may be a limiting factor. On the other hand, there are few incentives to operate a cowshed below full capacity. The special equipment in a cowshed is usually an inseparable part of the building. Usually such equipment becomes technically obsolete before becoming physically obsolete.

An important physical fixed asset at farm level which affects milk composition is the dairy cow. Cattle breeds and individual cows have a relatively narrow scope for changing the composition of milk. Still another specificity problem is caused by the fact that milk and beef production are mostly combined in Finland. Thus, cow breeds with the best combined production capabilities are favored. Breeding of cattle, e.g., to produce more protein in relation to fat, may take 15 years.

Dairy cows are the outcome of breeding of particular features. Some properties may be altered during a relatively short period, while other may take a number of years. The new embryo technique may shorten the breeding time. Changes in dairy cows may be reflected in new requirements regarding the buildings, equipment, feeding patterns, etc. Dairy cow breeders may also have fixed mental assets. Also, if the size of a new cattle breed were to differ significantly from the existing ones, some physical fixities in cowsheds might occur. E.g., a bigger cow might not fit into the existing parlors.

Farmers' skills have traditionally been geared towards maximal production quantity. Research, extension service and other organizations have also worked to increase production. A high production rate has come to mean the status of a good dairy farmer as a result of various competitions. The skills needed to attain maximal production are transaction-specific mental investments. The professional knowledge of dairy farm operators is an asset with very little value in alternative uses. This may prove to be a hindrance in bringing about the necessary changes in Finnish agriculture.

Dairy farming requires morning and evening presence seven days a week throughout the year. On most of dairy farms, alternative uses for the time not spent in dairying has only a limited value. The marginal extra hour in the cowshed does not offer alternative uses, which is an incentive for securing a full workload from dairy production.

Milk is transported from farms to dairies by using specialized trucks that have practically no alternative uses. However, trucks constructed so that the half the space is occupied by the milk collection tank and the other half is reserved for product distribution are in use in northern most Finland. As a highly perishable product, milk in its raw form is a product open to opportunism in a similar way as fixed assets.

Almost all dairy processing equipment after the reception terminalat the plant — with the exception of packaging machines, etc. — are transaction-specific. This is particularly true in dairy operations with only a few production lines. As the number of production lines increases, there is a possibility to coordinate the optimal allocation of processing capacity by modifying the combination of production lines used. There are some machines

which, in a one production line operation, are "special" but which can be converted into "all-purpose" machines in a dairy that has several production lines, e.g. for cheese products, butter, yoghurt and ice cream (OLLILA 1987b). Most Finnish dairies are able to adjust the combination of their processing lines according to the current supply and demand conditions. A dairy plant becomes technically obsolete in about 10 years.

At retail stores, there is usually a department especially designed for dairy products. There are also strict health regulations which define the environmental conditions of the department. Although the dairy product department is specifically for dairy products, items such as juices may compete for shelf space. If such other products prove more profitable, retail stores may have a disincentive to offer more dairy product alternatives to consumers.

It may be concluded that the most important decisions concerning transaction-specific assets affecting the quantity of milk production are made at farm level. The cowshed and equipment, and the farmer's skills are perhaps the most important factors causing asset-fixity. A dairy cow's asset-specificity depends on the point of view of examination. The alternative use for a dairy cow is meat production, either through calf production or slaughter. Growing a dairy cow usually incurs an opportunity cost for the period from the meat heifer to the beginning of milk production.

Uncertainty

The most significant source of uncertainty in dairying is the weather. Weather conditions have a significant impact on feed production. Often the problems are due to a lack of water in the spring, too much rain during the hay making season, and early frosts and too much rain again in the fall. Since the growing season is short, there is no time to lose in waiting for good weather. Changing weather conditions also have an effect on milk composition to a certain extent. E.g., the Market Research Institute of Pellervo Society (PSM) reported that the rainy summer in 1987 lowered the protein level of milk. Even thunderstorms are said to influence the protein content of milk.

Uncertain weather conditions have forced Finnish farmers to mechanize the farms over the level otherwise needed. The short work peaks in the summer have also prevented the joint use of farm machinery by several farmers. When the fields get wet, the heavy machinery becomes a problem.

Other sources of uncertainty at farm level include cow diseases, contamination of milk, damage to equipment and buildings caused by cold weather, difficulties in feed transportation, etc.

Uncertainty regarding milk quantity is mostly a long-term question. Weather affects the amount of milk produced, but the effect is indirect through the quantity and quality of feed production. PSM has attempted to determine the dependency between weather conditions and milk quantity, but without much success. It is easier to predict the production of an individual cow. On the other hand, the decisions made by farmers are unpredictable, since weather conditions seem to affect their mental state in a different way at different times. After the bad year in 1981, the number of dairy cows did not considerably decrease, whereas after another bad year in 1987 there was a decline due to more slaughter decsions.

As will be presented in the section dealing with standard operating procedures, liquid milk consumption is given priority as compared to other dairy products in decisions concerning processing allocation. In practice, Valio coordinates the supply so that the less milk is available, the farther north the haulage area is extended from where liquid milk is transported to the southern consumption centers. In the unforeseeably bad crop year 1987, e.g., liquid milk was hauled to the south from extra ordinarily far up north. Thus, if production declines, the supply of liquid milk for consumption is secured as far as possible. According to the managing director of Valio, af-

ter 1987 there has been some shortage of medium-aged Emmental cheese. If the situation becomes worse, the import of some special cheeses will be increased (HAKA 1988).

A farmer's decisions after an abnormal year may have at least two side effects. If the farmer decides to continue dairy production at the previous level, the off-farm feed supply plays an important role. If the farmer decides to alter the size of his herd, this will affect the beef market.

It seems that in the present situation the uncertainty in dairy production is so low that it may prevent producers from shifting to an alternative source of livelihood which usually involves more risk. The largest source of short-run uncertainty is at the consumption end. Even these uncertainties are usually a longer-term than daily ones. "Negative uncertainty", or risk aversion, may play an important role in dairy production exit decisions. The risk of feeling useless seems to be an important factor which delays retirement decisions (OLLILA 1986b). The secureness of living in a traditional fashion according to a regular daily times chedule appears to be a better alternative than moving from the farm to an apartment house or a home for the aged.

The most significant source of uncertainty in the coordination of the supply and demand of milk components is in demand. There is uncertainty both about the consistency of the present supply with demand as well as about future demand. Where alternatives are few, it is hard to appraise the consistency of the present supply with potential demand (few exit options). A change in preferences, in turn, causes difficulties in production factors that cannot be changed rapidly.

Uncertainty concerning the supply of milk in unexpected circumstances has resulted in wide public action to secure the availability of milk. As mentioned above, the principle of self-sufficiency as it is understood in Finland has its origins in the experiences of uncertainty during World War II.

Dairy products have become farther processed, more complex and more distinctly targeted to certain groups and uses. Along with the "specialization" of a product, its susceptibility to changes in preference or markets has increased. Uncertainty concerning the viability of investments in new-product development in the changing demand conditions has increased (GALBRAITH 1967, Ch. II).

At the present technology neither the delivery system nor the retailing industry seem to have sources of uncertainty to an extent comparable to the upstream stages.

Frequency

Frequencies of production and transactions of the main components of milk production are presented in Table 4-2.

Table 4-2: Frequencies of production and transactions of main components of milk production.

Component	Production period	Transaction period
Feed	1—3 times/year	2 times/day
Cows	1 year	5 years
Milk	2 times/day	3 times/week

The inconsistency between feed production and consumption can be corrected by storing. Feed grain may be stored by feed mixing companies, but hay and silage are mainly stored on farms. Perishability may be a problem especially as regards silage.

Cows calve once a year. A dairy cow may produce 4 calves before slaughter at 5—6 years' age. The new calves are either kept to be raised into dairy cows, raised for beef, or sold to another farm specialized in raising either beef or dairy heifers. Almost all the beef in Finland is a side product of milk production.

Dairy cows require milking preferably twice a day. Due to modern storage techniques, hauling the milk to the dairy three times a week is enough.

The contracts negotiated between farmers and dairies are often informal, as mentioned earlier. A contract is usually continuous and cannot be terminated by the dairy plant ex-

cept for reasons related to inferior milk quality. If milk delivery contracts could be terminated by the dairy cooperative, the contracts of non-members would probably be the first to be discontinued.

The most important contracts in dairy plants affecting milk quantity are the labor contracts negotiated between labor unions and dairy plants usually for one year at a time. Sometimes longer agreements can be reached.

The quantity of liquid milk delivered to retail stores is handled by a so-called ''base ordering'' system. In order to economize the transaction costs of ordering milk, the retail stores only announce any changes in their base orders calculated from past monthly, weekly and daily sales. The order, or the confirmation of the base order, is made on every working day for the following day, in the largest cities two times a day. Although the base order system reduces transaction costs, it is not considered a very market-oriented method. There are signs of moving back to the regular ordering system in order to improve the contacts and flow of information between the sales personnel of the dairy cooperatives and the retail stores.

Solid dairy products are ordered to retail stores two or three times a week. The deliveries are conducted by the regional sales offices of Valio. These offices are mostly situated within the premises of the local dairy cooperative. Thus, in reality, either Valio or the local dairy may be the distributor.

The frequencies in shopping vary according to the perishability and bulkiness of the dairy products. The consumption of liquid milk may be three times a day while some specialty products may be consumed occasionally.

Property rights/externalities

The present structure of property rights makes agriculture a special case among economic activities. While society has been able to induce some tasks such as rural settlement and food security to agriculture, agriculture has been able to shift some production costs to society.

In the past 30—40 years, agriculture has been a major means of affecting structural changes in Finland. Agriculture, of which dairy production accounts for more than a half, has been used to respond to the problems of the settlement policy and social policy, and to maintain a ''base population'' in the rural areas. These external goals for the dairy industry have had a strong impact on its performance from the point of view of production.

When Finnish dairy production meets with difficulties, society bears a part of the cost. The highest external cost falls on the rest of the rural population. E.g., because of decreased profitability of dairy production the rural communities will have to give up some of their tax income. Decreased purchasing power will narrow the market for services and goods, which will again be reflected as a decrease in tax income and may act as an incentive to move away from the community.

External goals have been an important factor in raising the public support to agriculture. Milk surplus export subsidies are now about 1.90 Fmk per exported liter of milk, totaling 1500 million Fmk per year. There is an increasing public pressure against subsidies at the present level.

Society is also restricting the property rights of a farmer to use his property. Costs formerly thought of as externalities such as possible pollution caused by pressing silage water, may come to be reconsidered as a cost to dairy production. The extension of product responsibility (pollution, herbicides, etc.) to producer level is being considered (Anon.1988g). A debate regarding the right of animals to have an outdoor yard to move around in has been strong lately; e.g. in Sweden, it has led to legal action.

The effect of other markets on the dairy market can be considered an externality. The most influential for dairy production is the beef market. The prevailing combined production of milk and beef determines the cow

breed used. In the winter of 1988, there was a shortage of beef on the market because farmers were waiting for governmental decisions about restrictions on milk production, and were not willing to sell their cows to the slaughterhouses before they knew the results.

The individual farm milk quota periods end at the end of December. This means that milking cut offs for producers close to the quota are possible and are relatively easy to implement through feeding. The decline in milk production in December, which most probably affects production in January as well, contributes to the sharpening of seasonal variation in production. From the point of view of seasonal balancing, the quota period should end, e.g., at the end of July instead of December.

Another important pressure comes from international trade. Negotiations in GATT, and among EFTA and the European Community, may result in the supply of foreign dairy products to Finland, which has so far remained in a relatively well-protected position against international competition. The effect of the world market is becoming stronger along with the increase in the processing rate of dairy products.

4.3.2 Structure

Market structure

The relevant elements of the market structure depend on the market issue to be analyzed (Caves 1982). Vertical and horizontal physical structure, product characteristics, barriers to entry and properties of demand will be considered here.

The vertical structure of dairy subsector may be briefly explained as follows. Dairy production, which takes place almost entirely on family farms, is mostly integrated forward to dairy processing cooperatives. Transportation from the farms and between/from the dairies is conducted by contracted truckers and also partly (20—25 per cent) by trucks owned by the cooperatives. The dairy cooperatives are horizontally integrated in tasks such as the marketing of other than liquid products where the marketing has been given to the centralized marketing body (hierarchical decomposition). Liquid dairy products are sold to retail stores and to large-scale kitchens directly by the dairy cooperatives. Marketing of all the other products is conducted by Valio and its regional offices. Valio also takes care of the export of dairy products.

Number, size and ownership of buyers and sellers

Milk is produced on about 59 000 farms, almost all of them family farms. These farms had 599 100 dairy cows in January 1987, of which 76 per cent were Ayrshires, 19 per cent Friesian, and the rest mostly domestic local breeds. An average dairy farm enterprise had about 10 milking cows, 3.5 heifers and 9.5 calves (Anon. 1989).

While in 1960 there were about 250 000 milk producers, their number has dropped down to one-fifth during the last 25 years. The decline in dairy farm number has been sharpest in southern coastal Finland (of the number of dairy farms in 1960 only 12 per cent were left in 1985) and slowest in northern Finland (34 per cent left) (Ruska 1988).

The regional development in the quantities of milk received by the dairies during 1981—86 is presented in Figure 4-4. It can be observed that the quantity received by the dairies has decreased in the south and west, remained steady in the east, but increased in the north.

The organization of the dairy marketing system including the number of buyers and sellers is presented in Figure 4-5.

Valio's milk collection system consisted in August 1986 of 285 trucker entrepreneurs and 148 milk trucks owned by dairy plants. The amount of milk hauled by the independent truckers was much larger than the proportion of trucks owned by them would indicate. A significant number of the cooperatives' trucks are stand-by vehicles.

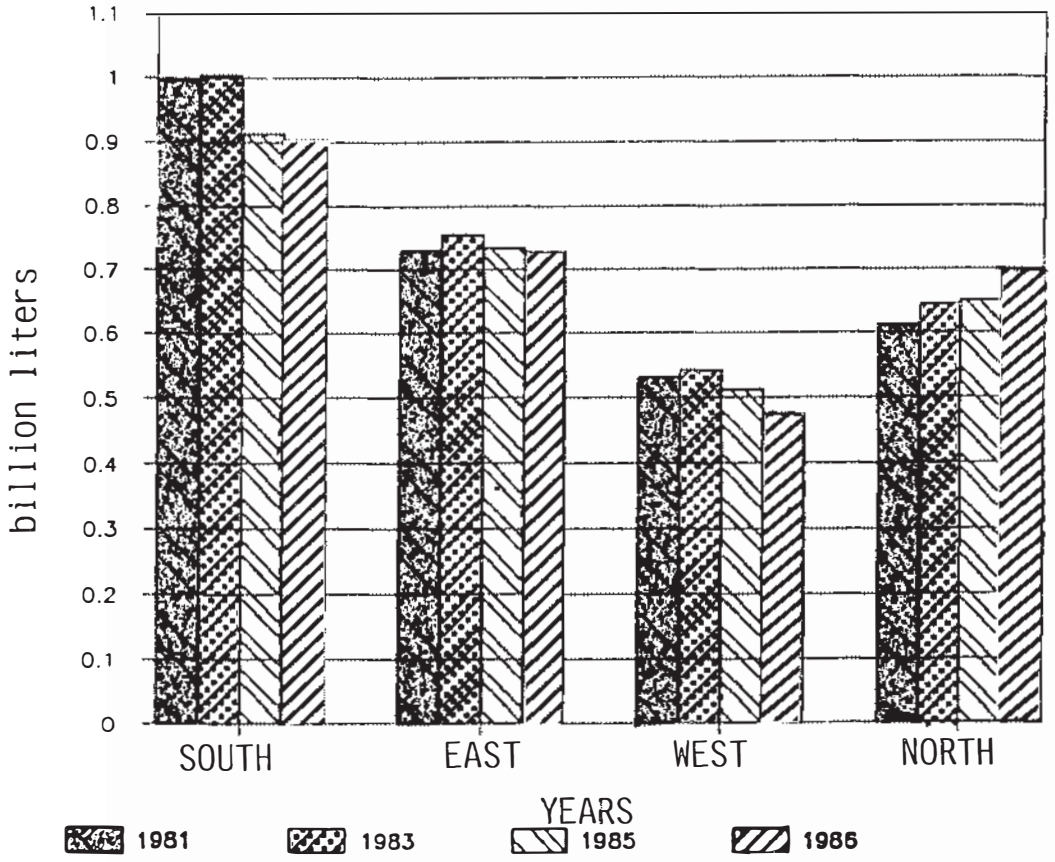


Figure 4-4: Milk delivered by regions 1981—86. Source: Anon. 1987a.

Up to the 1950's there were more than 450 dairy processing plants in Finland. In that era of village and local dairies, the plants were small. The average number of producers per dairy was below 200. Total milk production was lower than at present, and only about 40 per cent was delivered to the dairies. The decline in the number of dairy plants began already in the 1930's, whereas the number of milk producers started to decline about 30 years later. Between 1960 and 1986, the number of dairy farms dropped down to a fourth and the number of dairy plants to one half of their previous number.

In 1986, there were less than 150 dairy plants left in Finland (Ollila 1987b). Of these, 122 were members of Valio, 11 were members of the corresponding Swedish-language dairy cooperative organization Enighet-en, and the rest were either other cooperatives or companies. Most of those belonging to the two latter groups are relatively small and located in south coastal Finland. Up to the 1970's, also the consumers' cooperative movement had dairy processing plants.

The central organization of dairy cooperatives, Valio, was originally founded in 1905 as a butter export organization of the Finnish local dairy cooperatives. Up to the present time the influence of Valio has increased radically. As mentioned earlier, Valio has the main responsibility for coordinating local and regional dairy processing as well as for marketing all the other dairy products except liquid milk products. Valio's activities cover other fields as well such as prepared foods, fish industry, export of dairy process engineering, etc.

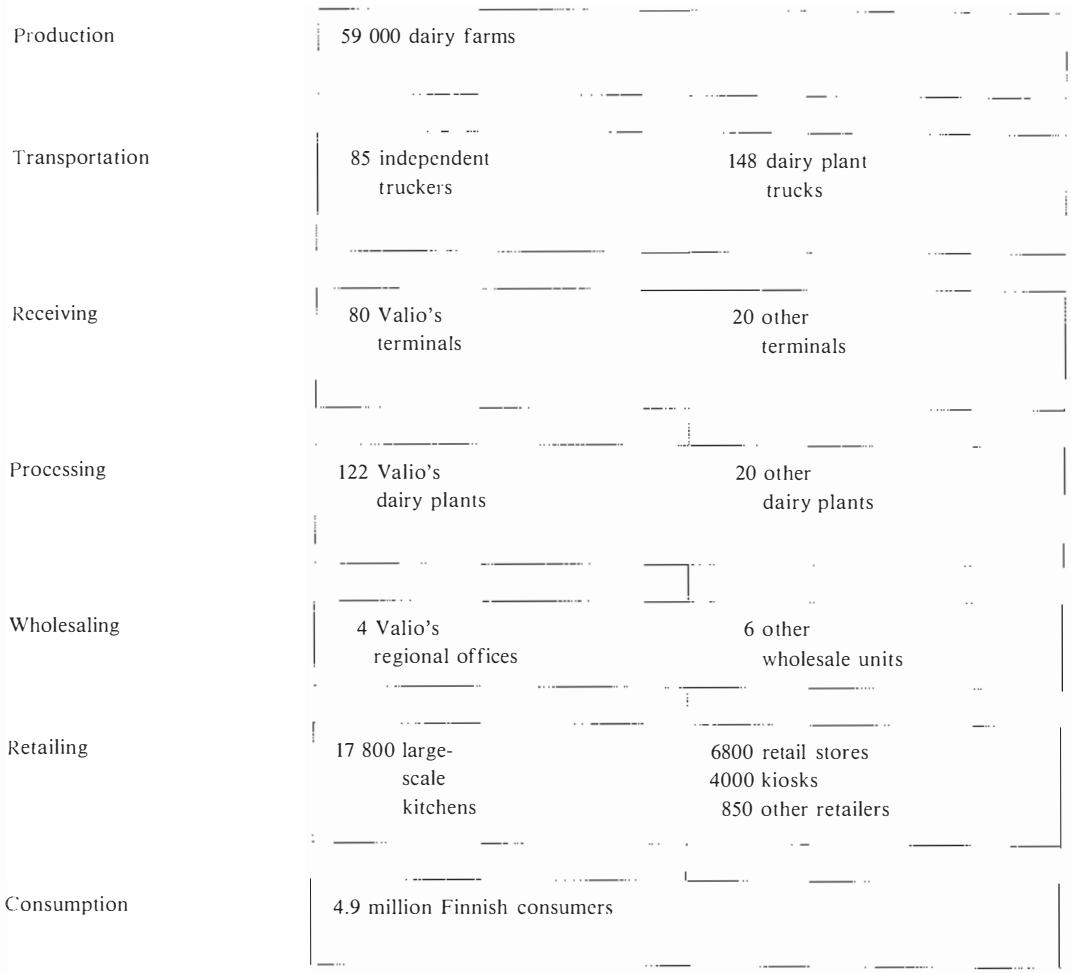


Figure 4-5: Vertical structure and number of units in the dairy marketing system in Finland in 1986.

In 1987, 60 of Valio's dairies had processing lines, while 25 dairies delivered their milk directly to the central plants for processing. The initial idea for central processing plants as a form of a federated system was introduced already in the 1950's. There is a central processing plant, e.g., in Ostrobothnia in western Finland founded by 40 local dairy cooperatives. At present, about one half of the total milk processing in Finland occurs in five central processing plants, a feature that is unique in Scandinavia.

The division of dairy plants into categories by size is presented in Figure 4-6. It may be noted that the 10 largest dairy plants receive one-third and the 20 largest about half of all milk.

Valio's member dairy cooperatives collect 92 per cent of the milk processed in Finland. Its dairy plants also process the majority of the milk. Valio's market share is large in price-regulated product categories such as liquid milk, butter milk and butter, but in non-regulated product categories such as yoghurt and ice cream the market share is considerably smaller. In 1987, apart from Valio, there were six large-scale cheese manufacturers an deight importers of cheese, among them all the major retail chains. Ice cream was produced by nine important manufacturers, of which

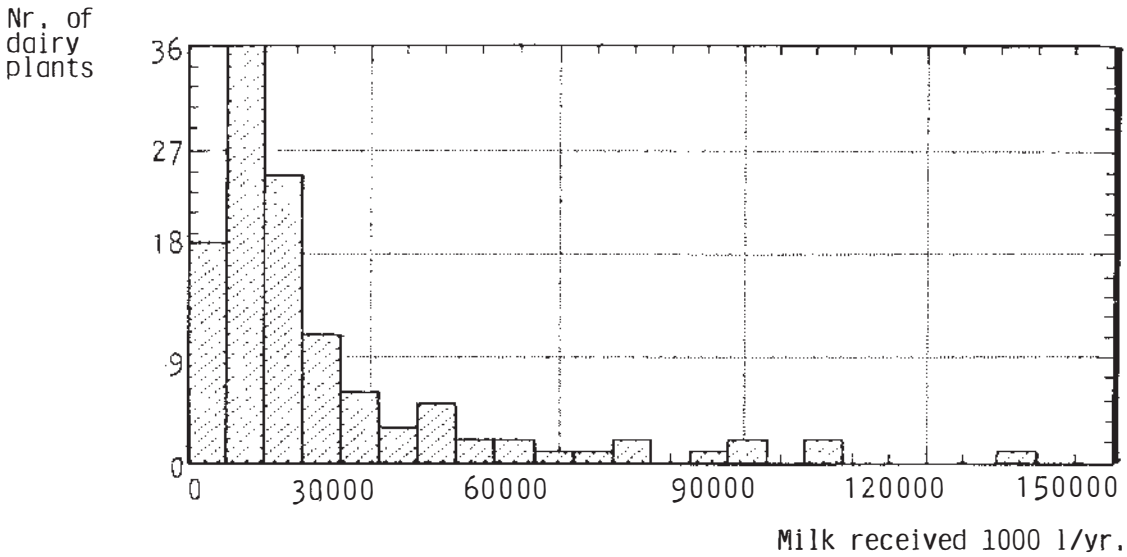


Figure 4-6: Division of Finnish dairy plants into size categories according to reception of raw milk (4.3 % fat). Source: Anon. 1987a.

two had international joint-venture licence manufacturing. Yoghurt was produced by four different companies.

Table 4-3 shows that the most important activities of milk processing have been concentrated during the last 25 years. The most rapid change has taken place in butter making, where the number of units producing 80 per cent of Valio's butter has declined into one quarter as compared to 1963. The number of units producing 80 per cent of the liquid milk has dropped to a half. In cheese and milk powder manufacturing, the relative concentration has been smaller. It can be assumed that the scale economies in cheese making are smaller than in butter and liquid milk production. The scale economies of milk powder making were probably already visible in the 1960's. It can be generally concluded that, in line with the proportion of milk received, 80 per cent of milk processing activities in Finland occur in the 20 largest dairy plants.

Table 4-3: Number of dairy plants conducting 80 per cent of selected activities of Valio in 1963, 1974, 1979 and 1984.
Source: Anon. 1987a.

Activity	80 per cent of production			
	1963	1974	1979	1984
Milk reception	104	68	62	57
Butter making	117	44	30	27
Cheese making	25	13	13	13
Milk powder making	7	7	7	7
Manufacture of liquid products	28	18	15	15

Valio's four regional sales offices conduct the regional marketing of butter, cheeses, etc. The offices work in close cooperation with the dairy plants located close by. Retail stores sell about 70 per cent of the total value of dairy products. Large-scale kitchens account for about 20 per cent, and the food industry for the remaining 10 per cent.

Product differentiation

Although raw milk differs to a certain extent in composition and hygienic quality, intentional differentiation of raw milk generally does not exist. If the hygienic standards are met, the dairies do not make difference from what milk they process whatever products they need.

Along with a higher processing rate, product differentiation increases, but still depends

very much on the product. In liquid milks, e.g., there are not many "real" brands. Valio launches 60—70 new products yearly. According to the new-product development department, some 15—20 are really new products, while the others are rather variations of old products. About 50 per cent of the variations and about 70 per cent of the new products are reported to be successful.

Entry barriers

Barriers to entry have generally been considered as an important element of market structure. The high cost of entering the market prevents potential rivals from competing, and allows the firms already in the market to enjoy a somewhat protected existence and create monopoly profits. At farm level, there are both legal and economic barriers to entry. Despite the permit and quota issues, starting dairy production "from scratch" requires a considerable investment in buildings, machinery, animals, feed production and skills. In the present situation, new entrants into dairy production are rare.

Cooperative dairies collect 97 per cent of all raw milk (92 percent by Valio, 5 per cent by Enigheten). According to PSM, 88 per cent of the dairy producers are members of a dairy cooperative. Thus, the cooperative central organizations control the collection of milk from the farms almost completely. It is very difficult to start a new processing operation without obtaining milk from the cooperative dairy system running a national collection network. Who controls collecting, also controls processing.

Entry into the manufacturing of a certain dairy product has been easier than entering into milk collection and basic processing. E.g., in the production of ice cream, yoghurt and dairy fudge, there are several other firms in the market besides Valio. Their problem is that dairy cooperatives control the supply of raw milk. In the cheese industry, imports form a significant part, although in relatively marginal, special products. These imports are an administrative decision to a great extent, based on reciprocal cheese trade.

Barriers for entry into the milk retailing business are, in many production lines, very high as well. For liquid dairy products there are licencing and sanitary regulations, which prevent new forms of dairy retailing from getting started. The retail industry is very concentrated, and new entrants outside the four leading organizations run the risk of becoming acquired by one of them.[3]

Growth rate of demand

The total domestic demand for milk products has been negative since the end of the 1960's. This issue will be discussed in more detail in Chapter 6.

Explanation of existing market structure

The structure of the Finnish dairy subsector is characterized by small production units and producer cooperatives with centralized control of processing. The reasons for this structure are, to a great extent, biological and historical. TRC may help to explain a large part of the remaining reasons.

The sparse population has made the exchange of perishable items costly, and self-sufficiency has therefore been more common than, e.g., in Central Europe. Still 40—50 years ago, the level of agricultural technology was such that farms having less than 10 hectares of arable land and two milking cows could provide full-time work for a farmer family with low exchange and income requirements. Small, hilly fields did not favor the use of large machinery, either. The survival of the small farms in Finland for so long is partly explained by their forests, which provided additional income. As mentioned in chapter 4.1, the settlement of the Karelian refugees during World War II had a significant effect on the overall structure of Finnish dairy farms by

[3] A regional chain, Valintatalo, was bought by a regional consumer cooperative, Elanto (E), in 1986 and another chain, Alepa, by a national cooperative, SOK, in 1988. There is no significant retail business outside the four major chains in Finland, namely E, SOK, K and T.

increasing their number while reducing their average size.

Why are Finnish farms predominantly family farms? TRC provides a partial explanation. The weather conditions are so extreme that no mistakes in farming can be allowed. E.g., the results of shirking in seeding are not visible until after it is too late to make corrections. Family members, who also have to bear the costs of careless work, are more reliable. The uncertainty of the weather conditions creates sharp peak loads of work, which may be too demanding for outside workers to commit themselves.

Uncertainty regarding the weather combined with transaction-specific assets such as dairy cows explains why feed growing and milk production are carried out within the same unit. By doing this, the feed supply can be secured.[4] In calf breeding there are no such uncertainties or transaction-specific (dedicated) assets. There is, thus, a tendency to increase the number of specialized calf growers, but here the sales tax raises the transaction costs.

The frequency of transactions needed for milk sales has caused the development of a special arrangement which decrease the transaction costs of selling milk. Because of the asset-fixity (perishability) of the product, cooperatives have been suitable to solve the problem.

There are clear reasons for why the dairy cooperative structure evolved. Highly transaction-specific assets existed on both the producer's and the processor's side which had to be secured, i.e., the cowshed, dairy cows and highly perishable milk on one side, and the special machinery and need for a frequent supply of high-quality raw material on the other. Why not combine the two into a single firm? First, the economies of scale are different, especially in Finland because of the small producer unit size. Secondly, the required skills are different. Thirdly, the site-specificity requirements combined, e.g., with monitoring problems are different. In addition to this, there are no significant externalities caused by other dairy producers (except the contamination problem). Thus, there are several features supporting the establishment of a producer cooperative rather than either a private company or an integrated firm. The absence of homogeneous preferences may be a partial explanation for why consumer cooperatives have not succeeded in the dairy business.

As mentioned above, Valio was originally founded to decrease the transaction costs of butter exports. Also the preservation of butter quality played an important role. When structural change widened the geographical distance between producers and consumers, Valio's role as a coordinating institution between supply and demand became more important. The vertically integrated system of milk production and processing with transaction-specific assets was able to utilize a joint marketing system to secure the market and the product quality. The property rights for the fixed assets could be extended to a stage in which either the asset-fixity decreased because of transformation into a more storable form or in which externalities could not spoil the product anymore. This explains the difference in the marketing system for liquid products and for other dairy products. The hierarchical decomposition of special tasks such as research and sales promotion evidently reduces the transaction costs, simultaneously providing the shift of power up to the level where bargaining with the government occurs.

After reception at a plant, the perishability of raw milk decreases as does the need for the cooperative. Especially with less perishable products such as ice cream, markets can be found between the basic collecting and further processing. With perishable (and bulky)

[4] Gilbert and Akor (1988) found the same to be true in examining the differences in the dairy farm structures in Wisconsin and California, USA. In Wisconsin, cow sheds are much more transaction-specific than the open shelters which are sufficient in California (p. 64). The uncertainty regarding the feed supply is also greater in Wisconsin. Most of their sociological findings regarding farm structures can be explained by TRC. Compared to California and Wisconsin, there is still another step to Finnish conditions.

products such as liquid milk, direct delivery reduces the transaction cost compared to the more centralized system. The uncertainty regarding temporary fluctuations in milk production has been reduced because Valio has been given the authority to control the inter-dairy milk supply.

Since domestic marketing activities and responsibility for domestic sales has also been shifted mainly to Valio, centralized planning and control has had a natural ground to grow in. The increased and continually more complex involvement of the state in the dairy marketing system has made it important to have a centralized body to negotiate with the state administrators (hierarchical decomposition).

Valio's role in the dairy marketing system is also emphasized because of external factors. The state sees Valio as an established organization that can be used to exercise governmental policy programs. The farmers' union, which has taken over the role of interest group from cooperatives, has identical interests with the government to utilize Valio as an institution controlling the information flow from top to down.[5]

In the era of local dairy cooperatives, producers took care of the transport of milk to the dairies. Along with the truck collecting system, this become less common, but still producers took their milk cans to milk collecting stands by the main roads. Nowadays milk is mainly hauled from the farmyards. The risk regarding transport, e.g. snow storms, has been transferred from the producers to the truckers. The economies of scale in transport have also created problems. The costs of externalities caused by poor sanitation or bad weather to other producers have created the need for rules to avoid these problems.

Although milk trucks are relatively specialized investments, they are not site-specific.[6] . Neither the farmers nor the cooperative can act opportunistically towards truck entrepreneurs. On the other hand, neither farmers nor cooperatives feel uncertain about not getting the milk collected because of the high frequency of this activity. Milk trucks cannot be easily used for other kinds of transport while they are hauling milk. There are no explicit reasons for why the market could not take care of total milk collection. However, dairy plants have retained a part of the transportation activities to secure competition. Private truckers have to be licenced, which increases their entry barriers.

Since the preferences of producers and the nature of consumption have up to present time been relatively homogeneous, the centralized control system has reduced the transaction costs. At present it seems that preferences on both sides are be coming mere heterogeneous. The interests of northern vs. southern, old vs. young, enlarging vs. quitting producers, as well as of different consumer groups, are varied and even conflicting. This increases the pressure against centralized and relatively inflexible organizations.

The highly centralized whole sale and retail system, which is not uncommon, e.g., in the Scandinavian countries, has its origins in the beginning of this century. Similar to the market situation of agricultural producers, the performance of the market at the other levels was not very good, either. The four major retail chains all have their origins in some form of collective bargaining. Two of them are cooperatives: the SOK organization has its origins with the rural population and the E organization with the urban labor population. The K organization is the outcome of the vertical integration of shopkeepers into wholesaling to improve their bargaining position towards the processing industry. The T organization was founded by small local wholesale firms, which have now become local retailers leaving the whole sale activities to the group's regional centers. Although not called cooperatives, both the K and T organizations have so many features in common with cooperatives that in countries where the definition of

[5] See OLLILA (1985) or ROKHOLT (1982) for further discussionon the roles of federated cooperatives, farmers' unions and the government.

[6] The situation is very similar to the airplane example presented by BAUMOL et al. (1982).

a cooperative is less strict, they would probably be referred to as cooperatives as well. The need for counter power on both sides — processing and retailing — has supported the centralization of these tasks.

The possibility to reduce the transaction costs of product management, assortment creation and communication, combined with the reduction of the costs of transportation, storage, billing, advertising, etc., and the chance to act as a counter power to the centralized food industry, have supported the current retailing system in Finland. Along with increased competition, the chains have tightened their internal relations and reduced the competition between shops within the same organization. This has shifted the control power upwards in the organizations. The current development has been unfavorable for the cooperative chains, E and SOK, whose members' preferences have been too varied to be used as guidelines in organizational planning. The decision-making power has shifted to the professional management and experts also in the cooperative retail organizations.

Rural retail services have experienced more difficulties than the urban retail stores. There has been an asset-fixity problem related to old facilities with no alternative uses and no salvage value. As a result, the rural retail services have not been able to readjust their activities according to the current situation. Also a free-rider problem with customers using urban retail services is causing a market failure of interests in having retail services in rural areas as well. Rural retail shops have had special difficulties in securing the supply of such perishable products as liquid milk or vegetables.

Trading structure

Most dairy farmers still join a dairy cooperative when they begin operations, although even an oral contract would be sufficient. Up to the present time, all of the dairies have been interested in receiving more milk in order to increase their utilization rate. A cooperative cannot limit the quantity of milk produced and received, as long as it fulfills the quality requirements.[7] It is not customary for a dairy cooperative to restrict the quantity produced by non-members, either.

A way of coordinating the quantities of milk delivered to the dairies is by deliveries from one dairy cooperative to another. As a matter of fact, a major portion of the total milk quantity is covered by inter/dairy agreements. Central processing plants, which process 60 per cent of all the milk, get more than half of their raw milk from local member dairy cooperatives in accordance with such contracts. These are long-term agreements with a notice period of at least one year. Valio has the authority to direct the flow of milk and to give instructions for the coordination of the desired milk quantities in various parts of the country.

The principle of equal treatment has traditionally been taken very literally in Finnish cooperatives. It has had a significant effect on the operation of the dairy marketing system. Among the impacts of this principle are that: (1) farm location does not affect the transportation costs, (2) all get the same service independent of their needs, and (3) it provides a system for leveling off the differences in the efficiencies of the dairy plants. Because of a lack of data for how to define "service at cost", this principle decreased the transaction costs of earlier, possibly unequal practices.

The first of these impacts can be proved questionable from the point of view of general allocative efficiency by using the neoclassical type of analysis presented in Exhibit 1. From the viewpoint of regional policy it can, however, be defended. It is somewhat surprising that the milk producers situated close to a dairy plant, who support the more remotely located members, have accepted this situation without complaint. It can be argued that this kind of practice is against the cooperative principle of serving the members on an at-cost basis.

[7] The inability to restrict the quantity is why a cooperative cannot acquire monopoly profits in the sense that the neoclassical economic theory defines them.

Same service to all members independent of their needs is widely practiced in dairy cooperatives, but has its weak points. Let us suppose that a dairy cooperative decides to order a professional magazine as a service to all its members and that the magazine costs 200 Fmk per year. Dividing the total cost of the magazines by the quantity of milk received by the cooperative, gives a cost of, say, 0.28 p per liter. The smallest producer of the cooperative delivers 12 000 liters per year to the dairy, the average producer 70 000 liters, and the largest 250 000 liters. For the smallest producer, the magazine costs 34.28 Fmk and for the largest 714.27 Fmk. The largest producer could question why he has to pay 714 Fmk for ordering a magazine he can buy directly at a price of 200 Fmk.

Several debates have sprung up when Valio has commanded that a profitable product be removed from the product assortment of one dairy and given to another, saying that it is more needed by the latter in order to implement the equal treatment of dairy farmers throughout the country. Valio has defended this practice by stating that the contribution of the local dairy in the development of the profitable product has been negligible, and that, therefore, it has no claim to the product. These production shifts have, however, led to frustration in some local dairies. It can be assumed that this has had an effect on local commitment.

If we think of the principle of equal treatment from the viewpoint of asset-specificity, it really decreased transaction costs in earlier times. The membership in the village dairies was homogeneous, and even members not present in meetings could be relatively happy with what ever the decision was. Site-specificity was not a problem since most of the producers themselves hauled the milk to the dairies. When hauling from alongside the main road routes was adopted, the risk of inaccessibility due to bad weather conditions between the main road and the farms remained with the farmers. The difficulties of calculating the true transportation costs was avoided by including them in the cooperative's overhead costs.

Now that local dairies are being closed down and centralization has increased, negotiations of mergers would be difficult if it would mean that the transport costs of local members would grow — assuming that transport fees were to be charged according to the actual costs. When mergers have occurred and the membership has become more heterogenous, the principle of equal treatment has succeeded in keeping the transaction costs between members and the dairy cooperative down. Monitoring costs are also low, and there is no need to spend time in acquiring information about the services offered to the other members.

Valio's authority to control milk flows and product allocation increases the asset utilization rate of transaction-specific assets. Centralized control also reduces the uncertainty involved in getting the perishable (time-specific) products converted into a less perishable form. Moreover, it decreases the transaction costs caused by the trade of raw milk between dairies. The function of planning has become more important. Compared to a situation in which the behavior of both dairy farmers and processing plants were free and unexpected, the authority of Valio to coordinate the flow of output from the farms and the dairies decreases the transaction costs of both. It would be costly for the farmers and the dairies to monitor the daily market situation. Valio's product flow coordination authority combined with the equal treatment principle can be seen as a way of reducing the dairy processing costs also from the technical point of view.

The present practice, where the dairy marketing system assumes responsibility for dairy product supply, can be easily understood by thinking about the site-specificity of milk production. E.g., the transport of liquid milk from Central Europe would be very costly because of its bulk and high perishability. Milk is also a "transaction-specific asset" for babies and, e.g. considering its calcium compo-

nent, for almost all. Experience in World War II taught the Finns that uncertainty in milk supply can occur. Giving the responsibility for an ensured milk supply to the main existing marketing system decreases the transaction costs. Valio, the dairy cooperatives and their members have supported this practice, because it has also helped to secure dairy production. The transaction costs of the high-frequency daily deliveries of liquid milk to retail shops have been reduced by allowing the regional organizations to take care of them directly, instead of using the central organization.

Legal structure

There is a number of legal arrangements governing the supply of milk. Among the most important are the farm income law (444/84), systems restricting milk production, and other statutes affecting the milk supply. Because the legal structure has been described by SALONEN (1989), KOLA (1989) and Anon. (1985, 1987e. and 1987f) in detail, it is not necessary to discuss it again here.

The farm income system deals with producer incomes from dairy production. In addition to income from milk sales, dairy farmers get income from beef and from governmental subsidies. The support is paid according to the farm field area (VNp 342/86), the number of cows (VNp 433/86) and the region where the farm is located. Also extra production supports and price systems exist. In general it may be observed that the smaller the farmer is and the more remote the area where he lives, the larger the support he gets.[8] The farm income law defines the maximum limit for dairy production. The government pays the cost of export of surpluses up to this limit. If production is higher, farmers pay the extra export cost collectively. The fee is collected in fertilizer and feed taxes, and as marketing fees. The milk export marketing fee was 5.5 p per liter in 1986. The northernmost and remotest areas are exempted from this fee.

There is also a production quota for each dairy farm. The above-quota fee is equal to the difference between the domestic and the world market milk price. In 1986 the fee was 206 p per liter. The quota is not transferable or saleable. Although producers have an incentive to produce up to the quota level, only 77 per cent of the quota is met by an average herd (RYÖKÄS 1988).

The government pays a transport subsidy of about 2 p per liter to the dairies. This has relevance for the milk supply because it allows dairies to collect milk from all the producers independent of their distance from the dairy plant. Transport subsidies have been included in the state budget since 1943. They were originally issued to promote milk collection from remote areas with a sparse population and bad road conditions. Since 1979, transport support has been paid to all the dairies.

The content of milk components in many dairy products is controlled, e.g., the fat content of all dairy products. It is also noteworthy that there are regulations for the content of other solids in liquid dairy products.

The legal structure of the Finnish dairy marketing system can be explained by the historical development of Finnish society. Finland's rapid transition from a rural into a modern society has placed agricultural production in a special position. In the 1940's, legislation supported a fast increase in post-war production. It was easy to continue this policy into the 1950's and 1960's because of the strong political power of the agricultural population.

When corrections to the legislation were made, the transaction costs of adding a correcting regulation to the existing system were lower than those of changing the basis of the entire system. Basic changes to rules always cause difficulties, which are a function of physical or mental transaction-specific assets (e.g., an acquired advantage or position). Uncertainty increases as well. The actors have learned to live with the existing system, and

[8] In 1986, production support according to quantity was 23.5 p per liter up to 30 000 liters per year, 12 p per liter between 30 000 and 150 000 liters per year, and nil above that. Production support according to farm location was 0—63 p per liter.

the learning process with the new system may take a long time.[9] As a result, the transaction costs of adding something seem to be lower than the costs of taking something away.

The entire agricultural policy has been considered a "transaction specific asset" of a few specialists and administrators, and the rest of society has regarded agriculture as a special field of the economy and policy up till the present time. The first "attacks" from the outside — such as by researchers close to the labor movement (Anon. 1986a) — have been relatively easy to defend because the attackers have lacked a sufficient understanding of the basic circumstances of agricultural production and governance culture. This is partly due to the development of an "idiosyncratic relation" (WILLIAMSON 1979) within the agricultural governance system, with a specialized language and accepted values. The situation has also prevented externalities such as the goals of the rest of society to interfere with agricultural policy, except for common goals such as food security.

4.3.3 Conduct

Actors

The main "direct" actors in the milk marketing system are the milk producers, their families and organizations, dairy cooperatives including their members, management, trustees and personnel,[10] retail stores and their organizations, and consumers. The government plays an important role in each transaction. Among other actors are cow breeders, the feed industry, the beef subsector, truckers, and consumer organizations.

To simplify it could be stated that the main objective of the milk producers is to maximize the revenue from their dairy operation to the producer household. However, other objectives can also be found. A sufficient amount of work, but not too much and without high peak loads, may be the mutual aim of a dairy producer family. A large-scale operation or high-yield cows may also act as a status symbol.

Dairy farmers may have differing targets as to the amount of milk produced, depending on their opportunity sets. The joint opinion voiced through farmers' organizations may not correspond to individual objectives, since it is affected by the opinions of other members such as feed farmers and dairy calf producers.

The objective of a dairy cooperative, to put it simply, is to maximize the members' milk producer price.[11] Cooperative coalition researchers, in turn, say that the objective depends on that coalition which has power in a cooperative. Considering quantity decisions, a cooperative with insufficient other ways of measuring performance may have a desire to increase its output. This may be the objective of the management, top trustees and members (KAARLEHTO 1956, pp. 39—40). Reward according to turnover is, in fact, according to FLEISCHMAN (1974), the single valid measure of cooperative performance. The personnel in a dairy cooperative, on the other hand, may wish to decrease the quantities of milk handled, as long as this does not affect the number of employees.

Representative organizations such as the farmers' union and dairy cooperatives are reluctant to change the system, which is based on the existing products of the decision makers.[12] So far the farmers' organizations have been influential enough to make society coordinate the mismatch between component supply and domestic demand by subsidized export of the surpluses. As a matter of fact, only a relatively limited number of decision makers have been required for such decisions.

[9] This whole set of problems can now be easily observed in the discussion about the taxation system reform presently under way in Finland.

[10] This categorization is drawn from PESTOFF (1982).

[11] This assumption was made in the so-called Helmberger-Hoos model (HELMBERGER & HOOS 1962).

[12] This problem of cooperatives was mentioned by STAATZ (1984, p. 208). If the farmers' union or a producer cooperative has been founded to advance its members' interests or to sell their production, it is hard todiversify beyond that goal.

Retail stores make choices in allocating the available space. If the volume of milk sold would increase, the bulky milk packages might raise the costs by taking up extra space. In general, however, the retail level should not have any objection to raising the quantity of milk delivered.

A number of actors make demands on the dairy marketing system. Demands vary and are sometimes conflicting. Fixed assets, increased uncertainty, irreversible decisions and external decisions may prevent the adjustment process even in a situation in which the gains of readjustment are obvious. When examining the individual actors, none of the relevant parties can be said to have strong incentives for readjustment. Rather, a process similar to a social trap (PLATT 1973 and OLLILA 1987a) can be seen, where the signals of a mismatch between supply and demand are corrected by the government, simultaneously removing the incentives for readjustment. This, in turn, causes an even greater mismatch between supply and demand. Thus, small short-term gains have led to a worse situation in the long run.

Standard operating procedures

At producer level, the quantity of milk produced depends both on the size of the herd and the production level of each cow. The number of cows is affected by the feed production capacity, the cowshed capacity and the labor capacity on the farm. Although an increasing amount of feed is purchased, it is profitable (and also the purpose of governmental policy) to base the production level on farm feed production. Almost without exception, the work force on a farm consists of a farmer and his wife. The ideal of a family farm with no outside employees prevails.

The average number of milking cows in a herd in 1988 was about 10 cows, increasing at a rate of about 0.4 cows per year (PSM). HEIKKILÄ (1987) has made calculations about the optimal dairy herd size. Her results show the optimal size to be close to 50 dairy cows. Independent of the validity of these results it may be said that farmers do have an incentive to increase the number of dairy cows. RYHÄNEN (1987) found that the profit of the best quarter of dairy farmers in a size group can be 10 times that of the worst quarter. His conclusion was that the manner of operating the farm was a much more important factor in economic performance than the absolute size of the operation.

It has traditionally been the goal of a good dairy farmer to produce as much milk as possible from each cow. The old feeding norms also supported this by recommending a little more energy feed for the cows than actually necessary. According to TURKKI (1978), the average feeding rate in relation to energy consumption is 104 per cent. He found that the corresponding percentage of the best performing dairy herds was about 95 per cent. When the average marginal product of a feed unit[13] was about 2.5, it was after 104 per cent only about 0.6. This indicates that 50 extra feed units yielded only 35 extra kilograms of milk per year. At the present price ratio between milk and feed price, it means that an average milk producer is feeding too much energy and, thus, producing too much compared to the optimum. JUSSILA (1982) found that the optimum is even lower in northern Finland. A standard procedure is that when the milk production of a cow increases, more concentrate feed is given. TURKKI (1978) states that feeding errors tend to be errors of over-feeding, and proposes a revision of the old feeding norms.

Silage harvesting also affects the quality of raw milk. The type of forage harvester which cuts the hay straight into the wagon, acts partly as a "vacuum cleaner" pulling dirt from the often open-ditch fields. The dirt contains spores of clostridia, which are harmful especially in Emmental cheese making. If the pH of the silage is above 4.2, the spores start to multiply. A forage harvester able to harvest precut and dried hay for cleaner silage making costs 100 000 Fmk, which is often too large an investment for a small dairy farm.

[13] One feed unit is equivalent to the energy content of one kilogram of barley.

There are also factors related to status which favor both maximal production and fat output. These goals are still implicitly supported by extension services and, e.g., by competitions for highest milk yield and fat production.

The central organization of the dairy cooperatives, Valio, coordinates to a certain extent to what dairy cooperative each producer should belong. Regional dairy cooperatives' associations play an important role in the process. These kinds of "gentleman's agreements" are not legally valid but they are considered important for the coordination of milk routes and in order to avoid horizon problems related to investments among producers who move into another dairy cooperative. It has been argued that truck drivers have a significant influence, e.g., in structural decisions because they are the only ones in continuous contact with the farmers.

In the dairy plant the most important decision considering quantity is made after milk reception and inspection. At national level the allocation of milk for various products is made according to: (1) the quantity of liquid milk projected and ordered, and (2) the quantity needed for domestic butter and cheese, and for export contracts. The rest is made into butter and skim milk powder.

The coordination of milk components for various uses is a central task in a dairy operation. If the fat content has to be reduced, this is usually done by the addition of skim milk or by the separation of cream. The butterfat content is increased either by separating skim milk or by adding cream.

At the individual dairy plant level, the raw material is calculated mainly according to two components: fluid and fat. The raw material for liquid products, i.e., for different kinds of liquid and fermented milks, is allocated first.[14] After that, the need for cheeses is projected. The next preference is given to whole milk powder, and the rest is manufactured into food fats (butter and fat mixtures) and skim milk powder.

Coordinated production management at the dairies is the main means of adjusting the dairy marketing system to seasonal fluctuations. There are two principal ways of doing this: first, by enlarging or shrinking the area from which liquid milk is hauled to the southern consumption centers and, secondly, by seasonally adjusting the product mix of the dairy plants. Another important goal of the product mix modification is to convert the peak production quantities into a more storable form.

When production starts to decline in September, a skim milk powder plant is usually the first one to stop its operation. It is usual that the milk powder plant idles for half a year, from October to April. Next there is a butter manufacture is decreased and, if necessary, some reductions in cheese making may occur. Despite the seasonal shortage in milk supply in winter 1987—88, cheese production could be continued at the usual level due to the addition of milk powder to the raw material for cheese (Anon. 1988b). Milk powder can form up to one-fifth of the raw material for cheese without changing the cheese quality. According to Valio's production manager, the method is best suited for soft cheeses such as Edam, but it is also applicable for yoghurt and fermented milk manufacture (Anon. 1988a). This method increases the total raw material cost by 5—7 per cent.

Regionally, seasonal coordination in the high-production season is accomplished in the dairies of central and west central Finland by varying between milk powder and butter making. In the low-production season, these dairies supply liquid milk also for delivery to the southern cities. E.g., in the federated milk cooperative Maitojaloste in west central Finland, the personnel who work at the milk powder plant in the summertime work a second shift at the milk packing line in the wintertime. However, more than 80 per cent of the milk

[14] The decision concerning the quantity of liquid milk for consumption is made according to the situation in the previous week, the same week in the previous year, taking into account holidays, etc. Binding orders come to the dairies in the afternoon one day be forehand.

consumed in southern Finland comes from south of the line Pori-Lappeenranta even in the low-production period. Dairies in eastern Finland continue cheese making throughout the year.

About 10 years ago Valio's member dairies authorized the central organization to take care of their overall production management. Valio's view is that some problems will persist even in the best possible production management as long as it does not have full authority about the product allocation decisions of local cooperatives.

The decisions concerning the export of surpluses are made according to the following procedure. The government has appointed an agricultural marketing committee to coordinate agricultural product import and export according to given guidelines. The committee is responsible for keeping the price level close to the target price. In milk products, a difference of only 1 per cent between the average actual and target price already requires action by the committee. The committee also plays a key role in decisions regarding the quantities to be exported or imported. The Ministry of Trade and Industry is responsible for the use of the funds for surplus export. The difference between the domestic and the export price is fully compensated to the exporting firms. The transport, insurance and marketing costs are likewise fully compensated. Valio's share of the export of dairy products is 85 per cent, while the remaining 15 per cent is divided between the dairy cooperative Enigheten and the private companies H.J. Ingman and Maitotuote. Anon. 1987f. provides more specific information about the surplus export system.

Standard operating procedures (SOP's) develop to decrease the transaction costs of recurrent transactions. In an environment with relatively low uncertainty and no significant externalities, they are effective in this task. But there is a tendency for SOP's to develop into a kind of transaction-specific asset themselves, and readjusting them becomes difficult. Highly developed planning systems require a well-controlled environment, and they are, therefore, likely to attempt to extend their control over a wider proportion of the environment. SOP's allocate decision making to specialized experts. This is the process of shifting power to the technostructure, described by GALBRAITH (1967). The decisions proposed by Valio are often backed up with technical calculations. In a secure environment, rapid changes may be resisted and the heterogeneity of preferences is undesirable.

Price vs. regulation

At producer level, the price of milk sold depends on quantity up to the quota level confirmed for each farm individually, as well as on milk composition and hygienic quality. At the current feed prices it seems to be profitable to produce up to the quota level. Quotas are neither transferable nor saleable, except to the government. The procedure of defining the milk price is presented in Exhibit 3.

Because of the shift in consumer preferences towards less fat, the importance of the butterfat content in the pricing formula has decreased and that of protein has increased. The shift started about 10 years ago. The change in the component pricing of raw milk has not, however, had the desired impact on the fat content of raw milk. In 1988, the farm milk component pricing system was the following:

- The target price is for milk with 4.3 % fat and 3.3 % protein.
- +/−0.1 % fat equals +/−2.2 p per liter.
- +/−0.1 % protein equals +/−2.6 p per liter.[15]
- Farm milk composition is determined monthly on the basis of the average results from two tests.

In dividing the raw material cost between various dairy products, one of the most difficult tasks is defining the value of the cream or skim milk to be added to or separated from the raw milk. When the alternative use of milk fat is often for (surplus) butter, and that of

[15] In 1989, the coefficient for fat was 1.5 and for protein 3.2.

skim milk for animal feed, neither is a very appropriate basis for defining the value of these components.

The allocation of raw material costs to various milk components is central in defining the profitability of the products. A common practice is to use the same values for milk fat and non-fat independent of the end product they are used for. One possible alternative is to use the values the components have in butter production. Another alternative, which is Valio's recommendation for calculating the production costs of dairies, is to allocate the component costs on the basis of paid producer prices. In this procedure, the value of the skim milk component is the price recommended by Valio minus the dairy's raw material purchase costs.

Seasonal pricing has been applied to decrease the seasonal variation in milk production. In addition, insemination fees are covered by the dairy cooperatives instead of by the farmers during the period from September to February. The target has naturally been to shift the calving to autumn by making the shift more profitable.

The target price secured by agricultural law definitely reduces the uncertainty of milk producers. However, it may also reduce the incentives for efficiency and general cost cutting, because the decrease or increase in costs will be taken into account in the following negotiation round.

It seems that despite the advantages of the administered milk pricing system in reducing uncertainty, it has increased the slowness to adjust to the changing marketing environment. When the regulative way of adaptation has been slow due to a political unwillingness to make changes, it has led to missed opportunities. In transactions where the suitability of the markets can be predicted, it has been difficult to use the markets because the administered price structure does not properly reflect preferences. Changing the rules of administered pricing is more difficult than changing those of a market system where there is no one to blame. Altering established rules requires a significant amount of political energy, and the changes tend to lag behind the real preferences in a rapidly changing, dynamic environment.

The producer price of milk also depends on the performance of the dairy cooperative in question. The price paid by different dairies may vary up to 30 p per liter.

Retailers consider milk as a relatively profitable article. Milk also draws customers to the store more frequently than the need for other products. There are no quantity discounts; small retail stores even have to pay small-order fees.

Governmental regulations play an important role in milk component coordination. The price ratio between butter and margarine is defined by law. Margarine is taxed so that the price of table margarine becomes 75 per cent that of butter (Anon. 1985, p. 112). The sales tax deduction system also works to value fat more than the other milk components. High-fat products such as butter and whole milk are oversubsidized, while partial sales taxes have been imposed on low-fat products such as non-fat and low-fat consumption milk (Pohjonen 1985, p. 42).

Table 4-4 presents the relative values added to consumption milk and Emmental cheese in 1975, 1980 and 1986.

Table 4-4: Relative margins of liquid milk and Emmental cheese in 1975, 1980 and 1986. Sources: Anon. 1981 and Anon. 1988d.

	1975	1980	1986
Liquid milk:			
Raw material	51.3	45.8	45.6
Processing*	27.4	26.5	25.5
Sales tax	9.7	11.8	12.7
Retail margin	11.6	15.9	16.1
Sales price, p/l	133	160	333
Emmental cheese:			
Raw material	49.7	37.4	36.8
Processing	22.1	29.8	28.4
Sales tax	8.9	11.0	12.4
Wholesale margin	4.0	5.8	6.0
Retail margin	15.4	15.9	16.4
Sales price, Fmk/kg	13.53	24.46	40.00

* includes transport, processing, marketing and loss

It can be observed that the relative value of raw material in the price of the final product has decreased. The value of consumer milk processing has decreased, but that of Emmental processing has increased. The government's and the distributor's share has grown. From this it may be concluded that if the tasks conducted have remained the same, the government and the wholesale/retail levels have been very successful in negotiating the administered prices of dairy products. The producers are the relative losers because, as is the case with many other products, the values added to the end products come from elsewhere than from raw material, especially from services. When the regulation was discontinued in October 1988, the margins could be expected to change, although slowly.

The government promotes butter sales by paying a subsidy so that butter can be sold at a lower price to the domestic food industry. This has made it possible to substitute a major proportion of imported margarine with domestic butter.

Changes in milk component pricing are reflected on the national economy as well. This can be illustrated by an example. Assuming that the target price minus sales tax refunding is 170 p/l, the fat component is worth about 107 pennies (62.7 per cent) and the skim milk component 64 pennies (37.3 per cent). In case of surplus production, the extra skim milk would be made into non-fat milk powder, a part of which would then be used as feed for dairy cows. When about 11 liters of skim milk goes into one kilogram of milk powder, the price would be 11x64 p = 704 p/kg. If the skim milk (protein) component is valued at 10 p/l higher, the milk powder price would increase from 704 to 814 p/kg. About 30 million kg of milk powder is produced for animal feed yearly at an average sales price of 10 Fmk/kg. The sum of 300 million Fmk represents about 10 per cent of the total dairy feed costs. Thus, a 10 p/l increase in the skim milk component (so-called value relation) would mean an increase of over 30 million Fmk increase in dairy feed costs. According to the farm income law, the increase in costs would be taken into account in the following round of milk target price negotiations, where by the subvention would shift from milk to the feed industry. As a result, in a situation of surplus production and as long as skim milk is valued in the same way regardless of its use either for food or feed, there will be problems in changing the value relation.

The Ministry of Trade and Industry and the central organizations of the dairy industry have made a contract according to which the state pays a butter storing subsidy as well as an interest subsidy, if the stored volumes are above the so-called base storage amounts, which are 2300 (metric) tons for Valio, 230 tons for Enigheten, and 50 tons for Maitotuote (Anon. 1985, p. 19).

Voice vs. exit

It can be stated generally that inside the dairy subsector the exit option exists only in producer input transactions. The alternatives inside the system are few, which limits the option of exiting the dairy marketing system.

In feeding decisions pertaining to milk production quantities, the producer has the option of choosing what kind of feed is given to the cows. The ratio between home-grown and purchased feed affects the quantity of milk produced, especially in years when the quality of the farm's own feed is not satisfactory. According to RYHÄNEN (1987) the amount of feed bought from outside the farm explains, depending on the size of the farm, from 20 to 40 per cent of the variation in farm profitability in regression equations. Dry hay is important but can be substituted by straw. If the silage is predried, dry hay or straw is not necessary.

In selling the milk, there are usually no buyer alternatives. Even on the borders of two dairy cooperatives, a farmer cannot choose to which cooperative he belongs. In this sense, exit is practically impossible. Since the dairies are mostly cooperatives, the voice option is still a possible way of expressing preferences.

However, the efficiency and real meaning of voice in large and complex cooperatives has been questioned. When the price of milk is administered and exit (without giving up production) is not possible, the milk production volume is the only thing the producer can influence. Even this is possible only up to the quota level. There would be an incentive for individual cost cutting, but the fact that any decrease in total costs is taken into account as a negative factor in the next price negotiation round does not support such behavior. Thus, at producer level there are two kinds of social traps (PLATT 1973) caused by the difference between individual and collective goals (1) with regard to restricting milk quantity,[16] and (2) with regard to cost cutting.

In some dairy products it is possible to substitute some milk components with other products. Milk fat can to a certain extent be substituted with other animal fats and vegetable fats. In the winter of 1988 there was a debate concerning the use of vegetable fat in ice cream, which, in January 1989, resulted in a new statute permitting their use and allowing the product also to be called ice cream. Vegetable fat is so much cheaper that the 3 million kilograms of milk fat used for ice cream yearly is in danger of being replaced by it (ALANEN 1988). The question now is, which is cheaper: to support domestic milk fat to make it competitive with vegetable fat, or to subsidize the export of unused milk fat? Valio, with its 60 per cent share of the ice cream market, is strongly in favor of milk fat, while the other ice cream manufacturers will be very tempted to become independent of the raw milk supply of Valio. It is also possible to substitute milk protein, but so far this has not been done in Finland.

[16] It has been stated that from the national economy's standpoint the export of whole milk powder is not feasible, although from the standpoint of Valio and some dairiesit is. If the dairy processing stage profits from this, the surplus should be refunded to the members. Still, that proportion which is refunded to the few dairies and members in question, will lower the income of all milk producers in the following year.

At the consumer end, milk and dairy products are often relatively difficult to replace with other products. However, alternatives exist both within dairy products and other competing products. E.g., consumers have an exit option with regard to milk fat content.

The exit option can rarely be used inside the Finnish milk marketing system. Control has been secured by preventing the use of price incentives for the promotion of individual action within the system. The only exit alternative is to exit the entire dairy system. Because of the complexity of the system, even the representativeness of voice can always be questioned. This means that the Finnish milk marketing system is very rigid toward small changes in the environment or in preferences. Incentives for adjustment have to come from the outside and be very strong in order to effect a change.

4.3.4 Performance

The performance of the dairy marketing system is a function of goals accepted by society, which, in turn, determines the criteria for good performance and efficiency. The politically accepted goals of regional and social policy have reduced the incentive to increase the efficiency of milk production, but have probably decreased the public social costs. Thus, the performance of the Finnish milk marketing system can hardly be considered as a problem of pure profit maximization. The ability of the system to reflect the preferences of various parties and to effect desired changes is taken here as a performance criterium, which were divided in the Marketing Systems Analysis framework into synchronization and adaptation coordination, and the distribution of costs, benefits and risk.

As a result of the analysis presented earlier in this chapter, the following conclusions can be made concerning the performance of the milk marketing system in Finland:

(1) The dairy marketing system performs better in synchronization coordination than in adaptation coordination. It

provides a secure supply of dairy products for consumers in relatively unfavorable weather conditions and a secure market with only minor price fluctuations for producers, and helps to settle regional policy issues regarding rural areas.

(2) The ability of the system to adapt to the quantitative and qualitative changes of the market can be questioned. Highly transaction-specific assets, together with centralized processing and distribution organizations in a closed market with administered pricing practices and high politcal influence, have created a very inflexible system, which is unable to adjust quickly enough to changes in the marketing environment.

(3) The coordination of the mismatch between supply and demand is to a great extent carried out by society. This lowers the pressure to adapt the system to the changing environment.

(4) The shift of power to the technostructure has favored technical progressiveness at the cost of market responsiveness, which creates uncertainty.

Implications of the distribution of costs, benefits and risk are presented in Table 4-5. The table is only indicative, but gives some idea about the distribution of costs, benefits and risk among the main participants in the prevailing dairy marketing system.

Overproduction up to quota and export limits can be seen as a benefit to the producers due to steady pricing. Overproduction is mainly paid for by the state. The cooperative benefits in the short run, but loses in the long run.

High, subsidized prices naturally benefit the dairy producers, although the price support may reduce consumer prices as well. The oversubsidized refunding of sales taxes is a benefit to the dairy cooperatives. The subsidies mean a cost to the state and the high dairy product prices to the consumers.

The incentives for efficient production are beneficial to an individual farmer in the short run, but a cost to the farmers collectively. This is because of the agricultural income law system, in which a reduction in production costs is taken as a factor decreasing milk price in the subsequent negotiation round. However, increased production efficiency is a benefit to the consumers.

Maintaining rural settlement through milk production policies is a benefit to the producers. The cost is paid by the state and the consumers. Food security policies distribute costs and benefits in almost a similar way, but they also support the retailers' security of supply.

In the prevailing production structure, the component pricing system, leading to the overproduction of fat, is a benefit to the producers. The mismatch is paid by the state and the consumers.

Reasonal peaks are a cost to the dairy processing system, which mainly coordinates the seasonal mismatch. A peak is a benefit to those producers who are able to adjust their production pattern accordingly, but a cost for those unable to do this. The consumers, who do not have a possibility the make use of the fluctuation through seasonally varying prices, pay for the peak in the form of higher prices throughout the year.

Slowness in adaptation coordination is a benefit both to the producers and the processing cooperatives, who do not have to change their SOP's and fixed assets. The consumers pay for the mismatch by having to buy products which have less value to them in their changed consumption preferences. The state pays for the mismatch in the form of increasing dairy product imports and surplus exports.

The risk of bad weather naturally affects the producers, even though they are collectively compensated for unfavorable weather conditions and, in addition, may get individual crop loss support. Thus, the risk of unfavorable growing conditions is divided between the producers and the state. Bad weather may also be a risk to the dairy plant.

The risk of cattle diseases affects the producer, but may also cause great losses to the processing plant. If the disease is not observed on the farm, the spoilt milk may contaminate a large amount of milk at the processing plant.

Table 4-5: Implications of distribution of costs (C), benefits (B) and risk (R) in the Finnish dairy marketing system.

Feature	Production		Distribution Retailer	State	Consumer
	Producer	Coop			
Overproduction	B	C		C	
Subsidized prices	B	B		C	C
Efficiency	C			—	B
Rural settlement	B			C	C
Food security	B	B	B	C	C
Fat overproduction	B			C	C
Seasonal peak	B/C	C		C	C
Maintaining present assortment	B	B		C	C
Bad weather	R	R		R	—
Cow disease	R	R	—	B	—

If the amount contaminated would be large, the state will benefit because of less export subsidies.

It can be concluded from the above analysis that dairy producers and their cooperatives will benefit, at least in the short run, if the prevailing system remains unchanged. Risks of unforeseen events are divided either between individual producers and the state, or individual producers and their cooperative.

4.4 KEY TRANSACTIONS WITH RESPECT TO EACH COORDINATION ISSUE

Division of a subsector into all its technically separable interfaces would result in an unnecessarily complex pattern. WILLIAMSON (1981, p. 1544) states that although more descriptive detail than is associated with neoclassical analysis is needed for this kind of analysis, even "a relatively crude assessment will often suffice".

The liquid milk marketing system is analyzed here with emphasis on transactions between "technically separable interfaces". A schematic presentation of the system is presented in Figure 4-7. The product flow is divided into stages starting from the farm-level choice of the production line and ending at the point where the milk is consumed. The transactions which will be considered more closely later in this study are numbered from 1 to 14. The decisions made in selected transaction will be briefly discussed in the following.

The milk system described below is that of the Valio Finnish Farmers' Co-operative Organization, which processes about 85 per cent of the milk in Finland. Only the main production lines of the entire variety of dairy production systems will be discussed. All the segments considered here may not be found in the same dairy processing unit.

Feed and heifer production (TRC 1 and 2)

The farmer has resources, labor, land and capital, for alternative uses. The decision on the production line involves binding a considerable sum of money for the investment in a cowshed, machinery and heifers (opportunity cost, asset-fixity). Also some decisions on the use of fields for feed production and on the use of the farmer family's time have to be made. In Finland, the licence for milk production requires a significant amount of feed production on the farm and work by the farmer family.

The farmer has the choice to buy either calves or heifers, the latter involving a larger out-of-farm investment but less farm work and a shorter wait for milk production. If the farm has no previous milk production, the time lag between the decision and the start of production is at least one year.

More common than starting milk production "from scratch" is a readjustment of existing dairy operations. Decisions concerning

the choice between hay and silage, e.g., require long-range planning of field and dairy operation machinery. Quantity decisions usually also involve a decision concerning the number of calves kept to be raised for milking cows. If new breeds are procured, they can be bought either as calves or as heifers.

Feeding, milking and milk storing (TRC's 3 and 4)

After the decisions at points 1 and 2, the scope of decision freedom at point 3 is rather limited. Long-term decisions concern alternative feeding and milking systems, but in the short run, individual decisions on feeding and milking, which usually occur simultaneously, have to be made twice a day seven days a week.

In order to obtain milk the cows are bred and one calf is born per cow per year. The calf can be raised into a new dairy cow or it can be sold for beef. Special beef cattle is rare in Finland. The choice of the cow breed, and the quantity and quality of feed, both affect the quantity and quality of the milk.

After milking, the milk is cooled and stored on the farm. Usually the farms have milk tanks with a capacity of 2—3 days' milk yield. Although storing is a "technically separable" stage, it is so closely connected with milking that for purposes of this study it is not practical to separate milking and storing from each other.

From farm tank to transport (TRC 5)

This is where a market or marketlike (cooperative) transaction often occurs. Transport from the farms to the dairy plant usually takes place three to four times a week. A special milk tanker drives to the farm and draws the milk from the farm tank into the truck tank. The milk volume is measured at this point.

Compared to earlier times when the farmer took the milk cans to milk stands along the main roads, the risk of inaccessibility because of bad weather or uncleared, snowy farm roads has now shifted to the dairy plant. Milk has to be kept cool all the way, which is naturally easier in the winter than in the summertime. The rationalization of milk hauling routes has been one of the main arguments for attempts to rearrange and centralize dairy operations.

Storing and preliminary processing (TRC's 6 and 7)

Upon reception at the dairy plant, the raw milk is weighed and recooled. Samples are taken for the measurement of fat, protein, antibiotics, etc., and the raw milk is transferred into large milk tanks. This is the transaction most vulnerable to externality spoilage.

From that point, the raw milk is delivered to other dairies if it has not been sent directly from the collection route to its destination. Milk, e.g., to the ice cream factories (about 300 million liters per year) is delivered directly from the collection routes without any treatment.

Raw milk is separated, standardized and pasteurized before further processing. Some skim milk may be delivered to other dairies after these operations. Inter-dairy transactions of transfer milk occur usually at points 6 and 7.

Choice between alternative uses of raw milk (TRC 8)

The decision about the amount for liquid milk and for other uses is made at point 8. The perishability of the products is the main short-term factor affecting the decisions on quantities allocated for different purposes. This happens generally as described in the section on standard operating procedures.

Liquid production line:

First, the milk for liquid products is homogenized, and allocated for consumption milks, fermented milks and UHT products (TRC 9).

Liquid milk for consumption is transferred into a tank to await packaging. The most common package size is one liter, and some deciliter, half-liter and 20-liter packages are made. After packaging, the milk is taken in-

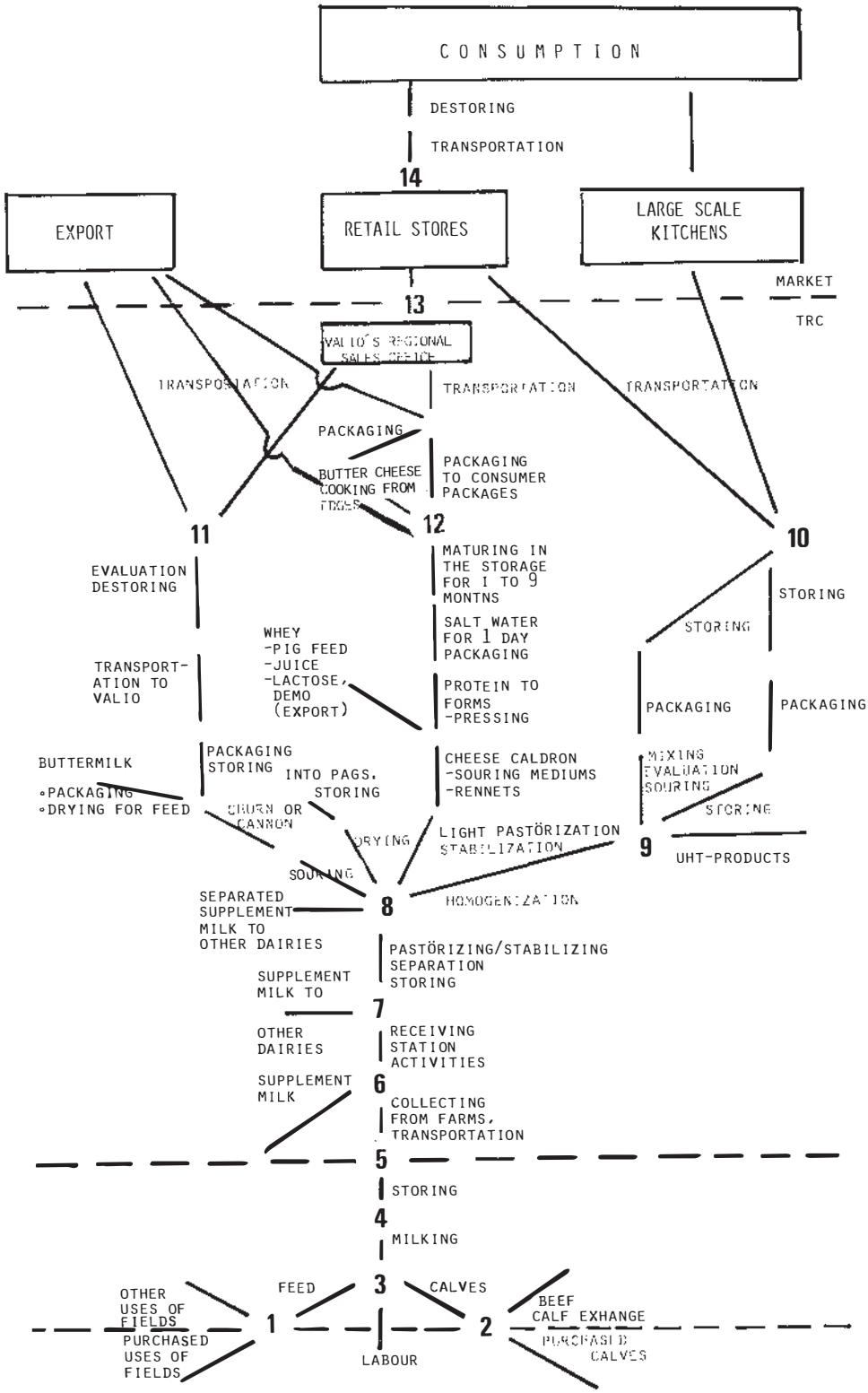


Figure 4-7: Technically separable interfaces of the Finnish dairy marketing system.

to the storage for delivery to retail stores and large-scale kitchens.[17]

Milk for fermented milks — one-tenth the quantity used for consumption milk — is fermented overnight. It is then mixed and quality-controlled before packaging. The packages are then taken to the storage to await distribution.[18]

A storage is needed for balance the uneven flow from the packaging section to the delivery. Liquid products are distributed directly from the local processing plants to retail stores and large-scale kitchens (TRC 10). The other products are delivered through Valio.

Cheese production line:

After standardization and pasteurization, the raw material for cheese is transferred into cheese vat, where starting cultures and rennet are added, after which it is cooked.

The protein part, cheese mass, is separated by pressing in cheese molds. The whey is drained and used in some juice products, in lactose manufacture or dried for pig feed. The cheese mass is held in salt water for one day, before it is packed for ripening. In the ripening storage, the cheese is held — depending on the cheese type — from six weeks (Edam) to a period of three to nine months (Emmental).

The ripened cheese is transported to Valio's storage for quality control, after which it is packaged into consumer packages for delivery to Valio's regional sales offices for distribution. Some of the cheese is kept uncut for delivery to large-scale kitchens and cheese shops, or for export. The pieces of cheese left over from cutting the cheese into consumer package sizes, are cooked into processed cheeses and packaged for delivery to Valio's regional offices.

Butter production line:

The cream for butter is separated directly from raw milk, or, to a certain extent, obtained from various processes making other milk products as surplus. The cream is ripened overnight before it is put into a butter churn, or more often at present, into a continuous butter making machine. In addition to butter, the process produces about 1.3 times as much buttermilk, which is mainly used for feed after drying. About one-fifth is packaged and sold to consumers.

The butter is packaged and taken to a butter storage, from which it is transported to Valio for quality control and storing. The main part is sold for consumption through Valio's regional offices. The rest is stored and exported.

Milk powder production:

Milk is dried into both whole and skim milk powder and packed into bags. Depending on the type of powder, it is used either for other consumer products, as raw material for the food industry, as feed for animals etc.

Retailers' buying decisions regarding non-liquid products (TRC 13)

As mentioned before, Valio's regional sales offices market all the other dairy products except for liquids. Retail stores purchase these products directly from Valio's offices, which receive the goods from the dairy processing plants.

Consumers' buying decisions (TRC 14)

At this point the consumer makes his buying decision from among dairy products as well as their substitute products.

The basic setting tasks, i.e., the technically separable interfaces, of the dairy marketing system were briefly described above. TRC can be used to analyze the different ways of organizing these tasks. In following chapters some specific coordination problems will be considered. Those transactions will be pointed out which are critical in respect of each problem.

[17] According to the food legislation, all consumer milk products must have the last selling date on the package. The last selling date for milk is the fifth day after packaging (packaging day + four days).

[18] There are no specific regulations on the last selling dates for fermented milks in Finland, but dairies mark the date, usually 10—14 days after packing, on the package voluntarily.

5 SYNCHRONIZATION COORDINATION

5.1 OVERALL BALANCE

5.1.1 The issue

Like most West European countries, Finland continuously produces more milk than it consumes. The development of milk supply and demand during 1950—88 is presented in Figure 5-1.

The main structural change has been the decline in milk consumption directly on the farm, which still in 1950 was about equal to the quantity delivered to dairies. By the late 1980's, direct consumption on farms had fallen to less than 10 per cent.

It can be seen in Figure 5-1 that the total supply of milk through dairies has remained at about the same level during the last 25 years. Only the last couple of years show a downward development. The total consumption of milk, however, has declined, resulting in a continuing surplus. The total supply has not been able to adjust itself to the declining demand.

Total support to the dairy subsector in 1950—85 (deflated using the gross price index to the 1985 price level) is presented in Figure 5-2. The subsidies are divided into production,

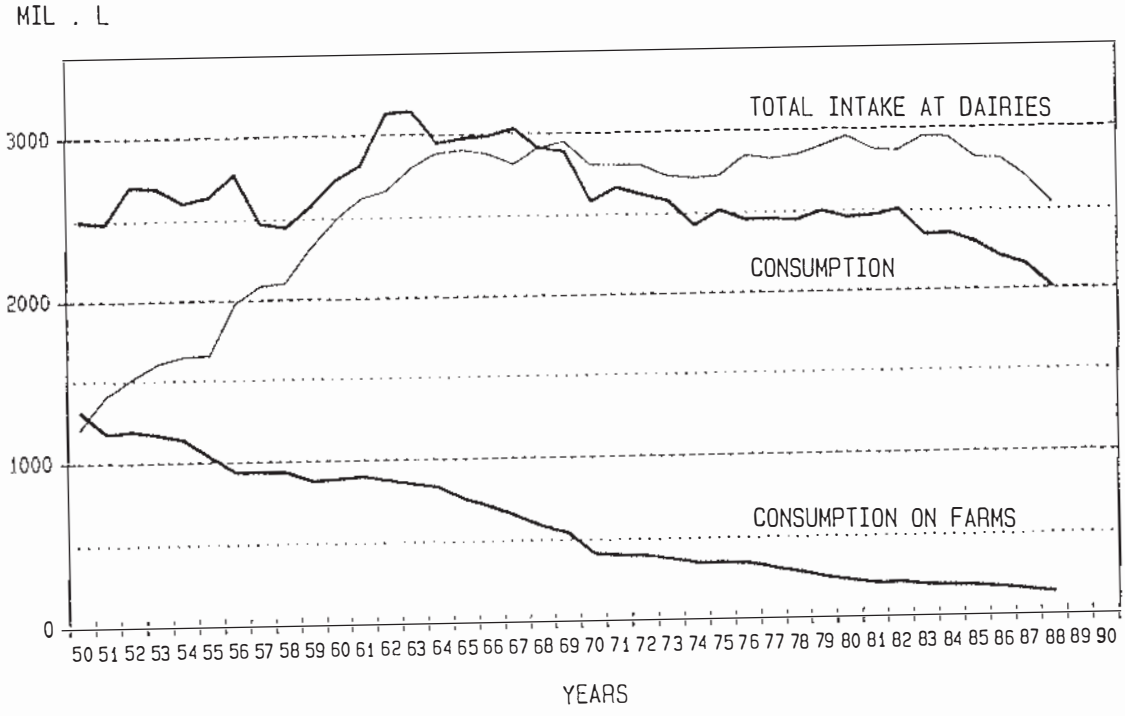


Figure 5-1: Supply and demand of milk in Finland 1950—88
Source: PSM

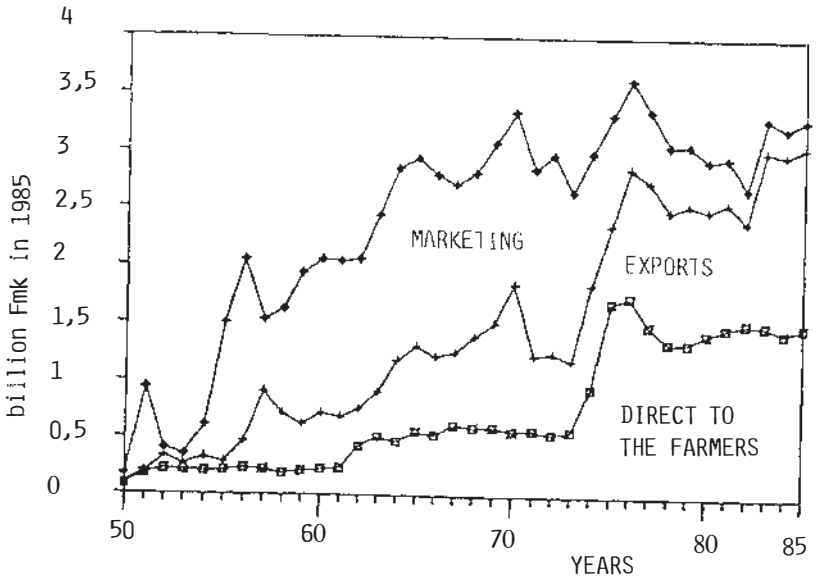


Figure 5-2: Total subsidies to the dairy marketing system in 1950—85. Source: SALONEN (1989).

export and marketing support. The figure shows an increase in total subsidies, and it can be seen that the trend is due to increased export and production support. Marketing subsidies have actually decreased. The total support to the dairy industry is at present in the order of 3.5 billion Fmk, of which export subsidies alone account for 1.5 billion Fmk. As mentioned above, public opinion is becoming increasingly unanimous that this is too much.

Negotiations concerning the liberalization of international trade within the European Community and GATT will also affect the Finnish dairy industry. Whatever the results of the negotiations, it will be more difficult to continue the current development.

The problem of coordinating the total supply and demand of milk raises the following questions: Why has the total supply of milk not decreased? What is hindering the change? Who would gain and who would lose if the prevailing incentive structure were to decline?

The origins of the mismatch between overall supply and demand of milk can be found in the post-war period. From the 1940's to the 1960's, increasing the quantity of milk supply was a major goal of dairy production policy. As mentioned before, the structure of the farms combined with the strong political power of the agricultural population supported the establishment of a legislative system that promoted the increase of milk production. Despite the existence of the milk surplus problem for at least 25 years now, the situation has remained unchanged. Recent years show a development in the right direction, but it is still too early to say whether this is due to unexceptional weather conditions or whether it is a permanent trend.

The first time Finnish agriculture faced surplus problems was in the crop year 1955—56. Surplus subsidies were considered as agricultural income, and this principle was included into the first agricultural income law in 1956 (HASSINEN 1986). The law also provided the milk producers with stable prices, in which unpredicted changes in production costs and, to some extent, weather conditions were taken into account. A farmer's income was tied to 85 per cent of an industrial worker's average salary. Uncertainty was drastically reduced and externalities related to, e.g., social, regional and employment policies supported the development. External goals were, as a matter of fact, even more important than internal goals in strengthening the development

which led to the present surplus problems. The Farmers' Union warned, already in 1957, about the trend towards surplus problems, but at that time unemployment was too serious for the situation to be corrected (HOKKANEN 1980, p. 100).

In the first half of the 1960's, the problem was more widely recognized, but no real measures were taken. Bad crop years delayed action as well. The first legislative step was the introduction, in 1970, of a premium for the slaughter of dairy cows. According to HOKKANEN (1980, p. 104) — and as TRC's asset-specificity principle would predict — its effect was most notable on the large farms in southern Finland, which had the most alternatives to dairy production.

Since the farm income law guaranteed a fixed price for producers, farmers could only influence the quantity produced. The economies of scale on small farms, combined with rapid technical development, was likely to lead to an increase in production quantities. Income from farm forests made it possible to finance new investments, and lack of alternative production possibilities made it necessary.

As mentioned before, the transaction costs of legislative redesign are higher than those of making minor changes to overcome the most urgent problems. This has resulted in a situation in which the negative effects of surplus production have been corrected, but which provides no significant incentives for changing the production. The quota system and the bonus system (to be discussed in the following section), together with the principle of transferring part of the costs of the export subsidies to farmers, are among the first legislative actions towards a permanent control of supply. It may be concluded that no link in the chain — except perhaps the dairy cooperative personnel — has real incentives to reduce milk quantity.

5.1.2 How the problem arose

Current policy

The means of coordinating the mismatch between the overall supply and demand of milk have been almost entirely administrative. The production shift contract introduced in 1977 was an agreement between the state and the dairy producer. The producer agreed to discontinue milk production, and the state agreed to pay 15—35 per cent of the income lost per animal taken out of production. Other, non-animal production (with some exceptions) was allowed. Additionally, an export marketing fee has been collected from the milk producers since 1977.

A bonus is a government offer to pay a milk producer for not producing milk. Bonus contracts are typically made for five years. The first contracts, issued in 1981, required a decrease in milk production by at least 25 per cent, and since 1984, by 15 per cent. The state agreed to pay 50—90 p per liter of unproduced milk. A premium was paid for cows used only for feeding beef calves as an incentive for shifting from milk into beef production.

A new milk bonus system was issued by governmental statute in January 1988. The state offered to pay, for a period of five years, 1.20 Fmk for each liter of milk left unproduced in comparison with 1987 production up to 50 000 liters, and then 0.60 Fmk up to a maximum of 80 000 liters if the producer discontinued the production of milk entirely. The money for the bonuses was distributed to the agricultural districts (areal organizations of the Ministry of Agriculture and Forestry) in proportion with the actual production quantities. Because the 1988 offer was considered very attractive by the producers, an order of preference had to be made favoring farmers between ages 55 and 65.

During 1977—84 about 11 600 production shift contracts, 10 500 milk bonus contracts and 1000 beef production contracts — 23 150 contracts altogether — were made (SEREN 1985, p. 6). According to the same report (p. 15), the effect of voluntary contracting with the aim of decreasing milk supply has been relatively modest. Only 10—20 per cent of the contracted farms may have decreased their production because of the contracts, while the others might have done it anyway. The con-

tract may have sped up the process of quitting somewhat, by a year or two. But even a temporary decrease in milk production on account of the bonus contract has lowered the cost of surplus exports by more than what is paid to the farmers as bonuses (p. 59).

The establishment of new dairy farms became subject to licence in 1978. Unlike the measures discussed above, this is a compulsory means. In addition to attempting to limit production quantity, the aim was to prevent the establishment of large non-family dairy operations. At first, a licence was required for herds over of 30 dairy cows. In 1982, this was decreased to 20 cows, and in 1984 to 8—20 cows. This has considerably increased the barriers of entry into the dairy farming business. Only in exceptional cases, a permit to start a new dairy operation has been issued. Enlargement above the given quota has become subject to licence. According to MÄKINEN (1988, p. 74), this system has slowed down structural development regarding the size of dairy production units, because the licence defines the maximum size of an operation. The average size can increase only when dairy farms smaller than the quota size quit their operation.

A milk production quota was issued for each individual farm at the beginning of 1985. MÄKINEN (1988, p. 75) states that the quota system became necessary because the market signal to producers, in the form of marketing fees, about the worsening market situation had proved too weak to effect a decrease in production. According to the quota system, a farmer was free to produce up to 30 000 liters of milk per year, which corresponds to the production of about five or six cows. Above that, an individual quota was established for each farm according to past production. Above-quota production became unprofitable, because only a world market price was paid for the surplus amount.

Although the quota system is an effective guarantee for preventing even higher overproduction, it involves some considerations. It provides no incentives to producers to improve efficiency, nor does it take into account the different life cycles of the farms. Thus, it has been necessary to give additional quotas, e.g., to young farmers. For some producers the quota has been too loose, and still today, only around 77 per cent of the total quota amount are actually being produced. MÄKINEN (1988, p. 75) points out the effect of lumpy inputs of cows on small farms unable to meet the entire quota, since adding one more cow to the herd might raise production above quota.

Other administrative means such as marketing fees will not be analyzed in this study. KOLA (1989) provides a good description of the full range of administrative means for overall balancing.

Key transactions for improving overall balancing

The key issues affecting milk quantity decisions are related to:

(1) Number of dairy farms — exit/entry barriers;
(2) Number of dairy cows on a farm — economies of scale;
(3) Level of milk production — marginal revenue; and
(4) Utilization of milk surplus — incentives for export.

The first aspect concerns the exit and entry barriers in dairy production, which has been the traditional form of farming in Finland. The operation and the skills have been passed on from parents to their children, and dairying has been the natural way of living on a farm. During recent years this has begun to change. When the government issued the milk bonus system, about 6300 applications were made, five times more than could be accepted. The applicants included many large-scale farms, and also several young farmers expressed their willingness to quit farming. Transaction specific investments and the lack of alternative sources of livelihood increase the exit barriers. On the other hand, it has been the goal of governmental policy to keep the rural areas populated, in which the role of dairy farms is very important.

Entry barriers consist of human factors, site-specific investments and administrative barriers. It is not usual that a farmer who has quit dairying and already become used to a more flexible day schedule is willing to restart a dairy operation. If new investments have to be made, they are high and provide no alternative uses, although governmental loan interest support for small units is available. Moreover, the government keeps a strict control over new entrants into the dairy business: a licence is needed to start operations, and another for the production quota.

It can be concluded that the entry barriers into dairy production seem to be higher than the exit barriers from dairy production. This decreases the frequency of decisions to quit and start again.

The question of herd size is mostly dependent on governmental regulations in the prevailing price structure. Most producers would have an incentive to increase the number of cows, but the milk quota system restricts it. Without governmental regulations there would be fewer and larger farms in Finland. From the viewpoint of the dairy industry, this would be a healthy development, but not from the point of view of rural settlement. Thus, the number of dairy farms is very much a political problem, especially if it is to be reduced in the short run.

According to a working group report of the Ministry of Trade and Industry, the prevailing food export system works satisfactorily from the governance point of view, but the picture is different from the standpoint of the national economy. As the principle is full and, in practice, almost automatic compensation of all dairy product export transactions of firms, export support is paid independent of the prices received for the sold products. The export price of a good does not affect the economy of the exporting firms at all. Because of this, the system does not provide any incentives to the firms to attempt to find good export prices and export markets. (Anon. 1987f, p. 18).

In the prevailing system, the government bears the cost of surplus exports. This export system itself releases pressure to decrease the surplus. The development of surplus export quantities and costs is presented in Figure 5-3. It can be observed that the cost of export has become more and more expensive. The export

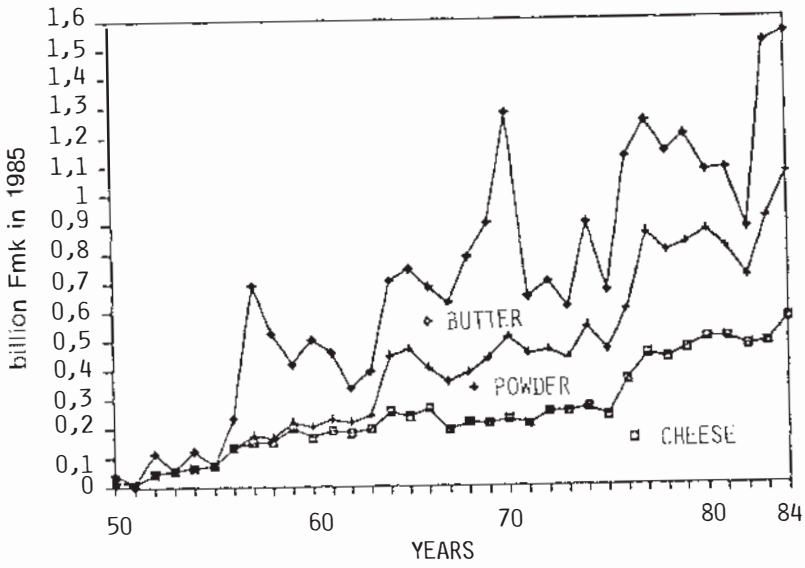


Figure 5-3: Quantity and cost of milk surplus exports in 1951—84. Source: The Agricultural Economics Research Institute.

system will be analyzed more closely in Chapter 6.

Since the domestic consumption of dairy products cannot be raised and it is not profitable to considerably increase their export, the only possibility to correct the mismatch is to decrease the total supply of milk. The number of dairy cows per production unit is already so low compared to the economies of scale of dairy production that a reduction in herd size and number seems difficult. It is not very economical to lower the production per cow, either.[1] The most likely solution to the coordination problem seems to lie in decreasing the number of farms. This, however, is in conflict with regional and rural settlement policies because, in many areas, there is a of lack of alternative sources of livelihood. The lack of alternatives together with transaction-specific assets causes both political and individual slowness to adjust, and the present policy has been insufficient to give impulses for the system to do this.

In order to set a target for a sufficient milk production volume, self-sufficiency production in the lowest quarter of the year has to be calculated. A calculation for determining the minimum required production of the present type of milk (4.34 % fat, 3.24 % protein) is presented in Exhibit 4. The calculation is based on the assumption that the raw material for liquid products, cheeses and butter to be produced in each quarter of the year corresponds to actual domestic consumption. Some milk powder (66 per cent of the present production) also has to be produced for food items.

The calculation shows that 2020 million liters of raw milk would have satisfied the need in 1987 in the lowest-production (fourth) quarter. Because of seasonal variation, the other three quarters would still produce a total surplus of 345.5 million liters. The "target" would be 75 per cent of the present actual quantity, which would correspond quite well to the present domestic demand.

The overall effects of reducing milk production from 2700 to 2020 million liters would be the following:

- 340 000 dairy cows producing an average of 5940 liters per year would be enough. The number of dairy cows in 1986 was over 600 000.
- 27 000 dairy farms having 13 such cows could take care of the required production. In 1986 the number of dairy farms was about 60 000.

According to the above analysis, the problem of coordination of total supply and demand of milk can be expressed as follows: How is it possible to decrease milk production from 2700 to 2020 million liters either by means of the market, the government or cooperatives, and what consequences would these measures have for each party involved?

5.1.3 Alternative policy measures: price, quantitative control, and cooperative adjustment fund

Price

(a) Analysis based on production economics

The traditional theory of production economics presents the use of two inputs in a closed environment as shown in Figure 5-4.

The intersection of MVP and MFC in Figure 5-4, point O, is where the input use is op-

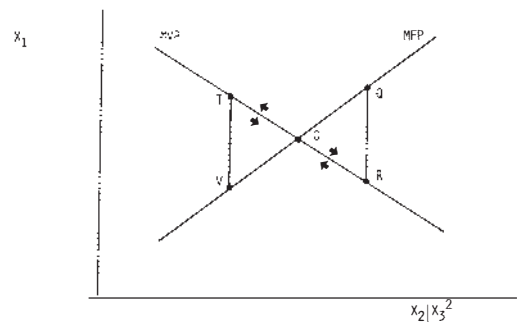


Figure 5-4: Relation between the marginal value product (MVP) and marginal factor costs (MFC) of two inputs.

[1] The average production of a dairy cow is now about 5000 liters per year. Even without using hormones, the production could be doubled (Anon.1988j).

[2] The third input, X_3, is a constant.

timal for its production value. If the MVP of input X_2 decreases to point R, the loss is shown as the difference between R and Q. Their producer has an incentive to divest some of X_2 and return back to point O. If MVP increases to T, the profit shown as the difference between V and T acts as an incentive to invest more in X_2, which leads back to the equilibrium point O. The movement on the MVP line is reversible.

In reality, however, reversibility has not always proved to be a correct assumption. Especially in agriculture where inputs such as land, climate and human skills are very site- or transaction-specific, reversibility is either not costless or it is not possible. This means that price changes alone cannot act as coordination mechanisms for such large changes.

The prerequisite for reversibility is that the acquisition value of an input is equal to its salvage value ($P_A = P_S$). However, when acquisition and salvage values differ ($P_A > MVP > PS$), a level in where it does not pay to invest more if the MVP increases, but it does not pay to sell if MVP decreases, either. The price variations do not affect the production within that level.

The examination here follows the analysis of production economics presented by JOHNSON (1972). The basic model is

$$Y = f(X_1, X_2 \mid X_3)$$

where the rate of asset-fixity is defined as the difference between the acquisition and salvage values of the input as follows:

$$\infty > P_{XiA} > P_{XiS} > 0 \text{ for } i = 1, 2$$
$$\infty = P_{XiA} > P_{XiS} = 0 \text{ for } i = 3 \text{ (i.e., } X_3 \text{ is fixed)}$$

By defining the marginal value product (MVP) lines as the locus of all the points for which the MVP of an input is constant, the graph presented in figure 5-5 can be drawn.

Replotting the diamond defined by the intersection of the isomarginal value product lines for P_{X1A}, P_{X1S}, P_{X2A}, P_{X2S}, and drawing the perpendiculars from the corners of the diamond divides the X_1X_2 plane into 9 areas and yields Figure 5-6.

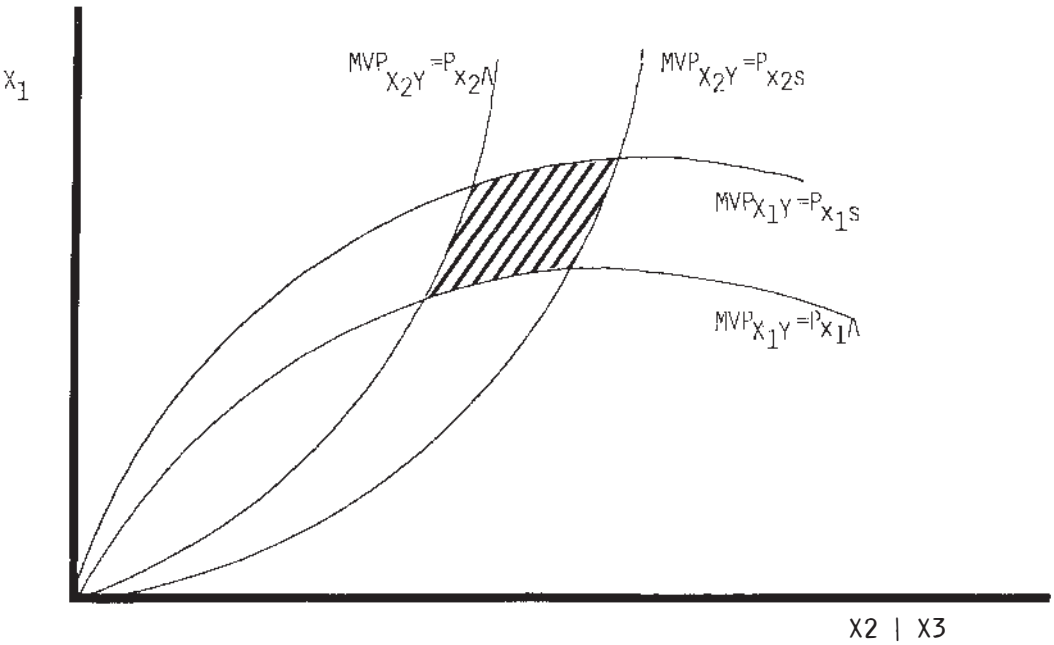


Figure 5-5: Marginal value product of acquisition and salvage values of two inputs.

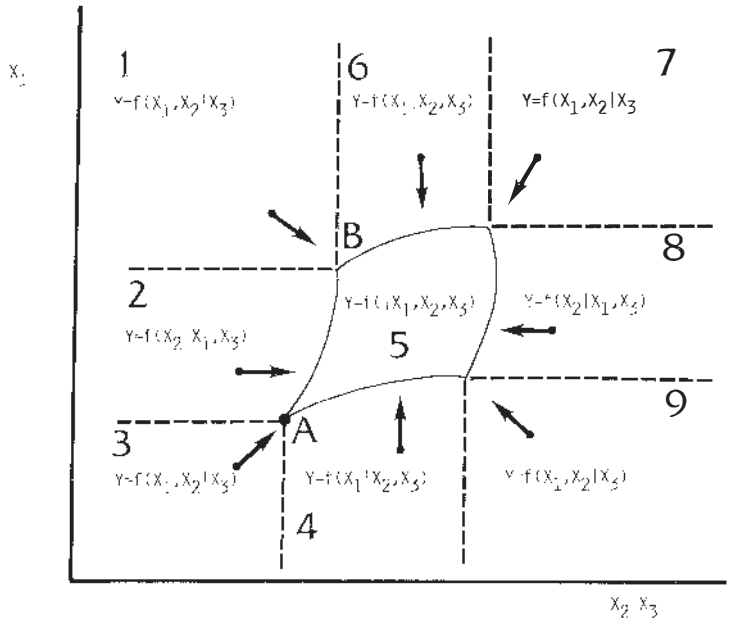


Figure 5-6: The isomarginal value product lines for acquisition and salvage values of two inputs.

If a producer had perfect knowledge, he would always arrange his input use so that he would operate at point A. At that point $MVP_{X1Y} = P_{X1A}$ and $MVP_{X2Y} = P_{X2A}$, i.e.

$$\frac{MVP_{X1Y}}{MVP_{X2Y}} = \frac{P_{X1A}}{P_{X2A}}$$

If, however, the producer has imperfect knowledge about prices, production relationships, etc., he may end up operating at a point other than A. If he ends up operating in area 3, he has made the mistake of underproducing, since $MVP_{X1Y} > P_{X1A}$ and $MVP_{X2Y} > P_{X2A}$. This can be corrected, since by increasing the use of both inputs he can move to point A. It is to be noted that in zone 3 the producer is operating in the subfunction $Y = f(X_1, X_2 | X_3)$. The subfunctions appropriate to each zone are shown in Figure 5-6.

If the producer ends up in any other zone than 3, he has made a mistake that is not entirely correctable. E.g., if he is in zone 1, $MVP_{X2Y} < P_{X2A}$, he expands his use of X_2; and $MVP_{X1Y} < P_{X1A}$, so he sells some of his X_1. He then moves along the subfunction $Y = f(X_1, X_2 | X_3)$ until he reaches B, where $MVP_{X1Y} = P_{X1A}$ (so he quits selling X_1) and $MVP_{X2Y} = P_{X2A}$ (so he quits buying more X_2). At point B all inputs become fixed.

Similarly, if he is initially in any zone except 5, he operates along the subproduction function shown in Figure 5-6, moving towards the edges of the diamond in the manner shown by the arrows, and ends up in zone 5, where all inputs are fixed:

$$P_{X1A} > MVP_{X1Y} < P_{X1S}$$
$$P_{X2A} > MVP_{X2Y} > P_{X2S}$$

Therefore, if in zone 5, he will not change his input use.

If the producer is initially in any zone except 3, he will, after he has adjusted his input use, end up using more of one or both inputs than he would under a perfect knowledge condition (point A). Mistakes of underproduction (zone 3) are completely correctable, but beyond point A, there is a tendency to overproduce, because mistakes of overproduction are not entirely correctable.

If acquisition and salvage values were equal, zone 5 would collapse into a single point and

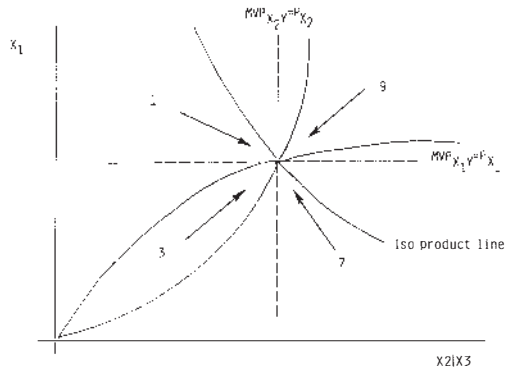


Figure 5-7: Use of two inputs when their acquisition and salvage values are equal.

the graph would look like in Figure 5-7 (JOHNSON 1972). In this case, the mistakes regarding overproduction would be entirely correctable, since one could always "sell one's mistakes".

The analysis shows that transaction-specific assets cause overproduction under circumstances of imperfect knowledge. Although the uncertainty regarding producer prices in Finnish dairy production is low, the uncertainty related to, e.g., climatic conditions, combined with highly transaction-specific assets such as a cowshed, will result in a similar situation as in Figure 5-7. This suggests that price alone cannot solve the problem of overproduction.

(b) How low should price go to effect exit?

The marginal value product of input X_i is Marginal Physical Product times the price of the product.

$$MVP_{XiY} = MPP_{Xi} * P_Y$$

In the conditions of assetfixity,

$$P_{XiS} \leq MVP_{XiY} \leq P_{XiA}$$

The condition for exit is

$$P_{SXi} > MVP_{XiY}$$

Exit by decreasing the price would depend on the difference between the acquisition and salvage values of the input.

An example may clarify the situation: A new cowshed will cost 500 000 Fmk and be amortized in 10 years by 50 000 Fmk per year (without interest). 0.5 Fmk of every liter produced in a year will go to cover the investment, i.e., 100 000 liters per year. The salvage price of the cowshed is 50 000 Fmk, which equals 5000 Fmk per year. Thus 5 p per liter each year is enough to cover the salvage value. This means that the producer price of a liter of milk may drop by 0.45 Fmk without causing exit. If the situation is the same in labor and in feed production, we may conclude that a decrease of 1.35 Fmk will cause no exit.

In conditions of limited entry into the dairy business, with production quotas and a product price negotiation system, it can be assumed that the producer price of milk is relatively close to the acquisition price of inputs. This means that a decrease in producer price would first have to cover almost the entire difference to reach the salvage value MVP.[3]

In order to make fixed assets more flexible, their salvage value has to be brought closer to their acquisition value. Can the salvage value of dairy farmers be sufficiently increased by training them for another profession? What is the social salvage value when the only alternative is unemployment?

The next chapter will examine a similar bid for dairy operations having different salvage values.

(c) Empirical analysis based on the milk bonus system

To determine how market means could be used to decrease the number of dairy farms, the farmers should be asked how much they would have to be paid to stop producing milk. The bonus system can be understood as the government's offer to dairy producers to give up milk production. It is interesting to study who would be willing to take the (relatively attractive) offer. Transaction cost economics

[3] It is probable that the producers' first response to a price decrease would be an attempt to increase the quantity produced in order to maintain their income at the same level. If the quota allows this to happen, development will take the opposite direction than intended.

would start by examining the transaction-specific assets. The last to quit would be the producers with the largest sum of physical, site and human fixed assets. The most willing to quit would be the producers with the most alternatives outside their present dairy production, i.e., whose dairy operation has the highest salvage value relative to the alternatives.

According to TRC, the following hypotheses can be made:

(1) Farms in southern Finland are more likely to take the offer than those in the north.
(2) Large farms are more likely to take the offer than small farms.
(3) Young and more educated producers are more likely to take the offer than old and less educated farmers.

Despite the lack of adequate data, a brief attemt to test the hypotheses will be made below.

Hypothesis 1:

The proportion of dairy farms applying for the bonus contract in February 1988 varied from one agricultural district to another, the highest being 28 per cent of all the dairy farms in a district and the lowest below 5 per cent. The proportion of applicants in 19 districts (officially numbered 1—19 starting from the capital area in the south and proceding northward) are presented in figure 5-8. It is easy to see that the districts with the lowest numbers have the highest proportion of applicants. Hypothesis 1 gets confirmation.

Hypothesis 2:

Figure 5-8 also gives the average dairy herd sizes by agricultural district. The correlation between the share of applicants and herd size is 0.63, which is significant.[4] Table 5-1 pre-

[4] At P = 0.01 level, the correlation coefficient is 0.549 when n = 19.

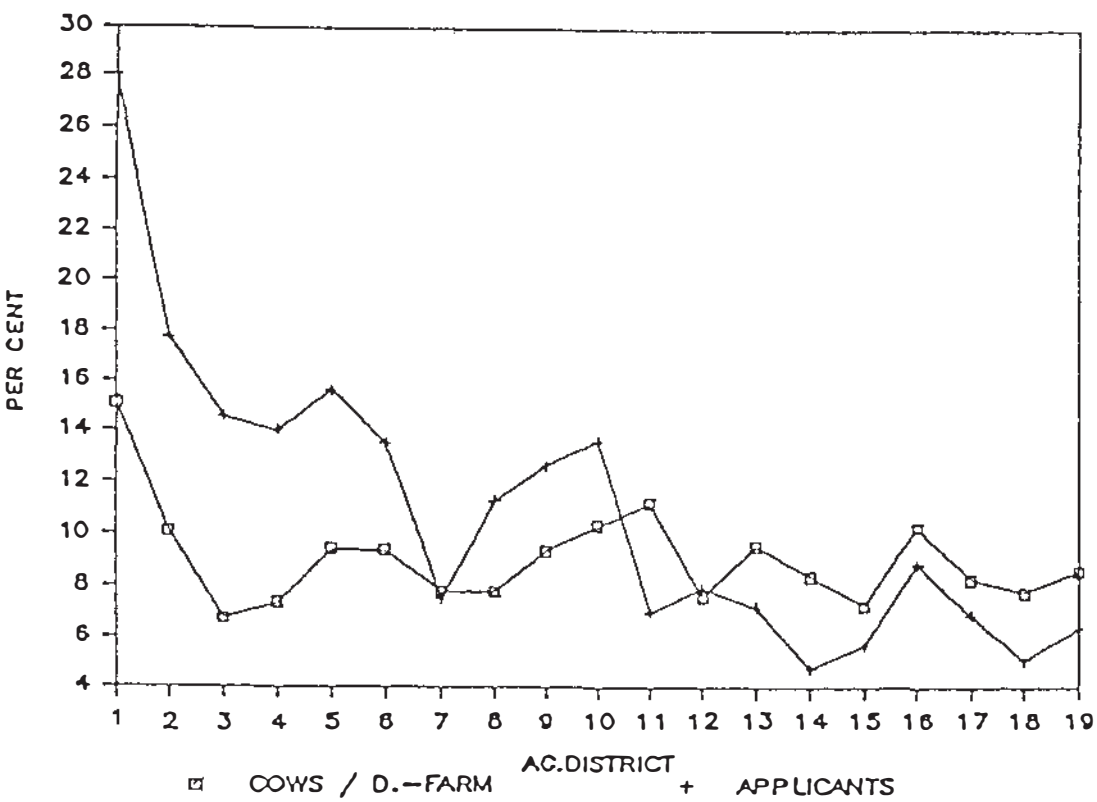


Figure 5-8: Bonus applicants by district and average dairy cow numbers per farm. Source: National Board of Agriculture.

sents the division of the 1981 bonus dairy farmers by herd size, including a comparison with reference groups. F = 9.98 illustrates the difference of variances between the herd sizes of bonus applicants in 1981 and all dairy farms farms in 1980.[5]

Hypothesis 3:

Table 5-1 presents the division of 1981 bonus farmers by age groups. Compared to the age distribution of all farmers (F = 30.1) it can be seen that the bonus farmers belong to younger categories than farmers as a whole. No data are available for testing the part of the hypothesis concerned with education.

Table 5-1: Division of milk bonus farms in 1981 and reference groups by age and herd size (%). Source: National Board of Agriculture.

	Bonus 1981	All farms 1980	All dairy farms 1980
Farmer's age:			
—44 yrs.	23.8	26.5	
45—54 »	33.4	25.9	
55—64 »	31.8	25.3	
65— »	11.0	22.3	
Herd size:			
—3 head	9.1		22.6
4—6 »	31.4		28.7
7—9 »	21.5		21.2
10—19 »	30.2		23.9
20— »	7.8		3.6
No. of farms:	1 532	212 630	85 196

The following conclusions can be drawn from the analysis:

(1) Fixed assets seem to explain a major part of the effects of an individually based bonus system. It may be questioned whether the largest farms closest to consumption are the most suitable ones to withdraw from production in the long run from the standpoint of production economics. If the bonus system continues, the last farmers to continue dairy production will probably be the remotest small farms with no alternatives or with low economic sensitivity in their operations.

(2) If the goal of structural policy is to support small dairy farmers and dairying in the north, the bonus system seems to work towards this goal.

Bearing in mind that each 100 million liters discontinued for five years will cost about 580 million marks to society at the present bonus level, it may be asked whether there is no cheaper way to reach the same goal. The above analysis showed that the applicants are not necessarily those producers whose discontinuation would be most desirable in the long run. On the other hand, as also stated by the analysis of the 1981 bonus system (SEREN 1985), a large proportion of the applicants may be such who would have quit anyway within a couple of years.

Since the height of the threshold for quitting varies, should the offered bonus vary accordingly? Should the government issue an auction for offers to quit, which would solve the problem of paying extra in a case where a smaller bonus would suffice? But would the frequency of transactions become so low that the market would not work? Would the opportunity cost be too high? Would the scope of decision freedom be too large (see Figure 2-6)?

Quantitative controls

(a) Prevailing quota system

In order to decrease surplus production, the Finnish government issued quotas for the dairy farms in 1985 based on their average production in the preceding three years. Farmers producing above their quotas must pay a levy on the excess, amounting to about 80 per cent of the total producer price (see Exhibit 3).

The quota system has had a certain effect towards a reduction of surplus production. However, in many individual cases, quotas have been considered unfair. E.g., young

[5] Analysis made by KÖYLIJÄRVI (1988) of a sample after the 1987 bonus gave, however, an other kind of a result the average size of herds being 10.3 dairy cows compared to 8.5 cows of bonus applicants. This may be explained either by the lag effect of earlier bonuses or that the size of the herd noes not explain the variety of alternatives very well.

farmers with an already uneconomical dairy unit size to start with, have felt themselves to be in danger of losing their future income unless their quota was raised. No single answer has been found to the question of what a fair production quota is.

Because the quota cannot be sold, it has come to mean in some cases a significant portion of the farm's total value. When a quota was set for each individual farm, it became a part of the farm's fixed assets, which in turn increased the difference between its acquisition and salvage values. There are no data available for estimating the value of the quota. According to the authorities of the National Board of Agriculture, its effect on the total value of the farm is "considerable". What raises the value of the quota even more is the fact that giving up one's milk quota is almost the only way to acquire a pig production licence which in turn decreases the asset fixity of the quota.

As shown in Figure 5-9, an increase in fixed assets increases the size of the "diamond" presented in the former section. When the value of a dairy operation increases in relation to its alternative uses, P_{X1S} shifts to $P_{X1S'}$ and P_{X2S} shifts to $P_{X2S'}$. This means an increase in the area where no changes in production are made.

Thus, although the quota system to some extent prevents the further increase of surpluses, it makes it more difficult for farmers to give up dairy production. This is because the quota is only transferable with the farm. The system has also created an incentive to produce as close to the quota as possible, even though only around 77 per cent of the quota is actually met on an average farm.

The government has thus given a free value increase of their dairy farm assets to the farmers remaining in the dairy business. This can be considered as a cost for those producers who either have no quotas or who have a quota of uneconomical size. The effects on allocative efficiency are not favorable when produc-

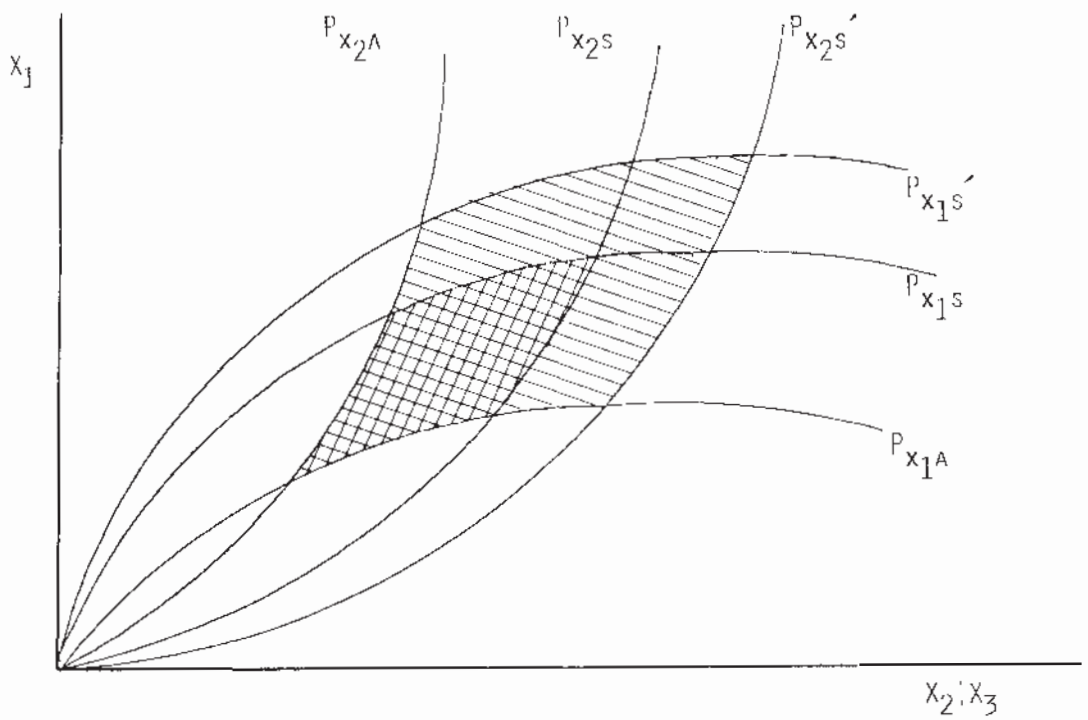


Figure 5-9: Effect of farm quotas on the difference between acquisition and salvage values of a dairy farm.

tion decisions are made according to administrative rules, not according to the relative efficiency of production.

(b) Making quotas saleable

One way of decreasing the asset fixity of quotas could be to make them saleable. This would mean that quotas would be issued as permits for the delivery of a certain quantity of milk to a processing plant, e.g., 1000 liters per year per permit. If only a limited number of quotas were available, their value would be considerable. The value of a quota would have to be considered as a production cost. HAMM and NOTT (1986) estimated the cost of the quota in Ontario to represent 25 per cent of the producer price of milk.

Saleable quotas would, thus, become a cost to the producers remaining in the business, and the benefit of the quotas would shift from the producers remaining in dairying to those who quit. The cost of entry would increase, but entry would be possible, whereas in the prevailing system it is not. The salvage value of the dairy operation would increase and also have a positive effect on allocative efficiency.

(c) Transferring quotas to cooperatives

In recent years, attempts have been made to shift the quotas from farms to dairy cooperatives. It has been argued that this shift would improve the flexibility in production management. Such a shift would be relatively easy to achieve because of the dominating role of dairy cooperatives in collecting milk, and because of the strict boundaries between the cooperatives.

The effect of the transfer on the distribution of costs and benefits depends very much on the rules according to which the quotas would be distributed to the farmers. If the quotas were allocated on a nonmonetary basis, who would make the decisions and according to what criteria? The cooperative management, in their own view, would be in a position to decide how to achieve the best possible production efficiency, which in turn would lead to increased centralization of production. If the decisions were left to the members, the rules by which the decisions would be made would have a decisive effect on the outcome.

If the quotas became fixed assets to the dairies, how would it affect the development of the dairy processing industry? The value of the existing dairy plants would grow. Flexibility at the processing stage would decrease and entry barriers increase. Administering the quotas would raise the transaction costs of the dairy cooperatives. They would also have to withstand the complaints of members who feel themselves unfairly treated, which are now aimed at a faceless administration.

(d) Summary of the effects of quantitative control alternatives

Table 5-2 summarizes the distribution of costs and benefits of quantitative control systems to selected parties. The cooperative quota system is assumed to be structured according to the existing quota system with changes based on product management.

When quotas go along with the farm, entry into dairy production through a generation shift is beneficial to the young farmer. If the quotas were made saleable, the value of a farm with a quota would increase. In a generation shift situation, the increased farm value may cause extra costs to the young farmer remaining on the farm in the form of, e.g., payments to sisters and brothers. If a farm has no quota, it would have to be bought from outside. By making the quotas saleable, entry into the dairy business would become possible, although more expensive, to those left outside in the prevailing system.

The quota system is beneficial to all the farmers in the business when the quota is issued. In the prevailing system, enlarging the operation above quota is usually not possible. If quotas were saleable, enlarging would be possible, but would involve costs. If the cooperatives had the quota, it might be beneficial both to those who would maintain their present operation and to those enlarging theirs. But the uncertainty of cooperative decisions might have a negative impact.

Table 5-2: Summary of costs and benefits of presented quantitative control systems to selected parties.

Task	Prevailing quota system	Saleable quotas	Cooperative quotas
Entry to dairying:			
— generation shift	+	—	0
— from outside	—	—	0
Dairy production:			
— as before	+	+	+/—
— enlarge	—	+/—	+/—
Exit:			
— from dairying	— (+)	+	0
— from farming	+	+	0
Processing:			
— existing coop	0	0	+
— entering firms	0	0	—
— product management	0	+	+
— quota management	0	0	—
Government:			
— subsidy cost	+/—	—	0/—
— regional policy	+	—/+	
Allocative efficiency at farm level		+	+
Adjustment efficiency	+/—	+	0
Consumer prices	—	—/+	—

In the prevailing system, exit from the dairy business is not profitable unless it happens through selling of the entire business to another who is able to use the quota (For a few dairy farmers it is , however, possible to acquire a pig quota by quitting milk production). Saleable quotas would increase the farm's salvage value and make adjustment to an alternative source of livelihood easier. It would change the zeros in the last column of Table 5-2 if it would be possible to sell quotas to a cooperative.

If it were possible to set the quotas "correctly", the farmers would have an incentive to cut costs instead of increasing production. Saleable quotas might also decrease the economies of scale as a function of the quota price. Thus, a selffunctioning market element to coordinate total supply and demand would be generated. HAMM and NOTT (1986) report that many Ontario dairymen operated their facilities at less than optimal capacity because of the rapid increase (marginal cost) in the values of quotas over the last few years.

Individual farm quotas do not have a significant effect on the processing industry, except by creating more efficient production through saleable quotas. Shifting the quotas to cooperatives would, however, have a considerable impact on the industry. The value of the existing cooperatives would increase, although quota management would incur some costs. If the entry conditions for new cooperative members were restricted, monopoly profits could be collected. Entry of new processing firms would be difficult.

Through the present quota system, the government is able to limit the further increase of milk production, which would raise possible future subsidy costs.[6] In the longer run, quotas affect production costs by increasing the farm assets, which, according to the present income law, have to be compensated to the producers through higher subsidies.

The quota system is effective in keeping the existing dairy farmers on their farms and thus preventing a decrease in the rural population.

[6] However, the prevailing surplus problem is one of decreasing consumption.

Depending on the areas where quotas would be saleable, this would have either a negative or a positive effect on the region in question. If the quotas were saleable within a limited area, this could help the adjustment process by providing resources for starting an alternative source of livelihood. The use of the money from quota sales for purposes not advancing the economic activity in the region could somewhat be prevented by regulative policies.

Allocative efficiency is low in the prevailing quota system, and saleable or cooperative quotas would certainly increase it. Adjustment efficiency could be increased both through the prevailing and saleable quota systems, but in the prevailing system only in the short run by preventing surpluses from growing further. Cooperative quotas would not have considerable effect on preventing surpluses.

Because the quota systems increase the production assets, they have a negative impact on consumer prices given the current pricing system not based on marginal cost basis. However, the increase in allocative efficiency caused by saleable quotas might have a positive impact on consumer prices in the longer run.

It may be concluded from the analysis above that the prevailing quota system is not capable of solving the problem of surplus production beyond preventing its further increase. An additional problem is the negative effect on allocative efficiency. Making the quotas saleable would ease the asset-fixity problem, but this would still act as an additional asset increase to the producers. Transferring the quotas to cooperatives would increase the assetfixity of the cooperatives, and give them considerable power for the coordination of production.

The alternative where the government would buy quotas back resembles the bonus system analyzed above. Still another alternative, in which a cooperative would buy and sell quotas, has similarities with the case analyzed in the following section.

Cooperative adjustment fund (CAF)

The problem of exit from dairy production seems to be, to a great extent, related to asset-fixity. Basically there are two ways of dealing with the problem: (1) by constructing a mechanism to protect the assets (e.g., producer price stabilizing regulations and price support), or (2) by constructing a mechanism to make the fixed assets more redeployable. The alternative presented in this section attempts to solve the problem in the latter manner, by establishing an institution here referred to as cooperative adjustment fund (CAF).

The cooperative dairy system was created to take care of the processing and marketing of members' current product, milk. Thus, it is not in the dairy cooperative's interest to look for other production alternatives for dairy farmers who wish to stop producing milk.

It would be in the interest of all the members to facilitate the exit of some dairy cooperative members in the prevailing production situation. Another alternative would be that the dairy cooperative would facilitate the exit. This would require a reconsideration of the members' common interest, currently centered on milk, towards a more comprehensive concern for the individual members' problems in the present situation. When it is in the advantage of the farmers remaining in dairy production that some others exit, why should they not also pay something for it?

At present there is a rapid structural change going on in the dairy processing industry. Cooperatives are merging in order to achieve economies of scale. As a result, the local transaction-specific dairy cooperatives are becoming useless and their facilities unutilized. One possibility would be to give another function to the local dairy cooperatives whose processing is discontinued, to help the farmers willing to quit dairy production. Members remaining in the dairy business would become direct members of a regional cooperative.

Among the functions of the CAF's would be:

(1) to monitor new production possibilities outside dairy production for cooperative members, bearing in mind the investments and skills the former profession has provided;
(2) to train members for new professions;
(3) to provide expertise in market analysis, business idea generation, product development, sales activities, business planning, etc.;
(4) to coordinate possible cooperative activities among the created small businesses in order to obtain better sales negotiation positions, secure the supply of raw materials, allocate orders to the new enterprises, and create better marketable product lines combining a number of producers.

It might also be possible to use the former dairy farmers as replacements for dairy farmers on vacation, to act as transport entrepreneurs, to manufacture dairy specialties such as local cheeses for the cooperative, etc.

CAF's could also take care of retired members by arranging them possibilities to raise their quality of life. Quitting becomes a problem to old farmers because of a lack of reasonable alternative ways of spending their time (Ollila 1986b). The life of a typical dairy farmer family revolves around the farm work, and there has not been time to develop hobbies, etc. There is the fear of becoming "useless". It would probably be possible to utilize the experience of the old farmers better than nowadays.

There are advantages in arranging readjustment in the form suggested above instead of using communal services or an independent corporation:

(1) The organization is already in existence. There would be no extra transaction costs in creating the system. Voice and exit could be exercised simultaneously.
(2) It would be possible to concentrate on the problems of quitting dairy producers with special skills, assets and background.
(3) The members would probably have more trust in an organization of their own, as they have gained experience with it (Exhibit 1). Trust is especially important in exit decision making and also in securing that the business ideas to be developed in cooperation with other people remain a secret.
(4) The planning of the timeliness of the change of profession would be improved. Training could be started in advance, and the shift would be smoother within the same cooperative organization.
(5) There would be better possibilities to facilitate the exit of those dairy farmers whose alternative opportunities are few but whose cost of changing the profession would be lowest. Most of the other systems favor the farmers who have the best opportunities for alternative production.
(6) A market could be created for some of the transaction-specific investments. Fixed assets would become more redeployable through the increase in their salvage value.

CAF's would have potential to cope with some asset-specificity problems, to decrease the uncertainty related to alternative professions, and also to help to ease certain externality problems discussed in the following.

When some of the dairy farmers exit, all the other producers are better off. In the bonus and buy-out systems, the cost is borne by the entire society, and the benefit comes to the farmers remaining in production. If society is continuously willing to pay the cost of milk bonuses, there would be a possibility to channel them through CAF's. The price of exiting the dairy business would be considerably lower if the alternative production were less uncertain. In the prevailing bonus system, the former producer is left largely on his own with the bonus money with no guidance about what to do next. Retraining has to be paid for by the farmer himself.

However, instead of channeling bonuses through CAF's, they could be funded by charging a fee from the remaining dairy producers or by giving the amount otherwise used for marketing the surpluses to CAF's. Since 92 per cent of the dairy producers are members of the cooperative system, the free rider problem would decrease to 8 per cent of

all producers. CAF's would help in making the cost bear on the behavior more closely.

Joint ventures could also be arranged by CAF's between cooperatives to create new production possibilities. Especially in situations where members of Valio's cooperatives are already currently also members of another cooperative, e.g. SOK, joint ventures would be possible. According to PSM (Anon. 1988k), 75 per cent of Valio's members were simultaneously members of a cooperative slaughter-house,[7] 60 per cent of SOK, 59 per cent of Hankkija, and 67 per cent members of a cooperative bank. Thus, joint ventures would seem very natural.

With respect to the features of cooperatives mentioned in Chapter 2 and Exhibit 1, the following aspects may be pointed out:

(a) Asset-fixity

- CAF's could be a means of increasing the salvage value of dairy production in the exit situation. Simultaneously the acquisition value of the new operation would be reduced since earlier benefits and profits earned for the cooperative could be added to the new production capital. This could significantly reduce the asset-fixity problem.
- CAF's could be able to gain market power and prevent opportunistic behavior in situations where the quitting dairy farmers have to make transaction-specific investments. E.g., long-term production contracts between members and CAF's should be more resistant to the exploitation of transaction-specific assets than contracts between a producer and an IOF.
  Personal relationships and trust in the cooperative, developed during the dairy farming period, would be at least partially transferable to the new business.
- Preservation of market options in new businesses which are presumably more volatile than dairy production could be arranged more easily through CAF's than on an individual basis.

(b) Uncertainty

- Prices are in most cases less predictable and more flexible in other businesses compared to dairy production in the prevailing conditions. Increased information about supply and demand conditions through CAF's might improve the situation.
  Thin markets are a problem in most of the new rural economic activities. If the market is uncertain, many businesses may not be established. By providing information and being capable of affecting the members' decisions to a certain extent, CAF's could prevent such a situation (Exhibit 2, p.5).
- The fact that cooperatives can set final producer prices for products after the real costs are known may spread the risk to a larger number of producers in new, risky businesses.

(c) Property rights/externalities

- CAF's would maintain the members' property right to the assets of the cooperative created during their patronage period also after they stop delivering milk. The external benefits of the remaining dairy producers would be shifted to the quitters, who have created these benefits for the remaining producers.
- CAF's could use public goods such as advertising the area of the origin of a product in product marketing. It is not easy for an individual firm to forbid the use of an already promoted statement of origin because it cannot have the exclusive property right to the location. In a cooperative with free entry conditions of such property right would not be a problem.
- The preservation of product quality has been one reason for the establishment of many cooperatives. Standards and product lines are a way of ensuring the quality of products, whether perishable or not. But, e.g., handicraft products lack standards, which makes it impossible to use forward contracting and advertising. CAF's could establish production lines, coordinate manufacturing, and market whole lines of products, and thereby lower the transaction costs for the buyers.
- It is not easy for small businesses to use brand labels. Consumers have a limited

[7] The decrease in dairy cow numbers brings along a lack of beef. CAF's would also facilitate specialized beef production with funds created by the quitting dairymen.

capacity (bounded rationality) to remember various brands. CAF's could establish more concurrent brands, which would benefit the individual small businesses, whereas IOF brands benefit the IOF alone.

— CAF's could, in accordance with the hierarchical decomposition principle, hire specialists, e.g., to carry out marketing research for collective benefit in situations where no individual firm could afford it.

Among the difficulties related to CAF's are the differing interests of the members of CAF's and the farmers remaining in dairying. Conflicts between these groups, and between heterogeneous CAF members, may occur in the longer run. It might be possible that the CAF members would renounce their membership after getting their new profession on its feet. Also, there are certain explicit problems regarding the prevailing agricultural income legislation.

5.1.4 Conclusions

After moving from a self-sufficiency economy into an exchange economy, dairy producers started to protect their transaction-specific assets by uniting into cooperatives. Through cooperatives, which represented a large number of people, they could execute political power to protect these assets. The uncertainty about buyers for their products and the goals external to dairy production added more elements which brought the cooperatives farther apart from market exchange.

According to transaction cost economics, the problem of overall balancing is, to a great extent, a problem related to fixed assets. The dairy producers with their skills have themselves become transaction-specific assets. Even surplus production can be explained as a result of irreversible mistakes.

Overall balancing is a problem of surplus production. The problem is emphasized because the total consumption of dairy products is decreasing. Three possible ways of reducing the surplus were presented: decreasing the size of herds, decreasing the production of cows, and decreasing the number of dairy farms. Because of the already small size of the herds and the diseconomies of scale of decreasing it further, this does not seem as a feasible solution to the surplus problem. It is also unlikely that a decrease of the production level is feasible. The most likely way of reducing the production is by cutting down the number of dairy production units.

Three possible coordination mechanisms for reducing the number of dairy farms were examined: a pure price solution, a regulative solution, and a cooperative solution.

Because of the great amount of fixed assets at producer level, a solution based purely on price does not seem to solve the problem. The producer price should be lowered very drastically to have a sufficient negative impact on the present producers. And, before exit would occur, the price decrease would have an opposite effect, because producers would have to raise their production as close to the quota level as possible to make a living.

The present quotas have, in fact, had to some extent an opposite effect to the goal of decreasing the production. The quotas have become fixed assets for the dairy farms, making exit even more difficult. If the quotas were made saleable, the problem of increased fixed assets would be solved, while the salvage value of a dairy operation would increase. This could also lead to improved structural efficiency of production, but perhaps work against the present rural structural policy. The cost of the quota might also substantially increase the milk production costs under current pricing practices.

The possibility of having the government buy back the quotas was examined as another alternative — a solution similar to the present milk bonus system. This would decrease the asset-fixity problem, but have a different effect on different farms. The dairy farms most likely to exit would be those with the highest salvage value, i.e., having the most alternatives outside dairy production. This would lead to the exit of producers whose exit

from the standpoint of production economics would not be preferable. As regards regional policy, this solution would work towards having production further up north in smaller and less modern units.

While coordination was conducted earlier by protecting the transaction-specific assets, which led to overproduction, TRC would predict the solution to overproduction to be to make the fixed assets more redeployable. Similarly as cooperatives are able to protect transaction-specific assets, they have potential to do this. By paying back to a dairy operation some of the assets earned while it patronized the cooperative, the salvage value of the operation is increased. Remaining dairy producers would have an incentive to pay something to exiting producers, because they would be better off after the exit. By providing information on other possible professions to its members, a cooperative would increase the salvage value of the former dairy farmer and simultaneously decrease the acquisition cost of the new profession. The trust the member has in his long-time organization would reduce the uncertainty of making the shift.

Transaction cost economics predicts that through the establishment of cooperative adjustment funds the cooperative solution would be superior to the alternative price and regulative solutions. While it simultaneously decreases both the transaction costs of exit and the production costs of milk, total costs can be expected to be lower than in either of the other solutions.

5.2 COMPONENT BALANCING

5.2.1 The issue

Milk is a relatively complex product consisting of components that vary in quantity as well as quality. The general composition is:

Milk fat	4—5 %
Milk protein	2—4 %
Lactose	1—2 %
Salt (Ca)	1 %
Water	86 %

Different milk products require a varying proportion of the components, and milk composition can be altered to a certain extent. Some questions may arise: How well does the supply of the various components match with the total demand for dairy products? How consistent is the economic value of the components with customer preferences and with their nutritional value?

Figure 5-10 presents the domestic supply and demand of two major milk components, fat and protein.

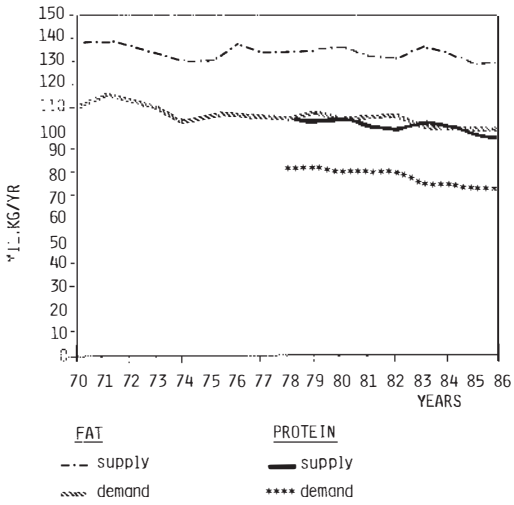


Figure 5-10: Supply and domestic demand of milk fat in 1970—86 and milk protein in 1978—86. Source: PSM.

Figure 5-10 shows that there is continuous surplus production of both milk fat and protein. When the self-sufficiency rate of milk fat was 124 per cent in 1970, it was 133 per cent in 1986. The self-sufficiency rate of milk protein was 121 per cent in 1978[8] and 133 per cent in 1986. The mismatch keeps growing. This is not due to an increase in fat and protein content in the raw milk, which has remained relatively steady, but because of increasing production. The problem of compo-

[8] There are no earlier figures of raw milk protein supply. This perhaps reflects the former attitude, which undervalued milk protein in production.

nent balancing is, thus, closely connected with the problem of overall balancing.

In earlier days when energy consumption was high, fat content was the most important factor affecting the value of milk. In addition to its presence in liquid milk for consumption, milk fat was used in cream, butter and cheese.[9] The value of fat was emphasized because butter was the main tradeable and preservable dairy product before the modern dairy processing system was created. At the beginning of this century, Finland was a considerable exporter of butter, and the need to control its quality led to the establishment of Valio. Cattle breeds were developed to produce milk with a higher butterfat content. Pricing formulas were developed to emphasize the fat content in milk in addition to weight or volume.

However, consumers began to change their consumption patterns and to demand lower-fat milk. This demand was first resisted by the system. Retailers did not want to enlarge their cooler space for new items, there was no need for more fat for butter or cheese making in the processing industry, and the existing price formula gave the farmers no incentives to produce lower-fat milk. Because of the relatively strong political power of the dairy subsector, the problem was solved by persuading the government to buy the extra fat as butter and cheese. This settled the short-term problem of readjustment.

At present, when no incentives for readjustment exist, the dairy subsector faces a growing problem of overproduction of especially milk fat. This study will address the problem by focusing on questions how could the dairy subsector be reinstituted in order to decrease the misallocation of resources. E.g., what would be the likely outcome if the pricing formula was changed but the rest of the governance structure of the subsector (ownership of processing plants, etc.) remained unchanged? It is probable that initially farmers would be locked into producing the same type of milk as before due to the genetic composition of their herds, so that the change in the price formula would simply result in lower farm incomes. In the longer run, some shift in herd composition (e.g., to more Holsteins) would very likely result. A key question is how the coordination of supply and demand would differ:

(1) in the current system, in which the government (the taxpayer) bears the cost of disposing of the excess butterfat;
(2) in a pure market solution (changing the pricing formula and nothing else);
(3) in a cooperative solution, involving a different transfer price formula compared to the producer price formula, and a gradual readjustment of the latter, as well as member education.

5.2.2 How the problem arose

Current policy

The pricing system has reflected the importance of the butterfat component. In order to set the producer price, all the milk has first to be converted to milk with 4 % fat. The value of fat has served as a guideline in cattle breeding and selection of breeds, in extension services, and, naturally, in the work of dairy farmers.

It can be said that a series of asset-fixity problems has caused the current mismatch between component supply and demand. With earlier technology, the most valuable component for exchange in time-specific raw milk was fat. This gave the starting point to the development which has led to mental asset-fixities with breeders, extension workers and farmers, and to the physical asset-fixity of cows.

The attitudes of consumers and nutritionists towards the various milk components may be interpreted as follows:

[9] It is relatively easy to adjust the fat content of milk in order to get the desired content for consumption milk. The extra fat can be then used for high-fat products such as butter or cheese.

		Economic value	Nutritional value
Milk fat	4—5 %	+ +	—
Milk protein	2—4 %	+ +	+
Lactose	1—2 %	0	—
Salt (Ca)	1 %	0	+ +
Water	86 %	+ +	0

Thus, to express it exaggeratedly, milk is paid for mostly according to its content of water and of fat, which is said to be dangerous for your health! In any case, there is an inconsistency between the nutritional value and the prevailing economic value of the milk components.

If the fat content could be reduced from the present average 4.34 per cent to 4.0 per cent (which is still above the average in Europe), this would mean a reduction of 11.4 million kilograms of butter yearly, which in turn could reduce the export subsidies down to one-fifth of the prevailing amount. If the subsidy were 20 Fmk/kg as at present (approximately), this would mean a reduction of close to 230 million Fmk in export subsidies per year.

The problem in cattle breeding is that the quantity of milk produced is interrelated with the quantity of fat and protein. According to the Finnish Animal Breeding Association,[10] the genetic correlation between liquid and protein production is +0.8, and between fat and protein about +0.5. There is some evidence that feeding practices may be a limiting factor in changing milk composition. E.g., Finnish Ayrshire cattle exported to Sweden produce less fat and more protein there.

Because of the positive correlation between fat and protein content, also the protein content would decrease if the fat content were to be reduced. A decrease of 0.1 per cent in protein content would correspond to about 2.7 million kg of milk protein, which is mainly made into milk powder for export. The reduction of neither fat nor protein would affect cheese making in present quantities.[11]

There is a 0.3 negative seasonal correlation between protein and liquid. This means that in December and January, when milk production is lowest, protein content is at its highest (close to 3.5 per cent compared to the average 3.24 per cent). Thus, protein would not be a limiting factor even in the low-production season.

Although the pricing system has gradually started to change during the last eight years, the effect on raw milk composition has been negligible.

Key transactions for improving component balancing

The most important fixed asset affecting the composition of raw milk is the dairy cow. The properties of a cow depend on the breed, on the feeding practices including feed quality and quantity, and on the environment where the cow is kept. Properties pertaining to the composition of the milk produced cannot be easily or rapidly changed, but requires years' breeding work. Breeders used to developing breeds with improved fat production properties may also have human fixed assets which hinder work towards meeting present consumer preferences. An additional reason, or counter argument, is that the demand for less fat is not shown in product pricing, and breeders do not want to act against the dairy producers' interests. Some breeders also feel uncertain about how long the present "fashion" will last.

Feeding recommendations, as well as feeding and feed preparation practices, also involve human fixed assets. In the short run, the renovation of feeding practices seems to be a more effective way to affect milk composition than waiting for the results of cattle breeding, which may take at least 10 years.

The following may be considered as critical transactions at farm level:

[10] Suomen Kotieläinjalostusyhdistys, discussion with J. Syväjärvi on 2 September 1988.

[11] About 23 million kilograms of both milk fat and protein is needed for the average yearly cheese production, which is 85 million kilos. The fat content of the liquid milk needed (10,7 × cheese = 914 million liters) would decrease from 39.7 to 36.7 million kilograms, and the protein from 29.6 to 28.7 million kilograms.

— feeding (extension)
— cattle breeds (cattle breeders, research)
— performance criteria for dairy farmers

These correspond to TRC's 1—3 in Figure 4-7, and are connected to transactions between the dairy farmer and parties outside the farm such as extension, research, and the rural community.

The transaction between the dairy farm and the dairy plant (usually a cooperative) defines the incentives to a farmer to produce a certain kind of milk. Thus, TRC 5 has to be important.

In TRC 8, the raw milk components are allocated for various products. Thus, this appears to be a critical transaction. A decision to export butter (TRC 11) makes it possible to shift the cost of misallocation from the dairy marketing system to the government.

5.2.3 Alternative policy measures

Prices

(a) Current pricing structure

The principles of the Finnish milk component pricing system have already been briefly discussed above. The system emphasizes the value of milk in butter making, since butter is the basis for defining the transfer price of milk for other uses in processing (TRC 8 in Figure 4-7).

The producer price formulation system explained in Exhibit 3 gives incentives to producers to produce a certain kind of milk. The transaction between producer and processing plant can be considered partly as an internal transaction when the processing plant is a cooperative.

The main question as regards the price factor is how well the prices of products — when converted to component prices — reflect the allocation of raw milk in TRC 8 and the composition of the milk produced (TRC's 1—3). These transactions define the performance of synchronization coordination in the system, if the choices of consumers in the limited exit situation are valid.

Because most of the prices have been administered, it is very difficult to examine the "true" influence of the market on the system and on resource allocation. However, the following observations can be made:

The prices of high-fat milk products are relatively high in Finland. E.g., the ratio of the consumer prices of 1 liter of liquid consumption milk to 1 kg of butter is about 11.6 in Finland, compared to 7.7 in Sweden, 6.1 in Denmark and 5.0 in Norway (Ahola et al. 1986). In view of the health opinions, this seems to be in line. But when this ratio is reflected through the processing system into producer pricing, it seems to act as an incentive in the opposite direction. Emphasis on fat value also affects the price differential between domestic and international markets, thus increasing the cost of surplus exports.

The structure of the component prices at retail level (TRC 14, Figure 4-7), wholesale level (TRC's 10 and 13) and in TRC 8 compared to the component price structure at producer level was examined by calculating the multiple regressions of the components (fat, protein and other solids[12] at each level. The calculations including an analysis of their variances are presented in Exhibit 5. The base data for the calculation consisted of 20 products and product groups of Valio, representing about 85 per cent of the domestic dairy product sales of Valio's cooperative dairies.

The dairy plant prices at TRC 8 were calculated by using the transfer prices of 4.3 % fat whole milk (2.17 Fmk/liter) and skim milk (0.76 Fmk/liter) and multiplying them according to their proportional use for one kilogram of each end product. The wholesale price used was Valio's catalogue price of 1 July 1988 including a 16 per cent sales tax. The administered prices and, for unregulated products, Valio's recommendation prices, were used as consumer prices.

[12] The direct measurement of the liquid component proved to be too ambitious because of the varying composition of milk liquid in various products. Water evaporates in varying proportions. Non-fat non-protein solids were chosen to represent the value of the milk components other than fat and protein.

Table 5-3: Relative prices of milk components at various levels of the dairy marketing system.

Component	Transaction			
	Farm TRC 5	Dairy TRC 8	Wholesale TRC 10, 13	Retail TRC 14
Fat	39.4	53.0	24.3	23.1
Protein	35.6	55.0	37.6	41.5
Non-fat non-protein solids	25.0	--8.0	38.1	35.3
Average price (Fmk) given by the regressions	1.75[13]	1.80	4.54	5.59

The relative prices for fat, protein and non-fat non-protein solids at each "critical transaction" are presented in Table 5-3. They were calculated for milk containing an average 3.23 % fat, 3.3 % protein and 6.07 % non-fat non-protein solids, from the coefficients given by the regressions. The producer prices of the various components for average farm milk (4.3 % fat, 3.3 % protein and 5 % other solids) are also given.

As can be seen from Table 5-3, the general trend is a decline in the emphasis on the fat component as the consumer end is approached. Other components, especially other solids, increase their importance. It can be concluded that there is a conflict between the consumer and producer prices of milk components. Thus, even with the prevailing administered consumer price structure there is a mismatch between the preferences reflected by the prices and the incentives given to the producers. The varying production costs of the different products create reservations regarding this conclusion.

At dairy plant level the regression indicates that fat and protein define the value of raw milk when it is allocated for various uses. The absurd-looking negative value for the rest of the milk given by the equation matches the attitudes of some dairy plant operators who look at the transfer milk from the point of view of transport. Although milk is not milk without its liquid component, it makes no sense to transport water back and forth from that standpoint.

The relative increase in the value of protein from wholesale to retail level is explained by the differing sales margins of various milk products. The high-liquid and high-fat products are mostly regulated and have relatively low margins, while high-protein products such as cheeses are freely priced and have considerably higher sales margins.[14]

From the calculations above, the following observations can be made concerning the milk component pricing system at producer level:

(1) If the prevailing producer milk containing an average 4.3 % fat and 3.3 % protein were priced according to the relative component values at consumer level, the fat coefficient would be 1.3 and the protein coefficient 3.0.[15]
(2) The present system having a base level for fat and protein (4.3 % and 3.3 %) according to which the fat and protein differentials are calculated, does not provide incentives, e.g., for any considerable reduction in fat content. Another approach providing this incentive would be to calculate the fat and protein premiums for each tenth of a per cent starting from 0. Using the same consumer component price ratio and allowing a maximum of 3.9 % for fat, the coefficients could be 1.4 for fat up to 3.9 % (and after this, 0), and 3.0 for protein without maximum limit.[16]

[13] The price used for the producer price excluding patronage refunds was 2.40 Fmk less the sales tax refund (1.7 × 16 per cent).

[14] After the time of the calculation the prices at retail level were deregulated in October 1988.

[15] The coefficients were calculated using a producer price of 2.40 Fmk, taking the relative values at retail level as presented in table 7-1 (0.55 Fmk for fat, 1.0 Fmk for protein and 0.84 Fmk for the liquid). 0.55 Fmk divided by 43 (%/10 of fat) gives 1.29 ⇒ 1.3.

[16] At the time of the calculation, the fat coefficient

It is obvious that at present there is a mismatch between the preferred composition of milk and the incentives provided to producers. But the fixed assets at producer level prevent the solving of the coordination problem by means of prices alone, at least in the short run. The farmers as well as the transactions prior to production, e.g., cattle breeding, should be provided with incentives leading into the desired direction.

A pure non-price solution alone cannot be effective, either. No matter how well and how fast cattle breeding succeeds in developing a cow producing low-fat milk, it will not be adopted by farmers without benefits for producing less fat. Without such benefits, the feeding practices will not be changed.

(b) Making fat a marginal product in a dairy plant's internal pricing

In a situation where the pure market solution would only make the producers worse off, but where price could act as an incentive to achieve changes in the long run, the cooperatives may be in an unique position to conduct the coordination.

The mismatch between milk component supply and demand creates adjustment problems also at dairy plant level. Because of fewer transaction-specific assets considering component balance, price policies should be more effective at dairy processing level than at producer level. A cooperative could make the adjustment in internal pricing immediately, and shift it to the producer price gradually along with the pace of development in feeding practices and cattle breeding. Simultaneously the producers could be assisted in making the change and pressure towards cattle breeders and feeding experts could be increased. A partial proposal for changing the rules in TRC 8 (Figure 4-7) is presented below.

The producer price of milk in 1988 was about 2.30 Fmk/liter. Additional patronage refund increased the price to about 2.55 Fmk. The average fat content was 4.34 % and the average protein content 3.24 %. The value of 1 % of fat is 20 p/liter.

The average fat content of all types of liquid milks is about 3.16 %. Thus, each liter of raw milk processed into liquid milk for consumption creates a fat surplus of 1.18 % (4.34 % 3.16 %). The price of the surplus fat is 1.18×20 p = 23.6 p/liter. Without this surplus fat the producer price of the raw material for consumption milk would be 255—23.6 = 231.4 p/liter.

About 0.8 kg of fat is required to make 1 kg of butter. The price of the raw material for butter comes to (0.8 kg/1.18 % $\times$ 23.6 p) = 16.00 Fmk/kg.[17] About 10.5 liters of milk containing 2.6 % butterfat is needed for 1 kg of cheese. The raw material for cheese according to this calculation costs 255 p—((4.34 %—2.6 %) $\times$ 20 p) = 2.202 Fmk/liter of milk and 10.5×2.202 Fmk = 23.12 Fmk/kg of cheese.

The total domestic consumption in 1986 was about 1030 million liters of liquid milk, 52.1 million kg of butter and 54.4 million kg of cheeses. The income to farmers was 1030 m $\times$ 2.314 Fmk = 2383.42 million Fmk. The domestic income from butter to the producers was (52.1 million kg $\times$ 16 Fmk/kg) + (0.2 $\times$ 52.1 $\times$ 1.69 Fmk)[18] = 833.6 + 17.5 = 851.1 million Fmk. The income from cheeses was respectively 54.4 $\times$ 23.12 Fmk = 1257.7 million Fmk. The total income from these three product groups was 4492.2 million Fmk: 53 per cent from liquids, 19 per cent from butter and 28 per cent from cheese products.

There is a need to decrease the price of butter for a number of reasons, i.a.:

(1) The consumption of fat is most rapidly decreasing of the milk components.
(2) The present price of butter is abnor-

was 2.0 and the protein coefficient 2.6. In 1989, the coefficients were changed close to the result of the calculation to 1.5 for fat and 3.2 for protein.

[17] No difference between the liter and the kilogram is made here. Naturally, also other components of butter have to be taken into account.

[18] In addition to fat, 20 per cent of skim milk is needed for butter. The value of skim milk is 2.55 Fmk—4.34×20 p = 1.69 Fmk. 10.5 million liters is needed, which totals $1.69 \times 10.5 = 17.5$ million Fmk. = 833.6 + 17.5 = 851.1 million Fmk.

mally high compared to almost any other Western country.

(3) The liberalization of international trade will make it difficult to maintain the present price structure, which is perhaps most biased towards butter.

(4) The law determining the value ratio between margarine and butter may not remain in force indefinitely.

(5) The high butter price affects export subsidies.

At the same time, there is reason to believe that the prices of cheeses and liquid milk could tolerate a small increase. As Valio calculates the price of cheese based on fat for butter, it may be too low. The high retail sales margins of cheese, sometimes 46 per cent of the total price, indicate that there is a possibility to increase the price of cheese products.[19] The price of liquid milk, in turn, is low compared to almost any competing product.

What would the effect be if the value of the raw material were calculated for liquid and cheese products leaving butter as a marginal product? If the total income to the farmers remained the same and the value of the raw material for butter would be 0 (the butter retail price being about 20 Fmk/kg instead of the present 40 Fmk/kg), how much would the average prices of milk and cheese have to be raised?

If the price increase were directed to milk and cheese according to their real value (65 and 35 per cent) when not taking butter into account, the calculated raw material price for a liter of milk would be 2.83 Fmk and for a kg of cheese 28.8 Fmk. *The question remains, would consumers agree to pay 50 p + retail margin more for a liter of milk and about 5 Fmk + retail margin for a kg of cheese?* Would retailers be willing to decrease their margin?[20]

The elasticities presented in Table 5-4 would suggest a balancing effect. Retail margins have been highest in formerly deregulated products such as Emmental cheese. After the retail prices of all dairy products were deregulated in October 1988, the margins can be expected to level off.

Table 5-4: Income elasticities of demand of selected dairy products in 1985.
Source: KAPRI & MAUNOLA 1988.

Product	Income elasticity of demand
Consumption milk	—0.37
Skim milk	0.44
Butter milks	0.06
Yoghurts	0.22
Emmental cheese	1.56
Edam cheese	0.17
Butter	—0.09
Butter-vegetable fat mix	0.55

Technical possibilities for changing milk composition — role of cooperatives

The above analysis shows that price is a useful coordinating mechanism, but because of transaction-specific assets, especially at the producer end and before it, price has to be supported by other means of coordination.

The dairy cooperative system is suitable for conducting this coordination. Compared to a pure market solution, the dairy cooperatives may soften the rigidities of adjustment caused by fixed assets, as it actually does now already. Cooperatives could also use voice in upstream transactions to facilitate the change.[21] They could demand more suitable cattle breeds for their members, either directly or through political influence facilitate related research and cattle breeding, improve extension about feeding practices and feed quality, etc. But not even the availability of

[19] HALMEENKARI (1984) has calculated the income elasticities of demand for cheeses as follows: Emmental 1.48, Edam 0.23, processed cheese 0.82 and other cheeses 1.98. It seems that the consumption of especially Emmental and special cheeses is growing along with increasing incomes.

[20] Another question concerns public opinion, which is now very reserved towards milk fats. Would it be provocative to decrease the price of dairy products that consumers consider unhealthy at the cost of other dairy products regarded as more healthy? It has been suggested by health professionals that the price of fat should, in fact, be raised even higher to discourage its consumption.

[21] As mentioned before, at present the cooperative system emphasizes voice downstream, aiming to alter consumption patterns back to correspond better to present supply.

suitable breeds will effect a change if the dairy producers have no incentive to use them.

Valio is in a position to solve the "Catch 22" situation between cattle breeders and dairy producers, where the former do not develop suitable breeds because the producer price shows no need for this, and producers are unable to meet the changing demand because of the lack of suitable cows. Convincing cattle breeders of the need for new breeds, and giving the producers only such incentives as the development in breeding allows, might provide Valio a unique place of influence. Meanwhile, Valio could already change the cooperative system's internal component pricing more towards the lines of consumer preferences.

Decisions regarding changes in feeding practices and readjustments in the breed structure of the herds would have a limited but immediate effect on the composition of milk. The cooperatives could persuade their members to trust that the component pricing would be renewed as soon as milk composition started to change. This would prevent losses to producers that would be caused by immediate price solutions. According to this mechanism, the new pricing would be introduced in the pace that fixed assets would allow, and meanwhile the incentives to be provided by the price would be compensated by trust.

5.2.4 Conclusions

The main problem in milk component balancing is the surplus of the fat component. Fat is technically bound to the other components, and the problem cannot, therefore, be considered as a separate problem of supply and demand.

The present dairy cattle and feeding practices are fixed assets that cannot be rapidly adjusted to eliminate the mismatch. Long-term research and extension work has to be done before producers will respond. It is difficult to provide incentives to farmers to work for benefits in the faraway future (social fence, PLATT 1973). Since the longer span increases uncertainty, the trust in future benefits has to be very strong in order to affect present behavior.

It was found that the present price structure at various levels does not correspond to the prevailing demand for the main components of milk. In fact, producers are provided with opposite incentives with respect to demand. If this is not corrected, they will not find it profitable to change the composition of milk within the limits of their standard operating procedures.

Because of the fixed assets involved, price does not adequately articulate preferences throughout the system. Voice is needed to carry the information. Because of increasing voice, the message should now be clear: changes in the composition of milk, especially a decrease in fat content, are needed. Voice cannot alone be effective, however, if no incentives are given in pricing.

The lack of technical alternatives causes an asset-fixity problem, making price ineffective, and simultaneously voice is not able to give enough incentives to change the behavior in the long run. The problem is the time gap between the required change in behavior and the expected result.

The simultaneous use of voice and price is required to make the change with minimum loss to the producers unable to respond immediately. In order to make this happen, belief in the necessity of change is needed.

Cooperatives have potential for conducting the simultaneous use of voice and price to effect the change better than either the pure market or pure administrative command. It was suggested that as an immediate response to the current situation, the internal transfer pricing structure could be changed to correspond to the upstream demand. There are no fixed assets to prevent this move. The change could then be gradually shifted to producer prices in the pace that the development of new feeding practices and cow breeding would allow, but all the time providing incentives to producers to change their behavior as much as possible.

5.3 SEASONAL BALANCING

5.3.1 The issue

For natural reasons the production of milk tends to fluctuate seasonally. The seasonal and monthly fluctuation of production and consumption during 1978—87 is seen in Figure 5-11.

In July 1979, the month of highest production during the period, milk production was almost 317 million liters, whereas five months earlier, in January 1979, only about 191 million liters. In 1979 the highest 30 days' production was 32 per cent above the average of the year, and the lowest 20 per cent below the average.

Domestic milk consumption converted into liquid milk remained relatively stable throughout the 10-year period. A major part of the variation presented in Figure 5-11 is explained by the differing number of weekends within the periods. It must also be noted that the consumption figures describe raw milk used for domestic dairy product manufacturing rather than real consumption.[23]

Since 1979 the seasonal variation of production has somewhat declined. In 1987 the highest month was 22 per cent above the aver-

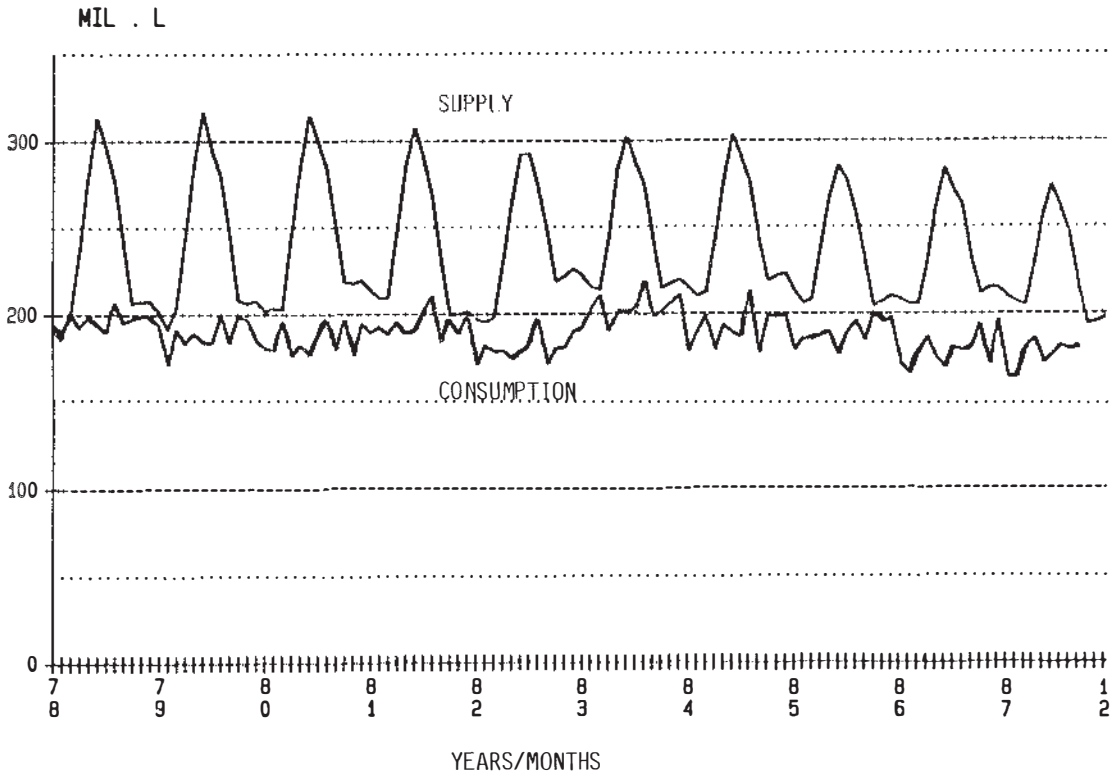


Figure 5-11: Monthly milk production and domestic consumption (mill. liters) during 1978—87.[22] Source: PSM.

[22] Milk supply has been divided into even 30 days' periods by moving the 31st day of both January and March to February, and the other 31st days to their preceding months. The product coefficients used in calculating the consumption quantities in liters were: 10.5076 for butter, 10.897 for cheese, 1.048 for liquid products, 8.2857 for whole milk powder, and 11.0335 for skim milk powder.

[23] There is always a problem in defining the point when a product is actually consumed. When a product is bought it is hard to know whether it will be stored or consumed directly, which in turn will affect the shopping behavior in the next period. This problem does not apply to fluid milk products as to, e.g., cheese products or butter.

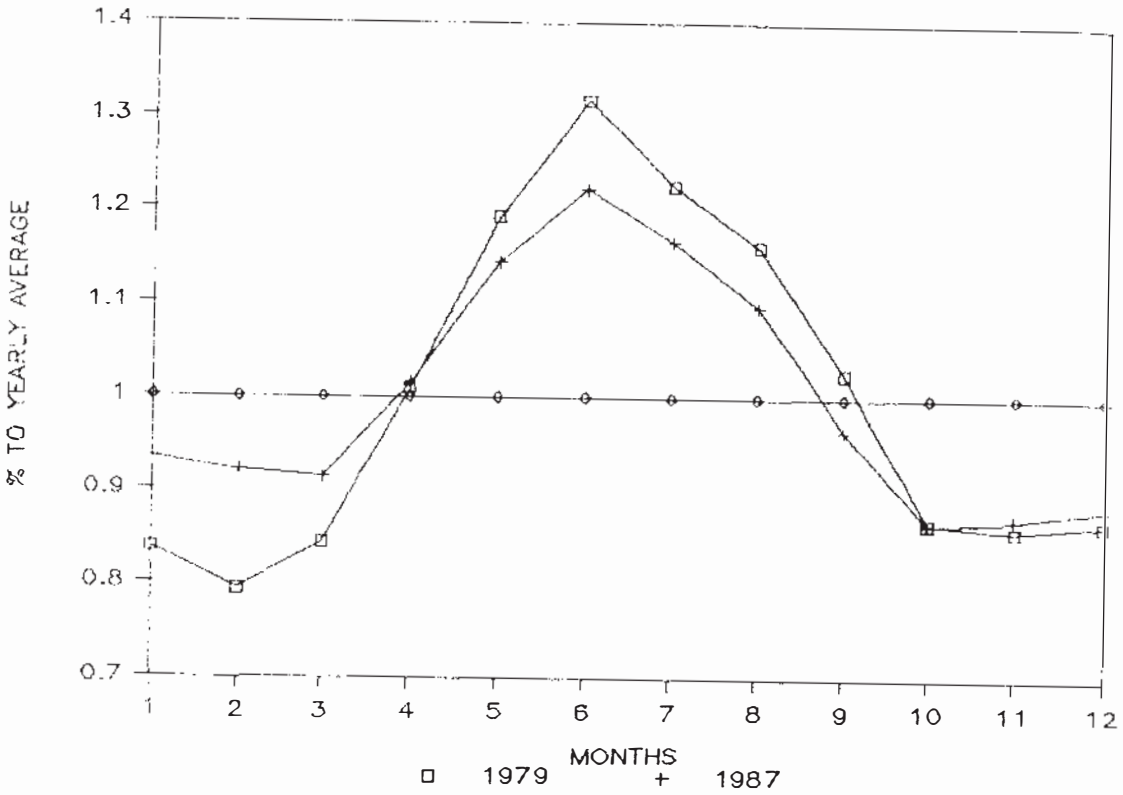


Figure 5-12: Seasonal fluctuation of milk supply in 1979 and 1987. Source: PSM.

age and the lowest 13 per cent below. This development is presented in Figure 5-12.

There is a mismatch between the seasonally fluctuating milk production and the consumption, resulting in a coordination problem. Investments in extra milk processing capacity for peak loads must also be made. How is the mismatch presently coordinated? Who pays for the peak?

5.3.2 How the problem arose

Current policy

The seasonal variation in milk supply and demand is almost completely due to external factors. On the supply side, the biological rhythm of dairy cows, as well as feed production, cause natural fluctuations in production.

Because of the weather conditions characteristic of Finland, the seasonal variation is extremely sharp. On the demand side, the consumption of many dairy products except for, e.g., ice cream, tends to fluctuate in a way reverse to the natural rhythm of production. In general, the consumption of dairy products is relatively stable throughout the year.

Formerly, when pasturing was the only practice of keeping cows in the summertime, there were no real means to affect the seasonal fluctuation of milk production. Coordination was carried out in two ways: by making milk powder from the extra milk and by adjusting the transport distances of liquid milk hauled to the main consumption centers.

There has been no actual involvement by the government for the seasonal balancing of milk supply and demand, except by dealing with the extra milk powder either by exporting it or by requiring that some of it be mixed into animal feeds. As mentioned earlier, Valio gasve its recommendation for the seasonal producer pricing of milk at the beginning of

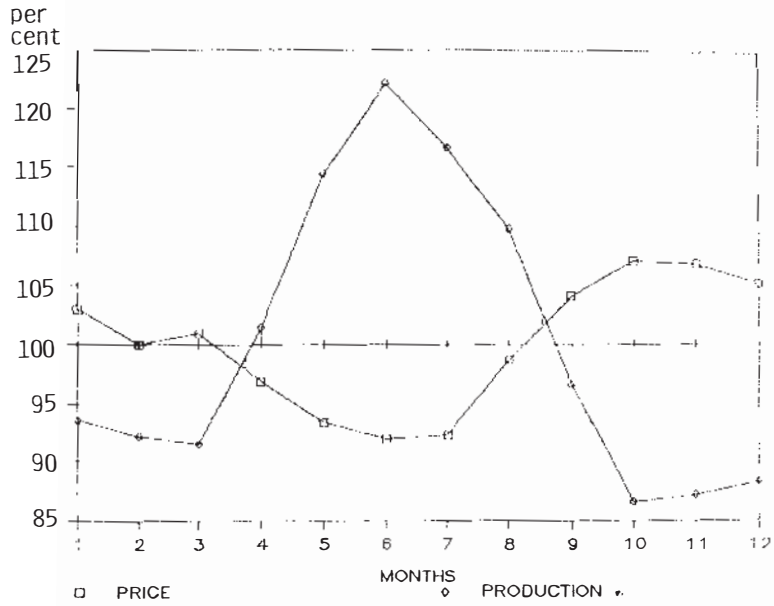


Figure 5-13: Seasonal variation in monthly milk producer prices in 1987. Source: PSM.

the 1970's, supplementing it later with premiums for autumn insemination.

The seasonal variation in the producer price of milk is presented in Figure 5-13.

Figure 5-13 shows that the seasonal price varies largely in reverse to production. However, the variation in price is much more even than the production variation. There is, in fact, an intention to increase the seasonal variation in milk producer prices.

TURKKI (1985) has found that with a 10 per cent seasonal price variation, the most profitable calving month is September, and the least profitable time is in the spring. As could be seen in Figure 5-12, seasonal pricing has had a positive effect on seasonal balancing. According to PSM, 35 per cent of the cows in recorded herds are already calving in the autumn. In other herds where profit consciousness is assumed to be lower, this proportion is considerably smaller. Thus, there are possibilities to smoothen seasonal fluctuation by extension as well.

Why has the price worked better in seasonal balancing than in either overall or component balancing? Fixed assets seem to explain a major part of this.

Earlier, feeds and milk were both perishable and, thus, time-specific assets. The development of technology has solved this problem to a great extent. At the same time, the asset-specificity at the dairy plants has increased both due to the increase in total investment and because they require a more stable flow of raw material through the system. This has made it more important to coordinate seasonal fluctuations, and the development of technology has made it possible.

The change in milk consumption has developed in a similar manner. The present technology has made possible to decrease the time-specificity of milk, facilitating the availability of uniform-quality dairy products throughout the year with minimum uncertainty. The separation of milk production and consumption has changed the consumption patterns so that nowadays they have virtually no connection to the natural seasons. Also the export customers are increasingly demanding a steady supply of newly processed products throughout the year.

There are no particular fixed assets to hinder the balancing of the seasonal fluctuation in milk production. Changing the variation of

seasonal supply incurs costs to the producer, but is possible. The main question is how to make the change profitable.

There is another external factor affecting seasonal balancing. The farm milk quota period ends at the end of December and causes producers close to the quota to cut off extra production, e.g., through a change in feeding. This decline contributes to the sharpening of seasonal variation.

Key transactions for improving seasonal balancing

The key transactions regarding the seasonal coordination of milk supply and demand are: feeding and calving decisions at farm level (TRC's 1—2 in Figure 4-7); milk transfer and allocation decisions (TRC's 6—8); and milk buying decisions of consumers and largescale kitchens (TRC's 10 and 14).

Slowness to adjust at farm level seems to be mostly a problem of insufficient information. If the natural rhythm of production is to be changed, profit calculations are necessary to find out if it is economically feasible. The producers' skills in, e.g., heat detection, may also require improvement.

The decision of whether to grow a calf for a dairy cow or for beef also has relevance in seasonal balancing decisions at farm level. At present there is no seasonal pricing on the beef market. This can be considered an unused tool in seasonal balancing.

At the dairy plants, the most important coordinating decisions are made at reception level. The transfer of milk (TRC's 6—7) is very important in balancing the supply and demand of liquid products. During the high-production season, e.g., the liquid milk consumed in the Helsinki metropolitan area is collected mostly from within a 350 km radius from Helsinki. During the low-production season, milk from as far as Oulu, 600 km away, is transportedvto Helsinki. The transfer decisions are mostly made by command at the central level of the cooperative system.

TRC 8 coordinates seasonal variation by allocating milk for various uses. This is possible because, as mentioned before, the dairy plants are designed so that they have alternative production lines in the same plant. In some dairies the people working in milk packaging in the low-production season may be operating the milk powder line in the high-production season.

The present system offers no incentives on the demand side to change the behavior of the consumers, either. Since the consumer and wholesale prices are stable throughout the year, while the weather in the summertime is more likely to favor the consumption of competitive, refreshing drinks rather than milk, the setting at the consumption end tends to work against seasonal balancing. In the present system, the processing level, the milk producers and the government (through milk powder export) together pay for the seasonal peak in milk production.

5.3.3 Alternative policy measures

Price

(a) Increasing the producer price differentials:

Shifting the natural rhythm of dairy production increases the costs of feed production (TRC 1), of calf production (TRC 2) and also to some extent of feeding and milking (TRC 3). In order to shift the calving time, the cows have to be kept indoors all through the summer. This prevents pasturing and creates costs in collecting of feed and converting it into a storable form. It has been noted that giving up pasturing increases some health risks, e.g., cow hoof problems.

There is a cost involved in shifting the cows' natural rhythm. If seasonal production is to be made more even, this price has to be paid. In the absence of any particular fixed assets the producer price differential should already provide a sufficient incentive to farmers. There are probably some problems related to incomplete information and bounded rationality., and the varying cost structures of different farmers may also make the shift more profitable to some farmers than to others.

E.g., owners of small, old cowsheds may prefer to continue pasturing.

The price differential may be enough (TURKKI 1985) to make the shift profitable, provided that the farmers realize this. If the price differential works as a sufficient incentive, increasing it might create an unnecessary surplus for producers who have already made the shift or who would do it even without the increase. If there are differences in the opportunities for making the shift, raising the seasonal price differential may set those producers worse off who have limited possibilities, i.e., whose asset-fixity increases.

Seasonal fluctuations may have a different effect on dairies depending on their production composition. A dairy plant producing less perishable (in TRC's terms less transaction-specific) products such as cheeses or milk powders, may not be so much affected as a dairy plant producing mostly liquid milk for consumption. This can be coordinated by production management means by designing dairy plants with production lines that can be easily converted for making other products, which decreases asset-fixity. Another way is by affecting the milk transfer market.

In conclusion, there seem to be no significant fixed assets that prevent seasonal shifts in production, and price should work as a coordinating function. The price differential seems to cover the costs for producers who have already made the decision. Limited information may cause a lag in producing the effect. Raising the differential might unnecessarily increase the price of milk.

(b) Seasonal consumer price

SCHMID (1978, p. 128) sees the distribution of peak load costs as a function of property rights. The peak loads may force the affected parties to make investments to raise their capacity, and, thus, they will surplus capacity during the low periods. The pricing rules define who pays the cost of the idle capacity.

During the present pricing system with fixed consumer prices, the seasonal peak loads of milk production are paid for by dairy producers and their cooperatives. This is done mostly by production management (e.g., production of milk powder, transport of milk), by building peak load capacity and by giving incentives in the form of seasonal pricing to producers to shift their production.

Under current property rights, the dairy plants cannot lay off workers in the low-production period (not even schedule their vacations) and thus take off some of the cost of seasonal fluctuation. Consumers pay the same price regardless of the peak load costs. Would it be fair to charge less from consumers willing to shift their consumption patterns to correspond better to the fluctuation in supply?

The situation in seasonal fluctuation can be examined as shown in Figure 5-14. The supply at the time point in question is assumed to be very inelastic. Demand for milk at retail level D_R being constant throughout the year, it is assumed to be somewhat less elastic than at processing level D_M. In a situation of "average" supply S, the producer price is P_M and the retail price P_R. In the low-production season, the supply curve shifts to S_L giving the equilibrium producer price P_{ML}. If the retail price is held constant, the margin decreases from M to M_1. During the season of high production, the supply curve shifts to S_H, giving the producer price P_{MH}. The retail price held constant, the margin increases to M_2.

In the current situation the manufacturing level pays for the coordination of seasonal fluctuations and, thus, for the idle capacity. If the seasonal price variation could be passed on to retail prices, the following could happen. The seasonality of consumption would increase in the limits allowed by the elasticity of liquid milk. The volume of seasonal variation in consumption would directly affect the need for excess capacity in processing. In a situation of excess supply, the relative value of milk used for other products would increase because of a lower marginal raw material price in these alternative uses.

The efficiency of the seasonal pricing of dairy products would depend on their elastic-

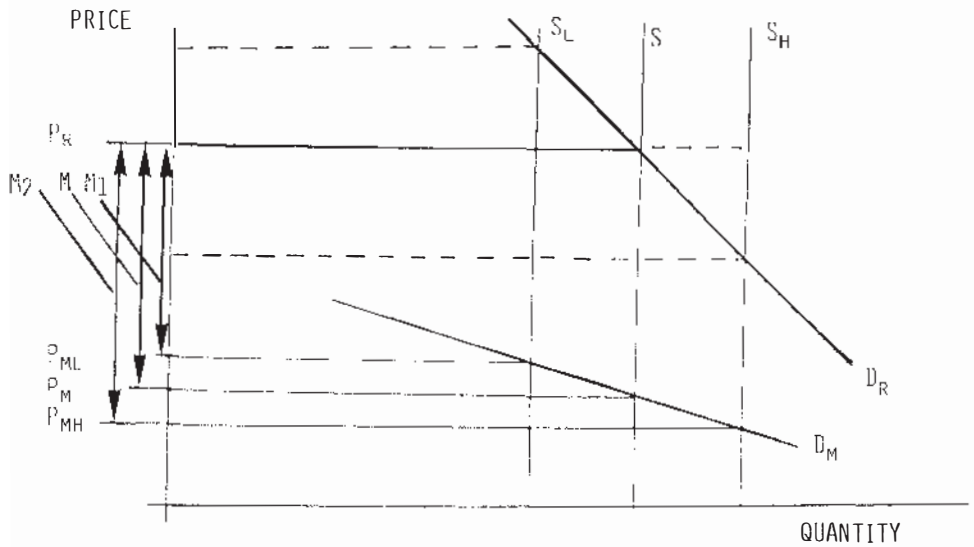


Figure 5-14: Effects of seasonal fluctuation on the producer and retail prices of liquid milk.

ities of demand. Liquid milk is a transaction-specific (perishable) asset at retailer and consumer levels. This may restrict the efficiency of price at the consumer end.

Role of cooperatives in improving seasonal balancing

As mentioned above, in the present centralized production management system, seasonal coordination decisions are made by command at the central organization level. The differential of the margin shifting from M to M_2 in Figure 5-14 (which the producers pay for) is used for coordination. The profits of coordination are distributed evenly to the cooperatives according to the rules set between the central cooperative and its members independent of their efforts in seasonal coordination.

What would happen to the transaction costs if the market of transfer milk were between the regional cooperatives instead of with the central planning unit? The central unit would act as a central clearing house with a "market price" for transfer milk, to which the buyers would be able to add the transport costs.

According to the hierarchical decomposition principle, this would decrease transaction costs. Since the cooperatives would be bargaining for themselves, this would lead to the improved allocation of resources in the plant, and give an incentive to the local cooperatives to educate their members to contribute to seasonal balancing.

Whether the total revenue extracted to the member producers for conducting the seasonal coordination task would be greater in the centralized or in the federated system would depend on the difference in the transaction costs of planning vs. the market, and the difference in the managerial slack. In both cases, transaction costs economics would predict fewer costs to the market than to planning.

But there is a large problem of fixed assets, which in this case is milk. The perishability of milk might result in opportunistic behavior. The protection of transaction-specific assets would probably lead to long-term contracts, and end up in fundamental transformation (see Chapter 2.3).

5.3.4 Conclusions

Seasonal variation is coordinated by a cooperative by using processing plants that are flexible in product allocation, and by leaving coordination to the command of centralized

planning by giving it the authority for product management. The decrease in asset-specificity at dairy plant level and the decrease of uncertainty have made the cooperative plants well-functioning seasonal coordinating mechanisms.

The absence of significant transaction-specific assets makes price an effective coordinating mechanism for seasonal balancing. The further use of seasonal producer price differentials is mostly a matter of increasing costs of production balancing compared to the savings obtained by decreasing the peakload processing capacity.

Relatively complicated standard operating procedures for seasonal coordination by cooperatives could possibly be managed by the market between the cooperatives, with the central unit acting as a clearing house. The frequency of transactions is so high that the transaction costs of seasonal coordination would decrease. But because of the perishability of milk there is an asset-fixity problem, and TRC predicts that the market would not necessarily be superior to the present system.

In the present system only the producer price varies, but consumers pay a constant price, e.g., for liquid milk. The cooperatives conduct the balancing. Whether the peak is paid for by the consumers or the producers depends on whether the overall volume of milk is adjusted to meet the demand in the lowest production season or to have as little extra capacity as possible. Are the consumers willing to pay a considerably higher price in the low-production season and at the same time decrease the consumption of milk to make new investments in extra capacity unnecessary? Or are they willing to pay the cost for extra capacity in order to get a sufficient amount of milk throughout the year without any price reductions in the peak period?

Because price seems to work well at the producer end, this is perhaps the best solution for seasonal balancing. Milk is a transaction-specific (time-specific) asset for consumers, which makes them inflexible to change their behavior.

6 ADAPTATION COORDINATION MEETING NEW CONSUMER DEMANDS

6.1 THE ISSUE

6.1.1 The changing consumer

The total consumption of dairy products is declining, as seen in Figure 5-1. Instead of accepting the change in the consumer diet as final, a more optimistic assumption holds that the dairy industry has not been adaptive enough to meet the changed and changing consumer demands and preferences. If this is true, the problem is to a great extent one of marketing.[1] Products derived from other raw materials have been more adaptive and thus, more competitive.

As a background for adaptation coordination according to consumer demands, it seems useful to briefly examine the patterns of changing consumer preferences and the reasons involved. Changing consumer demands can be understood as reflections of general changes in society, which affect people's lives and their food consumption habits. The development of technology makes it possible to meet such new consumer demands.

Changes in society as well as in food consumption patterns are complex processes in which the cause and effect are not easily defined. Finland changed from a rural into an industrial society relatively late. The structural change which began in the late 1940's shaped the country in 30 years into a modern industrial society, and, in part, directly into a post-industrial society. The pace of change was more rapid than in any other Western country. When in 1950 more than 70 per cent of the Finnish population still lived in rural communities, the proportion at present is less than 40 per cent. In 1950 about 45 per cent of the working population were in agriculture and forestry, while the corresponding share now is about 10 per cent. In 30 years every third person living in the countryside (altogether about 1.5 million people) has become an urban citizen. Thus, food producers have become food consumers at the same pace.

Perhaps the most significant change in food consumption units during the last 20 years has been the increase in the number of working women. According to Finnish official statistics in 1970, there were still half a million couples with only the other earning an income, but in 1984 such families had decreased to one-tenth (Anon. 1987b). In 1985, 48 per cent of the work force were women.

The immediate effect of this development was a rapid increase in household incomes. Along with the increase in incomes, qualitative factors began to receive more emphasis in food purchase decisions. It can be generally stated that, at present, neither price nor quality alone, but the utility value of a food item is the thing that counts.

The increasing number of working women required large-scale child daycare systems. The number of places in child daycare has more than doubled since 1975. The traditional roles of men and women in families have also been affected. The family member earning most is not necessarily the husband any longer, and even "house husbands" can be found. Women, in turn, have adapted themselves to the requirements of the labor market by increasing

[1] It should be noted that marketing in this study is understood as the information flow from the market to the producer, not the efforts of pushing a product to the consumers.

their education. For example, 66 per cent of the university graduate students in 1983 were women. Women also adapt by marrying later and having less children. The average age for women to get married has risen from 23.5 years in 1975 to close to 26 years in 1986. In 1950 there were 1.4 children per woman under 50 years, now only 0.8.

Since working women have less time to prepare food and more money to buy food, the consumption of high-processed foods has increased. A part of the value added in food has shifted from households into the food industry.

Family eating habits have met significant changes. The traditional (rural) daily rhythm which was controlled by meal times has changed. The different time schedules of family members do not tolerate strict meal times. During week days, people more and more eat away from home: children at the daycare or school, adults at work.[2] Family meals become more rare. E.g., the micro-wave oven has made it possible to eat whenever one feels hungry. Despite nutritionists' recommendations to the contrary, the importance of breakfast is decreasing.

Moving away from restaurant dining seems to be another trend. Consumers increasingly either buy entire meals or parts of meals prepared in a large-scale kitchen and consume the meal, e.g., at home. The border between home and institutional dining is diminishing. Meals consisting of several raw food items instead of single food items are being purchased more and more.

The nuclear family is breaking up. The quickened tempo of life does not favor lifelong relationships. The number of singles, single-parent households, unmarried couples, divorcees, etc., is increasing. In Helsinki, 40 per cent of the households are singles. It is obvious that the food consumption of a single-member household is different from that of a large family.

In rural society, the family and the neighborhood had a significant effect on everyday life. In urban society, the influence of the work, school and other groups as well as the mass media are important reference groups.

During the last 15 years, concern for health has been one of the most popular topics of public discussion. A part of the growing interest in health questions is rooted in the changing life styles. Less muscular work and more leisure have increased the interest in body exercises and holistic health ideals. Less fat and cholesterol, more non-processed, green food seems to be the consumption trend favored by certain consumer groups.

Table 6-1 presents the daily consumption of energy and both animal and vegetable protein during 1980—86. The only visible trend is the decrease in the consumption of animal fat by about 10 per cent.[3] The consistency in the other figures seems to indicate that the most significant changes have occurred elsewhere than in the quantitative consumption of the basic food elements.

The reduced animal fat consumption, which also affects the decrease of total energy consumption, may also be explained by the changing life styles of consumers. The need for muscular energy has decreased in most activities.

Toxins, pesticides, chemicals, additives and hard technology have begun to worry consumers. The demand for more naturalness and less processing may be influenced by the consumers being separated further from the actual production of food. »Back to nature'' movements are being founded.

Demands for convenience in food purchasing and consumption (as well as litter disposal)

[2] Eating at work has increased substantially after an agreement between labor unions and employers required the employer to arrange a meal for the personnel in one way or another. The larger employers have their own kitchens and lunchrooms, while the smaller use luncheon tickets which are valid in almost every restaurant.

[3] The per capita consumption in Sweden in 1986 was 12 700 kJ of energy, 87 g of protein (of which 60 g of animal protein) and 127 g fat (of which 72 g of animal fat). Thus, in Sweden the total energy consumption is higher but it is derived more from vegetable fats and animal proteins. (Anon. 1988c).

Table 6-1: Daily per capita consumption of energy, protein and fat in Finland during 1977—86. Source: Official food balance sheets.

Year	1980	1981	1982	1983	1984	1985	1986
Energy kJ/d	12233	12269	11911	11898	11720	12050	11710
Protein g/d	103.7	102.8	105	102.5	103.2	105.6	105.2
Vegetable	30.1	29.9	30	29.	30.1	31.1	30.2
Animal	73.6	72.9	75	72.6	73.2	74.5	74.9
Fat g/d	122.3	129.7	120.5	115.4	114.1	116.4	113.2
Vegetable	22.1	24.3	22.2	21.7	21.3	21.9	22.8
Animal	100.2	105.3	98.2	93.7	92.8	94.4	90.4

have increased. The value of the time used for food shopping, preparation and consumption has increased as well. More off-time has brought other dimensions to food than merely satisfying one's hunger. Aspects such as atmosphere, emotions and status are being observed in food consumption. Cooking as a hobby, involving acquaintance with different food cultures, has brought along dimensions such as adventure, excitement, etc.

It may be concluded that fewer and fewer common trends can be observed in food consumption. Consumption patterns are becoming increasingly fragmented. Consumers may take into account fastness, atmosphere, economy, culinary aspects, traditions, exoticism, adventure, status, health, diet, etc., in food. There is no such thing as an "average food consumer" any more, if ever there was.

Since people frequently change their roles from, e.g., economy consumers at lunch to status diners at dinner, the real challenge for the food industry is how to satisfy the various and increasingly fragmented needs of consumers, who still often change their minds. How to be flexible but still use economies of scale? The consumers are more and more educated and require better service, so this is the real challenge for adaptation coordination.

6.1.2 The changing food system[4]

The total flow of money in the food subsector in Finland is presented in Figure 6-1. It can be observed that only 11 per cent of value added occurs on farms. The largest part of value added to food items is in the food industry, next comes the category of farm inputs, and after that the food retailing industry.

The food system has adjusted to the changes in the environment by diversification, specialization and centralization. The value added to the products has shifted from the farms both backwards and forwards, as well as from the households back to the food system and forwards to the manufacturers of household appliances.

Figure 6-2 describes the shift of the relative proportion of farm inputs, and value added on farms and in food processing from 1960 to 1985. It can be observed that while the relative value added on farms was 47 per cent in 1960, it was only 17 per cent in 1985. It would have been interesting to include the food retailing industry as well as large-scale kitchens into the same figure, but there are no adequate data available. All that can be said about them is that the ratio between total sales of groceries and total farm sales plus the value added in food processing was 0.93 in 1960 but 1.20 in 1985,[5] which suggests a significant increase in the share of the retailing industry within the food industry.

The more and more rapidly changing and diversifying life styles and food consumption habits have made it necessary to change the

[4] For a more detailed discussion on this topic, see OLILA 1983 and 1987c.

[5] The figures for the grocery business are from Anon. 1987c. The coefficient only describes the relative increase in the share of the retail industry in the value added in the food industry. It excludes food imports as well as the largescale kitchen industry.

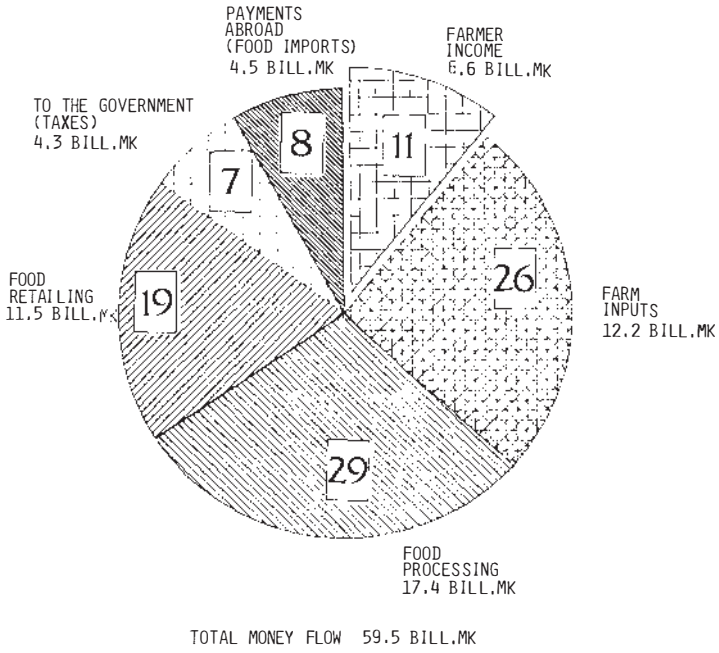


Figure 6-1: Total money flow in the Finnish food industry in 1985.
Source: AALTONEN & KOIVISTO 1987.

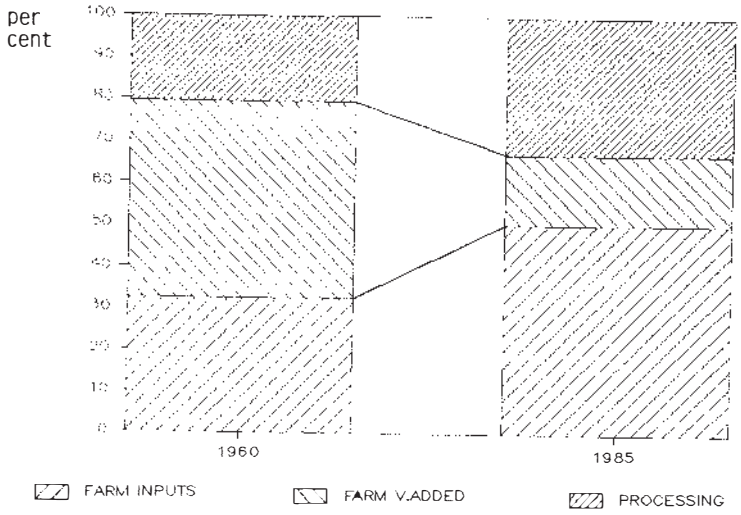


Figure 6-2: Relative shares of farm inputs, and value added on farms and in the food processing industry in 1960 and 1985.
Sources: Agricultural Economics Research Institute and Association of the Food Processing Industry.

entire way of thinking in various parts of the food system. Diversified needs, increased purchasing power, opportunities provided by advanced technology and an increasing number of alternatives have changed the participants in the food system from manipulation of the environment into adaptation and adjustment according to it. Some experts have stated that

the consumers have not actually changed so much, but their needs are now better taken into account than before.

Retail stores have segmented their services to different consumer groups by diversifying the store layouts. Automarkets for one-stop weekend shoppers, warehouse shops for the price-conscious, neighborhood stores for everyday shopping, food kiosks for late evening shoppers (3-shift workers),[6] and special tea, candy and cheese shops are to be found. Restaurants have also segmented their services. E.g., the menu, prices and customers at lunch hours may differ completely from those in the evening hours. The latest development has been the fading boundary line between home and institutional dining brought about by the increase in home deliveries. Although not so common as, e.g., in the United States, several retail stores have kitchens, grills and bakeries for prepared food take-away services. Pizzas, hamburgers and especially luncheon salads are increasingly being taken away from where they are prepared.[7]

The food processing industry is changing its new product development and marketing strategies to match the changed environment and consumption patterns.[8] Nutritional values, less calories and cholesterol, more freshness, naturalness and convenience, are slogans of today. The food industry is also starting to realize that one slogan is not enough, because there is no "average consumer" with steady needs anymore. As mentioned above, the real challenge for the food industry is how to satisfy the consumer needs, which vary continuously and unpredictably. This uncertainty and unpredictability sets new requirements for business strategies.

The slight controversy between the food industry and nutritionists is probably not only caused by the food industry's slowness to adjust. The deep-rooted food consumption patterns change much more slowly than what the discussion would indicate. This means that the most popular products are not necessarily those that are the most recommended. Although most consumers do like to eat what is considered healthy, they do not want to compromise with a taste they like. Insufficient product development has sometimes brought to the market products which really taste "healthy" and which have not been successful.

Along with the increase of prepared food items and meals, another challenge has emerged. Products are no longer meat products, vegetable products, dairy products, etc., but mixtures of all these. Ready-prepared meals will have a strong impact, e.g., on the farmers' cooperative food processing system, which is organized strictly according to raw material.

The producer level is still least affected by the changing consumption patterns. Among probable explanations for are that (1) the present market system does not carry sufficient information about prevailing preferences, and (2) the diversity of the life styles of most of the consumers is increasing as compared to the producers' life styles. Producers cannot easily understand the living circumstances of their end consumers. This has been a special hindrance for producers shifting away from traditional agricultural production, since the shift from product orientation to consumer orientation has required quite different skills. The transformation has, therefore, been very difficult.

6.1.3 Reflections on the dairy product market

The high consumption of dairy products in Finland can be partially explained by the fact

[6] Real convenience stores are not found in Finland because of the strictly regulated opening hours.

[7] See Ollila (1987d) for a discussion on takeaway dining.

[8] The changed situation has not always been easy for the Finnish food industry. The emphasis on quantity, the technical quality criteria and a safe competition position have made it very difficult for the industry to adopt new strategies. E.g., when consumers started to demand less-processed foods, the industry spent years discussing whether the consumers' demands were justified. Meanwhile, a 300 million Fmk natural food business with imported goods sprang up from nowhere.

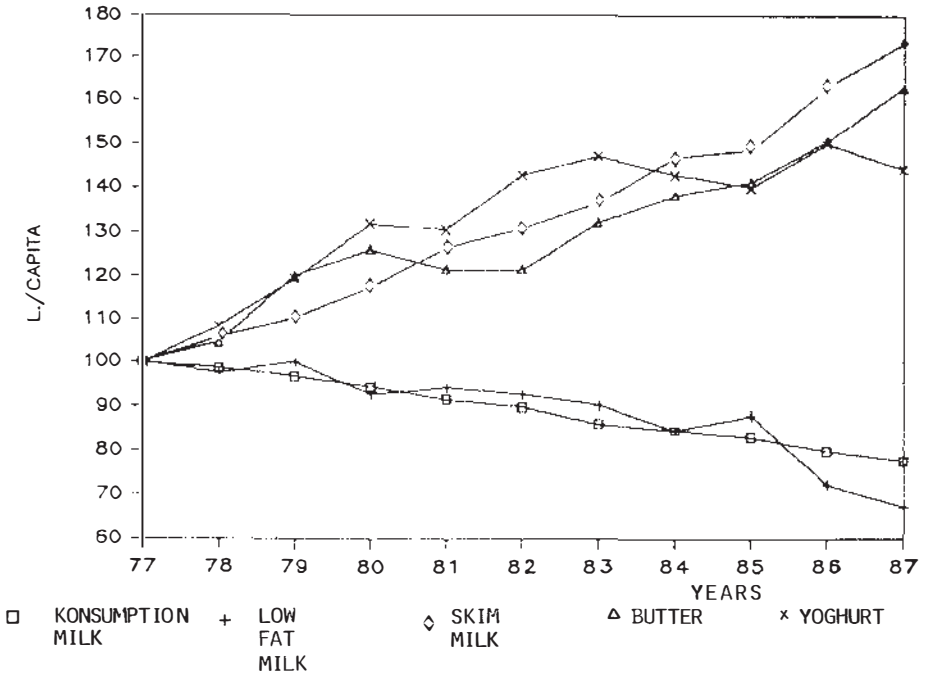


Figure 6-3: Relative changes in per capita consumption of selected dairy products in 1977—87.

that rural society dominated until fairly late. Traditional food items in which dairy products played an important role, belonged to the childhood food culture of most of the adults of today.

Changing life styles have modified the dairy product markets as well. Urban families with working women and high incomes are prominent in the statistics on dairy product consumption. The consumption of selected major dairy products is presented in Figure 6-3.

The twofold development is visible in Figure 6-3. The consumption of products that are convenient, highly processed, easy to prepare fast for small consumption units and that have a high income elasticity such as yoghurt, is increasing. During the same period, the consumption of long-life UHT milk has increased almost eight-fold, with consumers taking such milk to their boats, mobile homes, summer cottages, etc. Convenient pudding desserts have almost doubled, and fresh cheese products such as cottage cheese, which are convenient to be used as a snack, have increased their sales sevenfold in 10 years.[9]

[9] Source: Valio's Market Research Department.

The consumption of products in conflict with prevailing health attitudes — such as butter and whole milk — is decreasing. KETTUNEN (1988) has calculated that the reduction of whole milk and butter consumption cannot be compensated by the increase in cheese consumption by the year 2000. In order to maintain the position of dairy products, changes in product structure are needed.

There is evidence from the near past about the loss of the market share because of slowness to adjust to consumer needs. Valio lost a considerable share of the market in connection with a debate on mixing vegetable fats with butter and starting to manufacture lighter sandwich spreads. The debate lasted for years, and margarines increased their market share during 1966—85 from 14 to 37 per cent (Anon. 1987d). The manufacture of vegetable fat/butterfat mix was not officially allowed in Finland until in 1979 when a new mix having 80 per cent of butterfat and 20 per cent of vegetable fat introduced. It has now reached a market share of about 11 per cent. In Sweden, where the difficult decision was made at the beginning of the 1970's, the

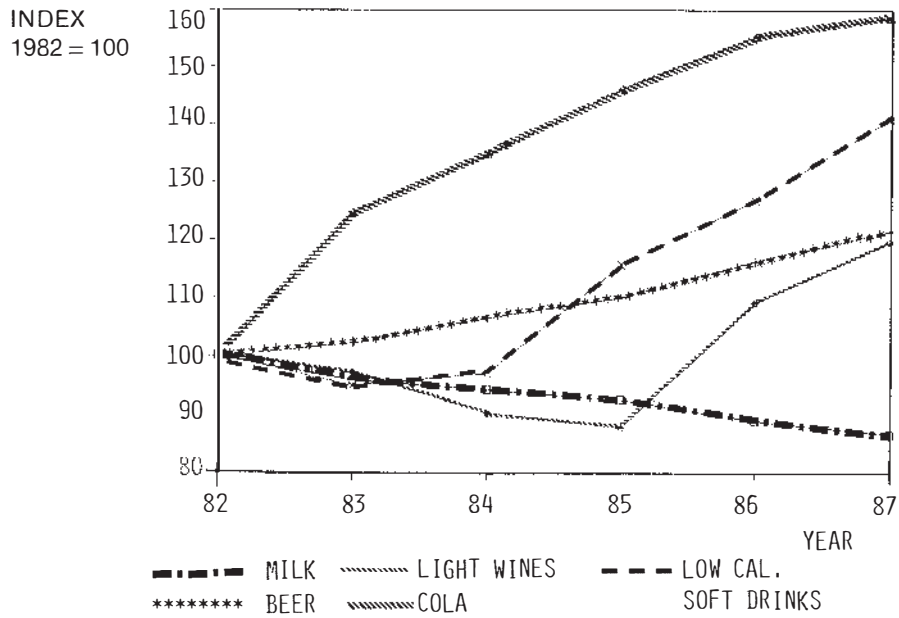


Figure 6-4: Relative per capita consumption of selected beverages during 1982—87. Source: Haarukkapaloja elintarviketeollisuudesta, various issues.

vegetable fat and butterfat mixes have already a larger market share than butter.

The change in consumption patterns described above can also be seen in the development of the consumption of selected beverages presented in Figure 6-4. Liquid dairy products have been partly replaced by beer, cola, wines and low-calory soft drinks.

Liquid dairy products still have a very strong market share, with a per capita consumption of almost 180 liters per year, compared to 68 liters for beer and 8 liters for cola.

The future of milk does not seem very promising by looking at the household statistics from 1985 (Anon. 1987d). When in 1985 the average per capita consumption of milk was 163.5 liters, a retired person consumed about 206 liters against 124 liters for a whitecollar worker and 92 liters for the category "not in the labor force" (including students, etc.). In the Helsinki suburban area, the average consumption was 119 liters compared to 192 liters in the rural communities. From this it can be projected that if competition remains the same, the downward trend in the consumption of liquid milk will continue.[10]

A comparison of use of raw milk for various products in the Scandinavian countries indicates a lack of adaptation according to new consumption patterns in Finland (Table 6-2).

In table 6-2 it can be observed that a much larger proportion of Finnish raw milk goes for milk powder production than in the other Scandinavian countries and a smaller proportion goes for cheeses and "other" products, although the two latter categories seem to be increasing rapidly. The above figures suggest both a slowness in adaptation as well as lost opportunities in a growing market. From Table 6-2 it can be assumed that the excess milk from the liquid product market in Finland is processed more into milk powder and butter, while the other countries use it to a larger extent for cheeses and "other" products.

[10] In Sweden, the per capita consumption of milk in 1987 was 140.4 liters, of which 87.7 liters was 3.0 % fat milk, 20.7 liters 1.5 % fat milk, and 32 liters 0.5 % fat milk. The average fat content was 2.2 per cent compared to 2.45 per cent in Finland. (Sources: Anon. 1988c and 1988d).

Table 6-2: Proportions of raw milk used for various product categories in Denmark, Sweden, Norway and Finland. Source: Valio.

% of raw milk used for:	Denmark	Sweden	Norway	Finland
Liquids	16	43	45	36
Cheeses	45	30	35	28
Powder products	25	19	12	30
Other products	14	8	8	6
% of fat used for butter	40	40	28	49

The dairy processing industry has some cooperation with the other food industry. Valio, e.g., has some joint product development projects with the meat industry, but according to interviews with the personnel of Valio's New Product Development Department, such projects are mostly concerned with issues such as package sizes. The increased consumption of prepared foods, home-delivered meals, special needs of large-scale kitchens, etc., have not yet made a significant impact on new product development.

The development of new production techniques such as biotechnology has also had an effect on product development projects. However, technology not related to production techniques such as the opportunities offered by micro-wave ovens, are not yet taken into account in new product development projects. Only some recommendations as to the applications of traditional recipes in micro-wave cooking have been made. The question of how the micro-wave oven and the change in cooking caused by it affect new dairy product development, remains almost totally untouched.

The liberalization of international trade will bring entirely new challenges for the Finnish dairy industry. According to HÄRMÄLÄ (1988), the differences in the prices of raw materials will no doubt be leveled off in the future as before, but the competitiveness of the domestic food industry must be taken care of by the processing industry. This means that the organization which controls the collecting of milk has considerable power in the business. However, the competitors of many domestic dairy products on the market are likely to be multinational companies. The discussion regarding the change in the dairy product market has been dominated by the issue of the economies of scale in production. This has also been one of the major arguments in attempts to establish larger dairy processing units in Finland. According to the above description, the most significant weak point of the Finnish dairy industry in facing the international competition may be in adaptation, i.e., in the ability to adapt to new consumer preferences quickly enough.

When looking at consumption figures, the first conclusion could be that dairy products are losing their importance in the consumer diet. Another question is whether the decrease in dairy product consumption is a reflection of slowness to adjust to new consumption patterns and consumer preferences. Even if the first conclusion were partly true, there is also evidence from the past about slowness in adjustment to new preferences and consumption patterns. The situation will, from the point of view of the domestic dairy industry, become serious when the liberalization of international trade brings foreign competition to the Finnish dairy market.

6.2 HOW THE PROBLEM AROSE

6.2.1 Key transactions for improving adaptation coordination

Consumers, Valio and the producer members

It is not easy to show clear evidence about the slowness in the adaptation of new products and services to meet consumer preferences in

the Finnish dairy industry. However, by examining the technical possibilities and, e.g., consumer voice in the public media it can be concluded that some slowness exists. E.g., low-fat milk and butterfat/vegetable fat mixes appeared on the market much later than what demand would have indicated.

The question of the fat content of dairy products has been very difficult for the Finnish dairy industry, which has almost without exception opposed the consumer demands for lighter dairy products and delayed their introduction. After a long debate, a lowerfat liquid milk was introduced at the beginning of the 1970's. The fat content was 2.5 %, which was raised to 2.9 % in 1976. This was followed by a long discussion about the unfairness of forcing consumers to eat more surplus butterfat in milk. It lasted till 1983 when the fat content of lowfat milk was decreased to 1.9 %. The same kind of rigidity in adaptation to consumer preferences was observed in the discussion concerning butter and butter/vegetable fat mixes.

Many new dairy products have been introduced on the Finnish market by IOF dairy companies. If they have been successful, they have been adopted by the cooperative dairy system as well. Yoghurt and gourmet ice cream are among examples of this.

Imports of dairy products so far concerned cheese products. From 1981 to 1987, the import of special cheeses has grown from 0.2 million to 1.7 million kg. Although the rapid increase has been a conscious strategy of Valio and has often been based on reciprocal import-export contracts, it clearly shows the increasing diversity of consumer preferences. Along with the development of international trade the decisions concerning imports cannot be based only on domestic strategies.

New product development in Finnish cooperative dairies[11]

Valio's new dairy products are almost always a result of its New Product Development Department interacting with the Central Marketing Department. New product development is concentrated into so-called New Product Development Groups (NPDG's), which are independent and usually consist of a product sales manager, a product development expert and a production expert (who may also come from a local dairy). At present there are nine NPDG's at Valio. The NPDG's report to the Product Development Committee, which consists of the top management of production, product development, etc.

The process of developing a new product can be roughly divided into four stages: (1) idea stage, (2) prototype stage, (3) development stage, and (4) decisionmaking stage, each of which will be briefly presented in the following.

(1) Idea stage:

The largest source of new ideas is information about what has been done elsewhere. International exhibitions and literature, reports from ingredient suppliers, etc., are important. Valio's own marketing research gives information about new product possibilities as well. Two leading themes that have been emphasized lately are nutrition and health, as well as convenience. Along these lines, product categories such as dairy product snacks, desserts and gourmet products have added several new products. Although the idea formulation occurs in NPDG's, the most of the ideas are rooted in technical innovations of production.

(2) Prototype stage:

Based on the idea of NPDG, a rough prototype of the product is manufactured in Valio's new product laboratories. The product is either presented to Valio's internal panels or to so-called focus groups, which also include members from outside of Valio such as housewives. An internal panel group is more

[11] This information is drawn from interviews with the personnel of Valio's New Product Development Department and Marketing Department altogether about 10 persons at different positions. The conclusions are by the author.

capable of evaluating the technical properties of the product candidate, while the latter focus group is used when emotional properties are emphasized. As a result, improvements to the prototype are made.

(3) Development stage:

Technical and marketing plans are made at this stage. The Production Department designs the industrial manufacturing process and makes production cost calculations. The Marketing Department conducts tests on the product, its packaging and advertising, and makes tentative marketing plans. It also makes sales volume estimates, although it does not have established procedures for this.

(4) Decisionmaking stage:

Based on the information gained in the previous stages, the new product committee decides whether to go on or to quit. If the decision is positive and the new product involves something more than e.g. just adding a new ingredient into yoghurt, the implementation responsibility is given to the founded project group. It has been decided earlier which particular dairy plant will be the manufacturer of the new product, and representatives of the plant are included into the project group.

The process described above applies to short-run new product development mainly for domestic markets. In addition, Valio's New Product Development Department has long-run development projects, which include basic research (e.g., biotechnology) to find new uses for milk components. These often involve international cooperation, especially with the other Scandinavian dairy organizations.

The following problems came up in the interviews with the personnel of the New Product Development Department:

(1) Cooperation between product development and marketing could be improved. Marketing lacks the capabilities to select and put into an order of preference ideas presented by product development and NPDG's. The limited capacity of the marketing personnel cannot adequately convert the consumer preferences into guidelines for new product development.[12] According to an employee in the Marketing Department, the energy goes into implementing the marketing activities, not into making plans and strategies. There are examples of the lack of product commercialization capabilities leading into lost opportunities. About 10 years ago, Valio developed a unique artificial mother's milk substitute. The inability to launch the product on the international market has led to the situation that a British corporation is now on the market with a product having the same formula. Valio also tried to start marketing gourmet ice cream a couple of years ago with no success. Based on this experience Valio also refused to buy a foreign ice cream manufacturing licence. Now that a much smaller firm has had remarkable success with gourmet ice creams, Valio came up with an imitation product in the fall of 1988.

(2) The personnel of the New Product Development Department feel that they are too restricted by the prevailing raw material structure. Product development has to accept the properties of the incoming raw milk and, thus, the products are not always competitive on the international market. They also feel restricted by the fact that the cooperative decision-making body often opposes products not in line with existing milk production. A controversy arises when Valio attempts to encourage consumers to eat more butterfat, while product development attempts to develop lowerfat products along the lines of nutritionists' recommendations.[13]

[12] The budget of Valio's New Product Development Department in 1988 was about 50 million Fmk, which is about 0.5 per cent of the total sales. The marketing research budget at the same time was about 2 million Fmk, 0.02 per cent of the sales. The corresponding figures of the almost samesized U.S. cooperative Land O'Lakes in Fmk were 35 million (0.8 per cent) and 8.5 million (0.2 per cent), in other words, the marketing research budget of Land O'Lakes was about 10 times that of Valio's.

[13] In summer 1988, Valio carried out an extensive campaign for milk fat and questioned the validity of research results on which the prevailing fat discussion was based. Public opinion was so distant from the points

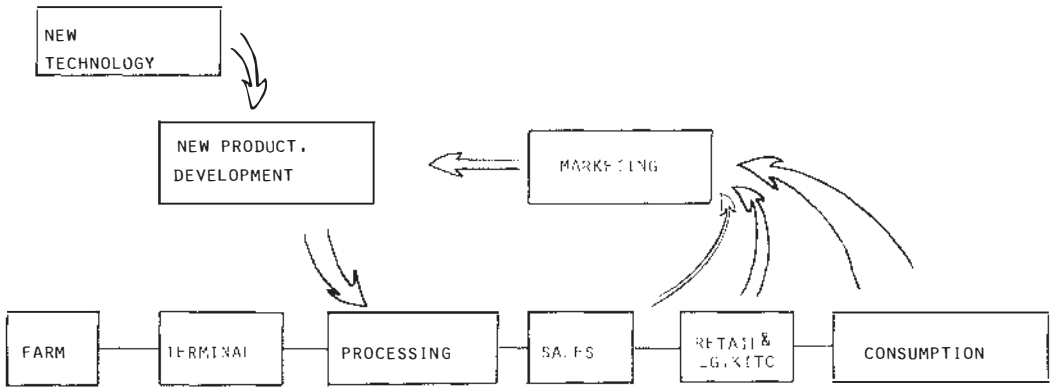


Figure 6-5: Critical internal transactions of adaptation coordination.

This may become an increasing problem when competition requires more products containing also other raw materials than milk.

(3) The people in new product development also feel that Valio's large organization is sometimes too reluctant to accept new ideas and that too much time has to be used for the internal marketing of new ideas.

Figure 6-5 describes the critical internal transactions considering adaptation coordination. The Marketing Department has a key function in adaptation coordination at processing level. This is where the customer preferences are converted into new product ideas, which are technically tested by the New Product Development Department, and entered into the processing system.

It seems that a major difficulty is the inability of marketing to combine preferences and new product development. There are also difficulties in getting the preferences of retailers and largescale kitchens to be taken into account. New technology and processing methods are better adopted through the new product development organization. The performance criteria of new product development should be shifted from the number of new introductions to reflecting the real performance of the products.

The marketing research organization also sees the follow-up of the new products as a problem. Even if they were able to monitor the performance of the new products, the message to the product managers is too often overlooked or not understood.

Export decisions

As mentioned earlier, surplus export procedures provide the same price to the dairy industry independent of its efforts made for the product. The United States cheese market illustrates the situation. Valio has exported Emmental-type cheese to the U.S. and, despite the subsidy of about 10 Fmk per kg, this export has been a relatively low-cost way for the government to dispose of Finnish surplus. »Finlandia'' is considered a first-class cheese and it has won awards for its quality. The prices of the main imported Emmental-type cheeses at the New York Exchange in 1982—87 are presented in Figure 6-6.

Figure 6-6 shows that ''Finlandia'' has continuously been sold at a lower price than Swiss cuts and the Norwegian brand ''Jarlsberg''. From 1986 to 1987, the price of Swiss cheeses went up, but that of »Finlandia'' remained at the same level. The difference in prices grows

presented by Valio that their acceptance was minimal. Despite this, Valio started a lively and, in Finland, exceptional debate about animal fats and also about itself. Even a completely new form of operation with village and farm dairies was suggested (Tenhunen 1988). The campaign itself well describes the problem of adaptation of cooperatives presented by Staatz (1984), when members are only interested in selling their present product, not in the consumers' preferences.

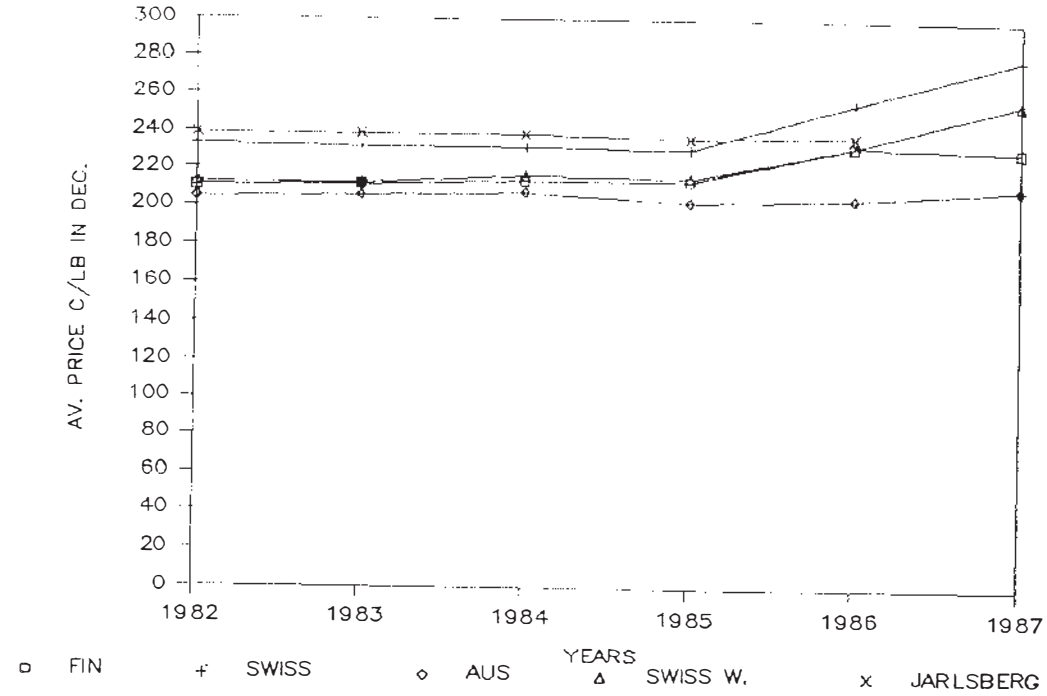


Figure 6-6: Wholesale prices of Swisstype cheeses in New York in 1982—87.

considerably when we come to the district dealer level. The dealer prices for retailers in Detroit in October 1988 were:

Finlandia	2.65 US/lb.
Austrian	2.55 US/lb.
Jarlsberg	3.10 US/lb.
Swiss	6.40 US/lb.

It can be noticed from the dealer prices that the difference especially between the margins of ''Finlandia'' and Swiss has increased. In a retailer's opinion,[14] ''Finlandia'' is a ''highlquality, low-priced mass product''. Compared to the sales promotion of Norwegian, Swiss or even Swedish cheeses, the promotion of »Finlandia'' cheese, according to the retailer, is insufficient. This probably explains the different development in the margins.[15]. It may indicate that the competitors of Valio circumvent the import quotas by increasing the value added to the product after it has crossed the border, by adding intangible properties such as a strong brand name.

The recognized consultant Linda C. Allen of Allen Associated Inc. explains the difference between ''Finlandia'' and ''Jarlsberg'' as follows: »With respect to cheese, it is a classic case of branded vs. commodity products, in my opinion. Jarlsberg has made a position for itself with advertizing. Valio is occasionally advertized by brand, but more typically is found in large bulk blocks in the deli case, both in supermarkets and specialty stores.»[16]

6.2.2 Current policy as explained by TRC

The standard operating procedures of adaptation coordination developed during the time of mass production with minimal externalities (competition). SOP's were shaped with a tendency to centralize the coordinating activities in order to decrease uncertainty. This development was supported by the producer mem-

[14] The owner of ''Grand Gourmet'' in Lansing, Michigan, who has had ''Finlandia'' for many years but taken it now from the shelf because nobody knew the product.

[15] The difference between ''Finlandia'' and Swiss broker prices is more than the prevailing export subsidy of ''Finlandia», which is about 10 Fmk per kg. This suggests that proper marketing would make the subsidy unnecessary.

[16] Personal letter from Linda Allen to the author.

bers, who promoted the system to secure a market for their milk. The local dairies became production-oriented and had nothing against shifting the functions outside their capabilities to the central level.

SOP's became fixed assets, which, in turn, made the entire organization technically and biologically oriented. The development into this direction was logical at a time when the largest source of uncertainty was at producer level. At the distribution and consumer end, the technical properties of the products were emphasized, not the development of new products. The quality criteria for dairy products are, therefore, mostly technical, not necessarily having any connection with consumer preferences.[17]

As consumption patterns became more fragmented, the centralized cooperative organization, well-synchronized but slow in the adaptation process, started to lose its opportunities. Valio's dominating position and import barriers have to some extent prevented this from becoming visible.

There seems to be a conflict between synchronization and adaptation coordination in the dairy subsector. Changing consumer preferences would suggest a change in production. On the other hand, the producer members established the cooperative for securing the market for their existing products. The cooperative management has problems in deciding to whom they should listen. If Valio behaved like an IOF, good performance would require listening to the consumers' preferences. According to the cooperative principle, however, good performance would require fulfilling the producer members' preferences. The cooperative becomes a hindrance to adaptation coordination.

[17] Central management is realizing this problem and arranging seminars to change the purely technically oriented criteria into criteria that take into account consumer preferences. It can still be easily observed in seminar discussions that productionoriented dairy plant managers see the question of increasing product quality rather as an extra production cost than a means of gaining a better price for the product (e.g., seminar at Korpilampi, 17 August 1988).

The inability to adapt may be a partial reason for the relatively high advertising budget of Valio. Valio spends about 100 million Fmk per year for advertising. During January—July 1987, 29.8 million Fmk was spent for the 13 most advertised food products in Finland, and Valio alone spent more than 35 per cent of this amount. The first two were Valio's products (MÄÄTTÄNEN 1987). This suggests that when a product cannot be easily changed, it is sold in its existing form as powerfully as possible.

The entire organization is a fixed asset for the member producers. Except for securing the market for existing raw milk, the cooperative has no other value for the members. Thus, there is no pressure from the side of the members to support adaptation. Also the farm income law bars any incentives for adaptation. E.g., if Valio could manage to develop, using biotechnology, an outstanding AIDS medicine and acquired huge profits for it, these profits could lower the producer price of milk if refunded to the members, because the patronage refund is taken into account in the dairy producer income negotiations.

The low rate of external effects has considerably decreased the uncertainty in production, which has supported the development of a centralized system capable of synchronization coordination. Internal uncertainty, i.e., the need for security in the transfer from one stage to another, has in turn supported integration. All this was a favorable and logical development in the stable market situation because it decreased transaction costs, but it is causing increasing problems in the present market with diversifying consumption patterns.

The low uncertainty of demand has made it unnecessary to treat the country as divided into separate marketing areas with varying preferences. The centralized new product development has produced the same products and package sizes for urban single yuppies as for the people of Lapp communities in the north.

Another problem connected with new

products concerns the process of granting the authority to manufacture the product. The Production Department gives the new product to the dairy plant it has chosen. It has happened that after a couple of years the profitable new product has been taken away and given to another dairy in a worse financial situation in the name of equal treatment. E.g., a relatively large dairy cooperative, Herajoki, put a great deal of resources into the development of yoghurt products in the 1960's and 1970's. After the success, the central organizationvmoved the production to another dairy cooperative. There are several similar examples that discourage innovations in local dairies in the fear that their "fair share" may be transferred to another plant. Even when a product has been developed by the central organization, with sometimes only minimal contribution by the actual manufacturer, the plant commits itself to the new product. Uncertainty concerning the future of the product has proved demoralizing, preventing local production process innovations and giving an incentive to conceal the profitability of the product. Centralized production management together with the principle of equal treatment also hinders the differentiation of the raw material according to the different uses.[18]

Externalities are growing in many ways. Other product categories are increasingly competing with dairy products, and international dairy products are coming to the Finnish market. The capability to adapt is becoming crucial. It seems that the key transactions causing slowness to adapt are:

(1) TRC 14: Consumers having a limited exit possibility cannot show their preferences through the market.
(2) TRC 5: The farmers' voice in protecting their existing production structure prevents adaptation if it requires changes in raw milk properties or the use of other raw materials.

In addition to the inefficiency in getting the preferences of consumers and producers counted by the system, there are also internal reasons for slowness to adapt:

(1) Overemphasis on technology in the dairy processing organization to some extent makes it incapable of monitoring consumer preferences and converting them into new products. The existing criteria for a "good" product may not reflect consumer preferences.
(2) The centralized new product development system is not sufficiently connected with the local and regional levels to reflect local preferences. There are no channels or incentives for local innovations, either.
(3) The rigidity inside the organization should be alleviated by emphasizing internal marketing and redesign of the incentive structure to support adaptation.
(4) The standard operating procedures regarding the export of surpluses do not provide incentives for making sufficient efforts to get the best possible price for the products.

6.3 ALTERNATIVE POLICY MEASURES

6.3.1 Producer members and adaptation coordination

The problem of the Finnish cooperative dairy system narrows down to the question: Whose preferences get counted first? Although an effective adaptation of dairy production and processing is also in the cooperative members' advantage in the long run, the immediate implications in this direction are insufficient. The producers live in a different environment with a different value structure than most of the final consumers. The system is unable to transmit information from one end to the other.

Since members do not see the importance of adaptation, the management of Valio has to spend a lot of their time convincing mem-

[18] In Kainuu Cooperative Dairy in northeastern Finland, it was found that more than one cheese could be made simultaneously in the same parlor. The innovation was presented to the central organization, which banned it stating that it causes hygienic hazards. The innovation was implemented surreptitiously and now, after a few years, has been adopted at all cheese plants.

bers about the necessity for change. The members feel alienated making decisions for which they do not see the reason. Thus, there is an information problem which the marketing system is unable to transmit.

The cooperative system might be able to increase the knowledge about customer preferences by actively informing the members.[19] The special ability of cooperatives to combine hierarchies and markets could be used to first increase information (hierarchies) about the need for change and then to adjust the pricing system (markets) to make the change profitable.

6.3.2 Development of new products

In new product development, the two main questions are how to improve the efficiency of market information in the new product development process, and how to improve the commitment of the product manufacturers (local dairies).

The first question depends on both the quality and quantity of information that market research is able to provide, and the ability and willingness of new product development to let this information guide the process. The improvement of market information would require granting more resources for market research, and probably separating marketing tasks from sales promotion tasks. Adapting to local preferences would require more marketing activities on regional and local levels as well.

A stronger commitment of local dairies to their products would require some kind of a bidding procedure concerning proposed new products. Also a guarantee that the dairy can keep the product if it is successful seems crucial. In order to activate the local and regional dairies to present new ideas (since they are closer to the market than the central unit), the New Product Development Department should provide more services to these dairies which are the real marketers of the products.

6.3.3 Governmental agricultural and food policies

It has been argued that the personnel in charge of dairy product export and of export product development have not had incentives for the active development of exports. Allocating profit responsibility seems to be rather difficult in this matter. However, Valio itself feels that there is increasing motivation for developing the export market. Without the export market, e.g., neither the existing nor the planned cheese industry could exist.

The connection between export subsidies, incentives for best possible performance, and the agricultural income law should be thoroughly studied and reconsidered at political level.

6.3.4 Scenario projected by TRC

Although the suggestions made above would improve adaptation, the prevailing dairy marketing system is not very well suited for the near future challenges of adaptation coordination.

Four factors can be seen as driving forces: (1) decrease of the proportion of the value of raw milk in the final dairy products, (2) attempts at regionalization of the cooperative structure, (3) deregulation of dairy product retail prices, and (4) international competition.

Along with the decrease of value added of dairy products, the proportion of value going to services, other raw materials, technology investments and research increases. Members control a diminishing proportion of the products to which the patronage and profit allocation are bound. Investment in the parts whose proportion of the value of the final product is increasing, competes with the patronage refunds. Even if the investment turns out to be profitable, the allocation of the profits is increasingly difficult.

[19] This may be a more general challenge for farmer cooperatives. Thus, the Central Organization of Farmers' Cooperatives, Pellervo Society, might take up the important mission of bringing the market and the members closer together.

If the assets were completely flexible, the cooperative would die out because the members would exit. But as this is not the case, capitalization of the assets would seem likely.

Valio has actively attempted to increase the size of cooperatives by merging smaller ones into regional cooperatives. Most of the local cooperatives seem to approve of the effort, but an increasing number feel that the solution is generally good though not in their case. It is possible that around 10 per cent of the local cooperatives may be unwilling riders and oppose the merger for various reasons. The uncertainty of the milk market for these local "rebels" might result in new cooperative arrangements between themselves.

Deregulation of the retail prices of dairy products makes retailers more price sensitive than in the past. They may attempt to get the regional cooperatives to compete with each other. By founding a new liquid milk packaging plant or by integrating with the »rebel" cooperatives, the retail chains could put the regional cooperatives into a difficult situation. If the factory price were to decrease, they would have to protect their fixed assets by lowering the producer price even more. The price squeeze is unlikely to be reflected in, e.g., labor wages, but only in the price of raw milk. Cooperative members would oppose such behavior,which in turn would block the demand. If the producer price were to remain regulated, the cooperatives would lose.

Liberalization of international trade will bring international dairy products and food firms to Finland. This is unlikely to affect the producer level, because virtually all West European countries are in a similar situation and the transportation costs of raw milk would be expensive anyway. Thus, competition is expected to occur at the level of entry to retail stores and other outlets. Therefore, there is no way to shift the cost of coordination to the prices of manufactured products, it has to be put on raw material prices. According to the hierarchical decomposition principle, this will lead to a situation in which the tasks of collecting and manufacturing should be separated.

According to TRC, the following scenario can be drawn:

(1) The power of the central organization, Valio, will shift to the regional dairies.
(2) Local cooperatives unwilling to merge will establish a new central coordinating unit.
(3) The retail level will start to bargain separately with the regional dairy cooperatives and the new organization, which will lead to increasing conflicts with the regional dairies. Competition will increase because of a growing number of foreign dairy products and, e.g., new liquid milk plants established by an international firm or firms in cooperation with some domestic retail chain.
(4) The regional dairy processing units will either (a) be changed into IOF's owned by the regional cooperative, (b) form joint ventures with domestic or international IOF's or retail chains, or (c) be sold to some of the former.
(5) The dairy cooperatives, which now form two national networks, will return to their initial tasks, i.e., milk collecting, ensuring good raw milk quality, collective bargaining, and overall and seasonal balancing of supply and demand.

Developments in the Michigan dairy industry and in the Finnish meat industry support the above scenario.

6.4 CONCLUSIONS

Adaptation coordination seems to pose a real challenge to the Finnish milk marketing system in the near future. Among the causes for the rigidities of the system can be seen the rules for dairy product pricing, the lack of exit possibilities at consumer level, the standard operating procedures and trading at processing level, and the asset fixity problem at producer and cooperative member level.

There is evidence that the dairy subsector is not particularly responsive to new consumer demands. New product development has largely been based on technical and biological sources without capabilities to convert the

changes in consumer and retailer preferences and in institutional dining into new product ideas. The main task of marketing has been the promotion of existing products and their variations.

Dairy product manufacturing has emphasized technical properties and has succeeded in making products of high technical quality. Transaction cost economics explains this to be a result of the cooperatives' fixity to a given product of the members and their initial purpose of protecting the products against externalities such as quality deterioration on the way from producers to consumers. Securing the quality of the products has been the major task of the Research Departrnent of Valio. This kind of orientation where technical quality is considered as the sole criterion for quality is very deeply rooted throughout the dairy subsector.

Standardized pricing together with limited exit possibilities (i.e., limited choice of alternative dairy products) have also acted as buffers suppressing consumer signals through the market. The SOP's regarding dairy product exports have not provided appropriate incentives for developing the export markets, either.

Changes in consumer preferences increase the uncertainty of the demand for the producers' milk. The fact that the membership of dairy cooperatives is tightly bound to the product, i.e., the milk delivered to the cooperative, makes the raw material a transaction specific asset for the cooperative. When consumer preferences change to an extent where changing the existing raw material for the end product becomes necessary, this becomes a hindrance to the cooperative. Producers have no incentive to respond to the demand for products external to their interests.

Without transaction-specific assets (of cooperative members and management), exit would be less costly and the cooperatives would decrease in size. According to hierarchical decomposition principle, milk processing would be separated from milk collection and collective bargaining. Collection and collective bargaining form the part of the dairy processing chain where the greatest value added is still based on milk, whereas after that, non-milk based functions such as other raw materials, know-how and services play an increasing role. The profits from these tasks external to milk marketing are not easily converted to the benefit of the owners of milk manufacturing plants without their capitalization.

Liberalization of trade combined with signs of structural changes in the dairy processing industry may dramatically alter the organization of the dairy processing industry. It is possible that dairy processing will be "capitalized", and the dairy cooperatives will withdraw to the area where they are superior: milk collecting, collective bargaining, and management of milk supply.

7 COMPARISON OF THE DAIRY MARKETING SYSTEMS IN FINLAND AND IN MICHIGAN, USA

7.1 DAIRY PRODUCTION IN MICHIGAN

The State of Michigan in the north-central part of the United States is very comparable with Finland both as to surface area and number of population. About 4 per cent of its 9.3 million people live on agriculture. Table 7-1 shows some selected characteristics of dairy production in Michigan and in Finland.

Table 7-1: Selected characteristics of dairy production in Michigan and in Finland. Sources: Anon. 1988e and 1988f.

	Michigan	Finland
Number of dairy farms	6 100	58 000
Cash receipts of agriculture, %	25	40
Number of dairy cows	358 000	599 100
Average herd size, No. of head	59	10
Total milk production, mill. liters	2 362	2 900
Average production per cow, liters/yr	6 542	5 000
Average age of farm operators, yrs	50	50

Michigan's total milk production and the number of dairy cows are about in the same size category as in Finland. The average milk yield per cow is a little higher. The most significant difference is in the average herd size, which in Michigan is about sex times larger.

While Finnish agriculture, especially dairy production, involves political considerations as to rural settlement, food security, etc., such factors are far less prominent in Michigan farming. However, agriculture has a special position in the U.S. compared to most other industries. According to a NC 117 report (Anon. 1978, p.126), agriculture is a key to maintaining the value of the dollar in international transactions and affecting inflation. Both explicitly and implicitly, people believe they are entitled to an adequate supply of food to avoid malnutrition. This consideration has had a substantial impact on the dairy industry.

In the following, Michigan's dairy industry will be examined separately where possible, but in many cases as a part of the U.S. dairy marketing system.

7.2 TECHNICALLY SEPARABLE INTERFACES OF THE MICHIGAN DAIRY MARKETING SYSTEM

A rough division of the Michigan dairy marketing system into technically separable interfaces is given in Figure 7-1. Perhaps the most significant difference as compared to the Finnish system is the division of Grade A and Grade B production already at farm level (TRC 5). This divides the system into two separate production lines, one with combined lines for liquid products, special products and whole milk powder, and the other specialized in butter, cheese and skim milk powder production. Deliveries of Grade A — Class III milk from the Grade A line for hard product manufacture acts as a coordinating mechanism.

As will be described later in this chapter, the pricing of milk differs fundamentally at TRC 5 depending on the Grade produced. The cooperatives, which handle some 80 per cent of the milk, weigh, inspect and transport it either to their own plants, individual milk processors and packers, or as Class III milk

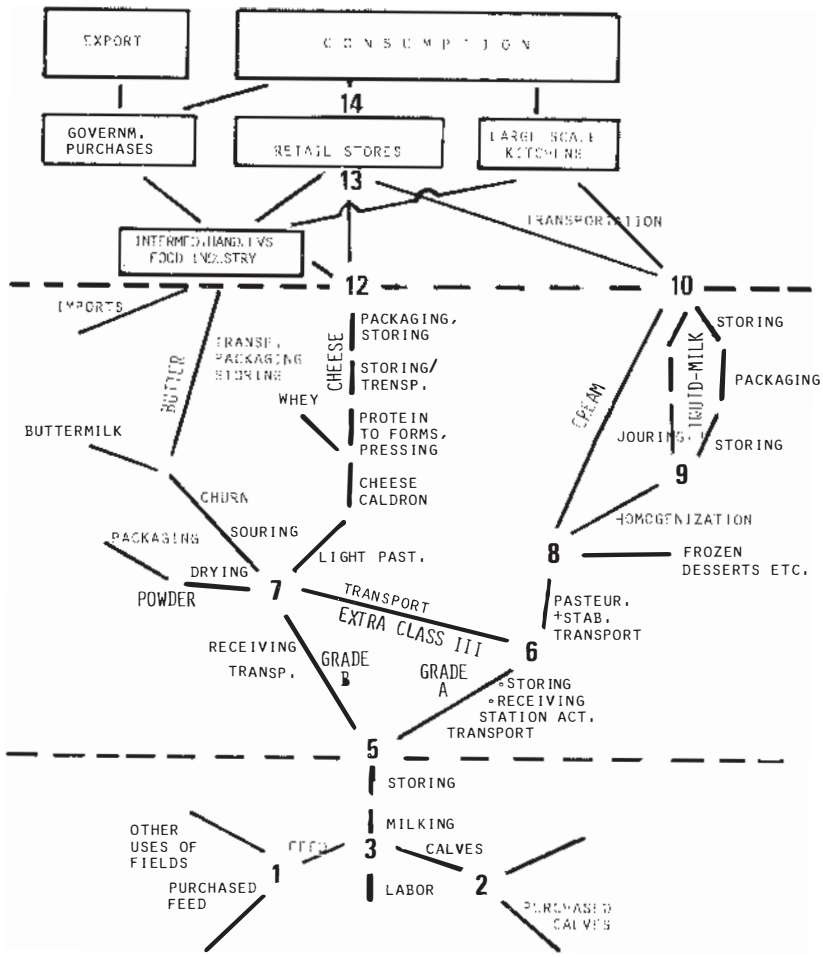


Figure 7-1: Michigan's dairy subsector divided into technically separable interfaces.

to hard product manufacturing plants, so there may be a market transaction either at TRC 5, TRC 6 or TRC 7. Liquid milk processing may take place in plants owned either by cooperatives, individual packers, or backwards integrated, retailer-owned firms. This is essentially different from the Finnish system.

The cheese line obtains its raw material from Grade B or Grade A — Class III. This differs from the Finnish practice, where rather the best part of milk is used as cheese raw material, since lower-grade milk causes problems in the manufacturing process of the specialty cheeses produced and lowers the yield. An increase in the consumption of specialty cheeses in the U.S. may cause a major problem for the current system. Actually two cheese lines already exist: a line for cheddar and one for other cheese types.

7.3 MAJOR DIFFERENCES IN THE DAIRY MARKETING SYSTEMS AND THEIR EFFECT ON COORDINATION ISSUES

7.3.1 Dimensions of transactions

Asset-fixity

Despite the fact that the tasks in dairy production are basically the same in Michigan as

in Finland, the geographical location,[1] among other factors, creates some differences to asset-fixity. The fact is that the farther north production takes place, the fewer the production alternatives. Dairy production is among the last possible alternatives as we proceed north. Thus, the asset-fixity of fields, farming machinery and farm labor is lower in Michigan than in Finland, even though this varies from south to north within both areas.

Similar to the differences in asset-fixity of dairy operations in California and Wisconsin found by GILBERT and AKOR (1988), there is good reason to believe that the circumstances in Finland are further down in the same continuum, Michigan being comparable to Wisconsin. Finnish cowsheds must be strongly built and insulated to keep the cows warm during the long, cold winter. The considerably higher energy price in Finland also supports careful insulation. In Michigan 50 per cent of all dairy operations are freestall type (80 per cent of operations with over 120 cows), and more than one-third have outdoor feeding. In Finland the predominant type is stanchions with feed storage for the whole winter. Finnish law forbids the spreading of manure on frozen fields, which means that every farm must also have a storage for manure for about six months yearly. In Michigan only about 22 per cent of the farms have long-term storage for manure, while more than one-third spread it daily on the fields (Anon. 1988e). It can be concluded that the asset-fixity of cowsheds is much higher in Finland than in Michigan. The incremental increase and decrease of the number of cows is easier in Michigan as well.

Dairy cows in Michigan are specialized in milk production, whereas the combined production of milk and beef is prevailing in Finland. Thus, the asset-fixity of cows can be assumed to be higher in Michigan. The separation of operations for producers of liquid milk (Grade A) and raw material for hard products (Grade B) creates asset-fixity of the raw material in the transaction where the allocation decision for various uses is made.

The fact that, e.g., 72 per cent of butter manufacture and 73 per cent of the manufacture of American cheese occurs in specialized plants increases the asset-fixity of the plants over Finnish ones, where the aim is to have more production lines in the same plant in order to improve coordination.

In conclusion, asset-fixity in Michigan seems to be somewhat lower at production level but somewhat higher at processing level.

Uncertainty

Weather causes uncertainty in Michigan as well. It is hard to compare the degree of uncertainty, since, e.g., Michigan had a drought in 1988 and Finland had too much rain and cold in 1987. The larger feed markets in the U.S. decrease uncertainty regarding the availability of feedstuffs, but the large price fluctuations increase economic uncertainty as compared to Finland, where the prices are much more stable. E.g., the ratio between the price of a pound of milk compared to a pound of feed concentrate was 1.91 in Michigan in the first quarter of 1987. A year later in the second half it was 1.52 (Anon. 1988h). The variation of the U.S. producer milk price in 1981—87 is shown in Figure 7-2.

Figure 7-2 shows that the variation of milk prices follows a regular seasonal pattern, but includes uncertainty. It may be noted that the price has a decreasing trend. The real price of milk has dropped by more than 30 per cent during the last 10 years (Anon. 1988h, p. 26).

Frequency

There are no considerable differences between Michigan and Finland in the frequencies of tasks involved in the dairy marketing systems, except that in Michigan 18 per cent of the contracts between dairy producers and the cooperative are made for only 90 days at a time, with a 30 days' notice.

[1] Finland is located between 60° and 70°, and Michigan between 42° and 48°. The northernmost parts of Michigan are at approximately the same latitude as Paris and the southernmost at the same as Rome.

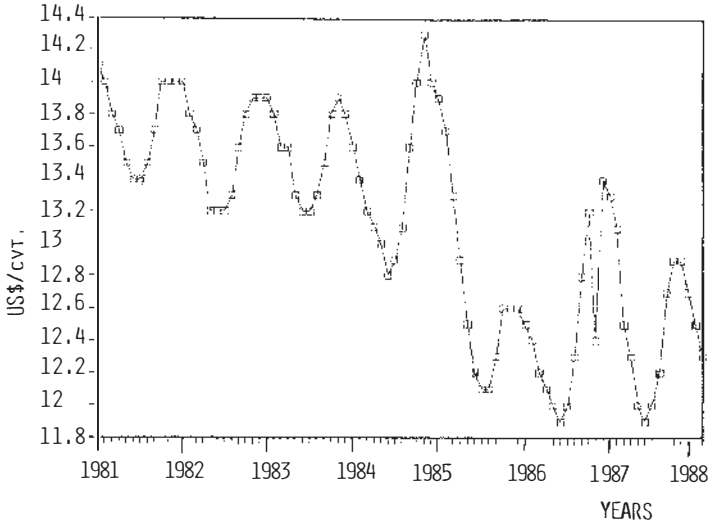


Figure 7-2: U.S. monthly all milk price from January 1981 to February 1988. Source: Anon. 1988h.

Externalities

Inter-state competition causes considerably more external competition for the Michigan dairy industry than is the case in Finland, where the entry barriers to dairying are high.[2] E.g., trade of milk products between Wisconsin and California may affect the Michigan dairy market as well. The pressure for economic production efficiency is higher in Michigan than in Finland.

Finnish dairy production has external goals such as food security, rural settlement, etc., which have to compete with the goal of strict milk production efficiency. This means that the performance of dairy production can be more easily measured in monetary terms in Michigan. Competition with other lines of agricultural production can be expected to be higher in Michigan than in Finland, where the production alternatives are fewer.

Despite balancing actions within the dairy subsector in Michigan, international grain trade, e.g., may have a substantial effect on feed prices. Import quotas are mainly decided politically and may vary from year to year.

[2] As mentioned in above, the situation may considerably change in Finland in a few years.

7.3.2 Structure

Market structure

Dairy production in Michigan occurs on 6100 dairy farms, of which 5300 are Grade A producers. The division of Michigan and Finnish dairy farms into size categories is presented in Figure 7-3.

The drastic difference in herd sizes is visible in Figure 7-3. While only 3.4 per cent of the milk produced in Michigan comes from operations with less than 30 dairy cows, the corresponding share in Finland is 99.4 per cent.

Other differences include ownership distribution and location of production. In Finland, almost all of the milk is produced on family farms which employ no outside workers. About 70 per cent of Michigan dairy farms are similarly family farms, but every third farm uses full-time outside labor and 40 per cent part-time labor.

In Michigan, milk is mostly hauled by independent truckers either directly to processing plants (95 per cent), or to receiving stations (four cooperative stations, one IOF). 90 per cent of the milk is received by five dairy cooperative plants, of which two receive 82

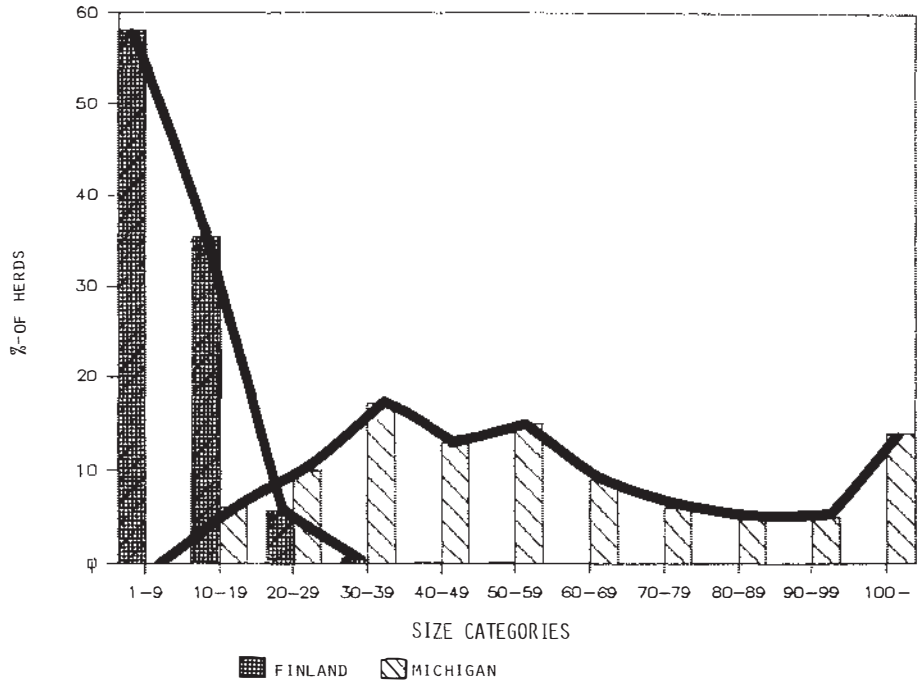


Figure 7-3: Distribution of Michigan and Finnish dairy farms by herd size.
Sources: Anon. 1988e, and the Finnish National Board of Agriculture and Forestry.

per cent. During the last 10 years the cooperatives have to a great extent discontinued dairy processing. All the liquid milk is processed and packaged by individual firms which obtain the raw milk from the cooperatives.[3] All the milk powder plants, in turn, are owned by the cooperatives. In hard product manufacture, joint ventures between cooperatives and IOF's are common. 70 per cent of the cheese is produced in such plants. Thus, only the most important balancing plants, i.e., butter and powder plants, are owned by the cooperatives any more. In Michigan, there are altogether 18 plants for liquid milk and ice cream, four for butter and milk powder, and seven for cheese (of which two are European-owned). The leading company has 57 per cent of the market, and the top four companies account for 80—85 per cent of the production.

The allocation of milk for various uses occurs mainly already at farm level and is conducted by the dairy cooperatives. In the manufacturing line, coordination is mainly carried out by allocating the milk components either for butter or for skim milk powder. The cheese plants use all their milk. In the liquid production lines, the extra fat is mainly processed into ice cream. Trade between the processors is scarce.

The Michigan retailing industry is concentrated, but not to the extent as in Finland. E.g., the four largest retail chains rule about 50 per cent of the grocery markets in the Detroit metropolitan area.

The landscape structure and natural conditions explain the high proportion of large farms in Michigan. Plain fields with less forests have facilitated — and to a certain extent, forced — the increase of farm size.

[3] In other states of the U.S., cooperative milk bottling plants still exist. It seems remarkable that the small plants have been able to maintain their share: according to USDA, in 1980 about 20 per cent of the bottling plants had a capacity of less than 1 million liters per year.

Among the externalities explaining the larger size of the dairy farms in Michigan are the interstate competition in contrast to the high import barriers in Finland, and the absence of external goals which have caused Finnish governmental policy to favor small farms. Since there has been no strong, centralized farmer organization with decision-making rules supporting small farms, it has been easier in Michigan to increase the size of the farms. Public opinion has also allowed the increase of farm size more freely in Michigan than in Finland.

Backward integration of the retail industry has been more important in Michigan because of the less concentrated retail and processing industries. The supply of dairy products, especially liquid products, is a fixed asset for the retail stores. Small retail store chains have had difficulties in ensuring a continuous supply, since the diversified processing level in Michigan has no such obligation regarding milk supply as in Finland.

Product differentiation

According to USDA, two-thirds of the milk sold in Michigan is packaged into plastic containers and the rest into paper containers. The plastic containers are manufactured at the plants themselves from chemicals, which has decreased the requirements for storage space and inventory. Among the advantages of the plastic container are that it is more flexible, less vulnerable to contamination, and cheaper than the paper container. Among its disadvantages are the smaller possibilities for product differentiation because of less space for advertising, and the claims of some customers about an effect on taste.

A regular Michigan supermarket has five different size categories (6/16, 1/8, 1/4, 1/2 and 1 gallon[4]) for skim milk, milk containing 1 %, 2 % and 3.5 % fat, chocolate milk and butter milk. There are usually several alternative private labels and brands. Thus, in the liquid milk category, it is not uncommon to have 40 to 70 different products to choose from in a supermarket. The total number of Valio's product varieties in this category is 22 (of which 12 are milk and 10 butter milk products).

The variety of cheeses and fermented products is similar to or smaller than in Finland. Service points for cheeses are not as common as in Finland.

Entry barriers

At producer level in Michigan there are no administrative entry barriers to the dairy production business. Entry to a cooperative is easy as well. Dairy cooperative members are usually loyal to their cooperatives. Some 3—5 per cent of the members change their membership, while the others remain with their first choice. Especially farms located in difficult climatic conditions show strong loyalty to the milk hauler. If the hauler starts to work for another cooperative, the producers may shift with him. Thus, the independent truckers, who are most in contact with the producers, also possess very much influence towards them.

Entry to dairy processing is not formally difficult, either. As mentioned above, there are two European processing firms operating in Michigan.

The real entry barrier concerns the transaction between processors and retailers. The uncertainty of being able to sell products to the retail stores has made it necessary to protect the transaction-specific, perishable assets from opportunistic behavior. This situation gave an incentive to cooperatives to leave processing to independent firms, and an incentive to retail store chains to integrate backwards to secure their daily milk deliveries.

The entry barriers in Finland are highest at production and collecting levels, while in Michigan the barriers seem to be highest at retailer level. The situation has not always been like this. When the Michigan Milk Producers' Association, a statewide cooperative, started to centralize its operations, un-

[4] According to USDA, 61 per cent of the liquid milk is sold in containers of 1 gallon (3.8 liters) and 21 per cent in containers of 1/2 gallon (1.9 liters).

willing riders founded a competing cooperative. This made it possible for the retailers to get the cooperatives to compete with each other and with independent firms. The cooperatives proved weak in this competition: if they tried to raise the price to the producers' advantage, the others would not follow. If the cooperatives tried to compete with price, the members opposed it. This development led to a situation in which the cooperatives were forced to discontinue processing. It seems that if cooperatives do not have 100 per cent of the market in milk processing, their share is likely to diminish close to nothing.

Growth rate of demand

The relative development of the consumption of all dairy products, whole milk, low-fat milk, cheeses and butter in the U.S. in 1965—86 is presented in Figure 7-4.

The pattern of the development of per capita consumption is similar to that in Finland. Whole milk and butter are declining and low-fat milk and cheeses are increasing. The difference, as pointed out above, is that the total consumption of dairy products has not declined to the same extent as in Finland; in the 1980's, an upward trend even can be seen.

Trading structure

A usually unnoticed factor which affects the behavior of actors such as dairy farmers, is society's definition of a well-performing operation. According to interviews with dairy experts at the Michigan State University, the neighborhood, in judging a dairy farmer's performance, pays attention to similar factors as in Finland, i.e., the size of the operation, the average production capacity of the cows and, to a lesser extent, the profitability of the farm.

The cooperatives in Michigan are perhaps more a means for conducting tasks assigned to them than is the case in Finland, where it is more a dairyman's "duty" to belong to the local or regional cooperative regardless of how well the cooperative satisfies his individual needs. The lack of alternatives naturally prevents a true comparison as well.

In Michigan, the dairy producers have a

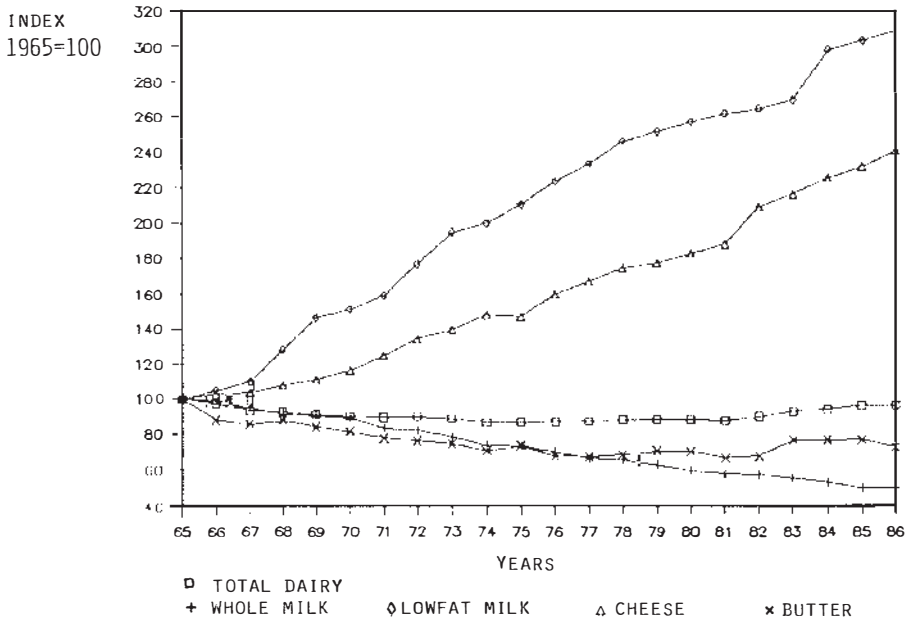


Figure 7-4: Relative development of U.S. consumption of total dairy products, whole milk, low-fat milk, cheeses and butter in 1965—86. Source: HAIDACHER et al.1987.

different attitude towards equal treatment than in Finland. In Finland, it is widely understood as similar treatment for all (e.g., the same transport cost independent of location). In Michigan, equal treatment is understood as service at cost with as little cross compensation as possible.

The dairy processing industry in Michigan does not feel responsible for the macro-coordination of the supply and demand of dairy products in the way the Finnish industry does. This prevents them from collecting rent for such an activity as well.

Legal structure

U.S. law provides rigid quotas for the import of dairy products. The regulations are important for the performance of the domestic price support system. The quotas prohibit the import of products that are currently produced in the U.S. and on whose part foreign competition would reduce the domestic producer prices.

The composition of dairy products is regulated and tested up to the processing level. After that, there are virtually no regulations. This has led to differences, e.g., in the solids content of skim milks. There is a clear difference in taste depending on whether the solids content in the milk is 8 % or 8.7 %.

7.3.3 Conduct

Actors

Compared to Finland, relations between cooperatives and other farmers' organizations are looser and less formal in Michigan. While the Central Organization of Farm Producers in Finland wants to have the exclusive right to farmers' collective activities, Michigan cooperatives carry out most of their own collective activities by themselves. This emphasizes their role as a collective group in the traditional meaning. A National Farmers' Organization does exist in Michigan, but does not play a major part. As a matter of fact, cooperatives and other collective farmers' organizations may be competitors in some lobbying tasks. The Farm Bureau, the farmers' major general lobbyist organization, supports free markets, but the dairy farmers seem to be quite happy with the Federal Milk Marketing Orders (FMMO's). This has caused a conflict between the Michigan Farm Bureau and the dairy cooperatives.

At national level there is a lobbyist organization of dairy cooperatives called the National Milk Producers' Federation (NMPF). An average dairy farmer seldom knows that it exists. While the power of controlling the Finnish system is very much at the federal level of the cooperative organization, with the employed management and the Farmers' Union, it seems to be much more at a local level in Michigan. The exit possibility of the dairy farmers seems to make the Michigan dairy cooperatives conduct their traditional cooperative role with respect to members' preferences better than in Finland.

Standard operating procedures

Milk for the Michigan dairy industry is predominantly delivered according to delivery contracts. Cooperatives usually have a written contract, but contracts between producers and IOF processors are often verbal. A contract is made for one year, but renewed automatically unless either party gives written notice 30 days before the end of the year. There are not many delivery contracts between two or more dairy cooperatives, or between dairy cooperatives and IOF processors.

It is common for cooperatives to have a contract of integration to balance supply and demand in a larger area. Pooling is a usual practice, and it has placed the cooperatives in a position to implement the balancing. It has also given them a possibility to charge so-called "over order" premiums. Cooperatives also exchange information considering the market situation. This market information is a public-type good, also benefiting others and thus causing some free rider problems.

Cooperatives have usually committed themselves to provide home for all the milk their

members produce. This reduces the risk of the opportunistic behavior of milk buyers.

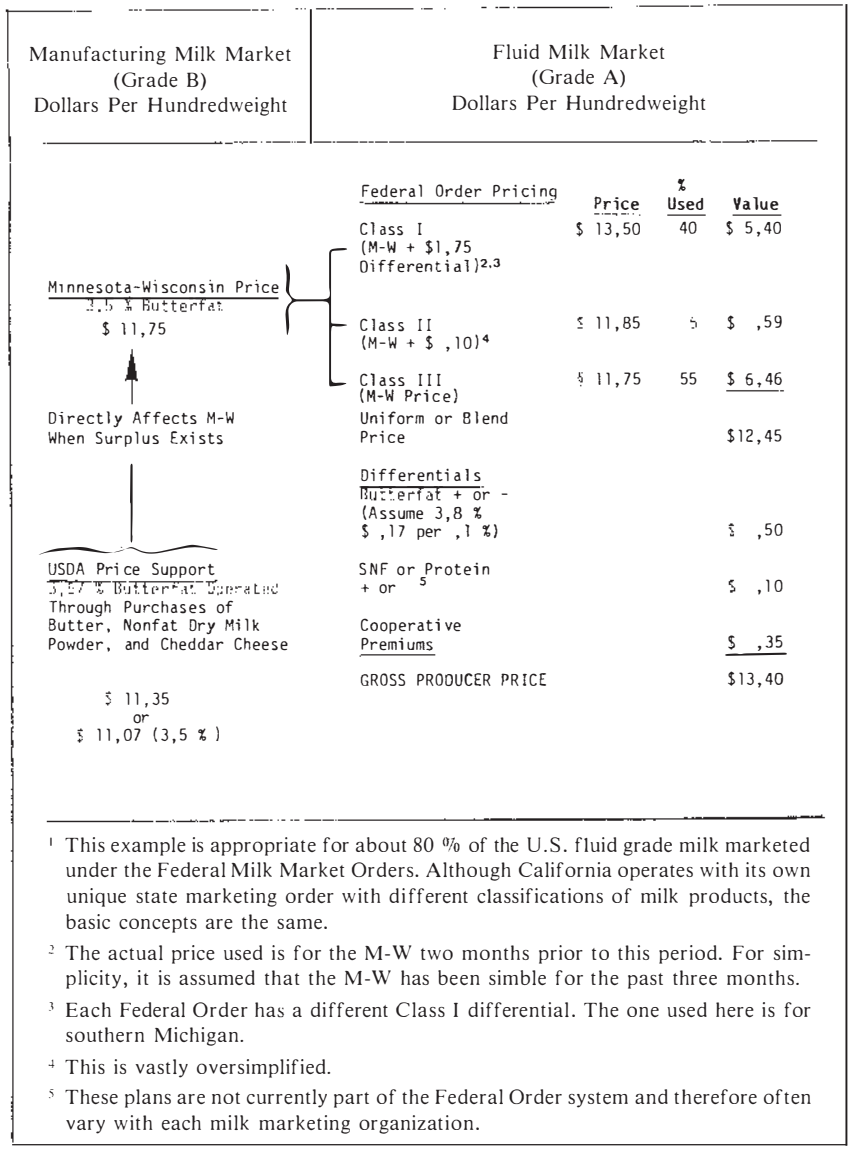
Milk quality control is relatively well arranged up to the processing level. After this there are regulations regarding sanitation but not, e.g., the composition of milk in final products.

Price vs. regulation

The pricing of milk in the U.S. is strongly influenced by the FMMO system issued by the federal government. 97.8 per cent of Grade A milk and 70 per cent of all the milk produced in the U.S. follow the FMMO system (Anon. 1986b). The system was adopted by the producers' vote.

The U.S. milk pricing system, which has many local variations, generally operates as presented in Figure 7-5.

FMMO recognizes two grades of milk:



[1] This example is appropriate for about 80 % of the U.S. fluid grade milk marketed under the Federal Milk Market Orders. Although California operates with its own unique state marketing order with different classifications of milk products, the basic concepts are the same.

[2] The actual price used is for the M-W two months prior to this period. For simplicity, it is assumed that the M-W has been simble for the past three months.

[3] Each Federal Order has a different Class I differential. The one used here is for southern Michigan.

[4] This is vastly oversimplified.

[5] These plans are not currently part of the Federal Order system and therefore often vary with each milk marketing organization.

Figure 7-5: A simplified example of milk pricing in the U.S.
Source: HAMM 1987.[5]

[5] The following explanation of the U.S. milk pricing system draws heavily on HAMM's article.

Grade A and Grade B. Health regulations for Grade A milk ensure safe milk for fluid consumption. Grade B is regulated to ensure safe quality when milk is used for the manufacture of hard products such as butter, cheddar cheese or skim milk powder. According to HAMM (1971), today about 87 per cent of the U.S. milk supply meets Grade A milk standards. The proportion is continuously increasing.

FMMO concerns only Grade A milk, but pricing is based on Grade B milk, whose price is established according to the exchange prices of cheese and butter in the Chicago and Green Bay Exchanges. The largest concentration of remaining Grade B producers is in the states of Minnesota and Wisconsin. USDA collects monthly information on the price paid to Grade B producers in those areas according to the cheese and butter exchange prices. This price is the so-called Minnesota-Wisconsin milk price (M-W price).

Most FMMO's have three classes of Grade A milk. Class I milk includes bottled liquid milk, skim milk, etc. Class II milk consists of cream and milk used for cottage cheese and frozen desserts. Class III is processed into butter, cheese and powder products.

The M-W price acts as a basis for determining the minimum price of Grade A milk as shown in Figure 7-5. The price is determined for milk with 3.5 % fat. The Class I milk price is the highest and is calculated by adding a fluid milk differential (1.75 US$ in Figure 7-5) to the M-W price, which is announced monthly. The fluid milk differentials differ for each market and increase in FMMO markets further from the Minnesota-Wisconsin area. Class II milk is set by a complex formula but is often close to 10 cents/cwt[6] added to the basic M-W price. The Class III price is the actual M-W price. Grade A — Class III milk is not differentiated to consumers from Grade B milk and, thus, consumers do not know which of these two categories the cheese or butter they consume is made from. The value of milk is thus determined by the use to which it is put, with the highest value coming from liquid milk products and the lowest from manufactured products.

The milk producer price is a blend price generated by the shares of the total used for the various classes (in Figure 7-5, 40 per cent for Class I, 5 per cent for Class II and 55 per cent for Class III). In the Figure, the M-W price 11.75 US$/cwt has yielded a producer price of 12.45 US$, which is approximately 1.20 Fmk/l. Like the M-W price, the proportions are calculated monthly. Each FMMO price is then adjusted upwards or downwards depending on the fat content. Every 0.1 per cent up or down from 3.5 % fat gives plus or minus approximately 17 cents (1.7 p/l). The differential may vary depending on whether or not the buyer is a cooperative. In addition to this, in many markets additional component differentials are paid according to solids-non-fat (SNF) or protein content. About 50 per cent of the U.S. milk supply operates under some kind of multiple component pricing scheme.

Cooperative milk marketing organizations have been able to negotiate a varying additional price premium to compensate for the marketwide services they provide, e.g., price information services.

The price the producer receives depends on how much he has to pay to transport the milk to the processor. Unlike in Finland, neither the principle of "equal treatment" of cooperative members nor governmental subsidy covers the differences in location.

Price support to dairy production is based on the Agriculture Adjustment Act issued in 1949. The purpose of this program is to attempt to establish a milk price which the market will not fall below and, thus, ensure to the producers an income level close to that of their non-rural counterparts. This goal is similar to the corresponding policy goal of the Agricultural Income Law in Finland. USDA buys all the butter, skim milk powder and cheddar cheese to maintain the market prices at a de-

[6] 1 cwt equals 100 lb. or 45.36 kg.

termined level, which is currently 11.35 US$/cwt (1.13 p/l) for the prevailing average 3.67 % fat and 3.2 % protein milk. In surplus situations, the government becomes the major purchaser of products manufactured from both Grade B and Grade A — Class III milk.

It seems that the basic difference between the producer pricing systems in Michigan and in Finland is that in Michigan the governmental support program works much more through the market system, affecting the milk prices indirectly. In Finland the pricing has been totally administrative in an attempt to calculate the average cost of production. The Michigan system provides better incentives to improve efficiency at both production and processing levels, but partly at the cost of an increased uncertainty of farm income.

As mentioned above, the price used for the determination of the Class I milk price is actually the M-W price of two months prior to the month in question. This means that a producer has the possibility to know in advance what he will be getting.

The seasonal pricing of milk works through the market via the M-W price. As seen in Figure 7-2, there is a clear seasonal pattern in milk price. The variation is usually 3—4 per cent of the yearly average (in Finland the variation is about 8 per cent). There is also a seasonal pattern in retail prices, although this variation is much smaller, only around 1 per cent (Anon. 1988h).

Data on the values added at the various levels of the U.S. dairy marketing system comparable to the Finnish data presented in Table 4-1 is unfortunately not available. The average value of raw milk in dairy products in the U.S. is reported to be about 43 per cent (Anon. 1988i, p.38), which is at about the same level as in Finland. But since the producer price in Finland is about three times as high as in the U.S., it may be questioned whether the processing margins and especially the retail margin have to be almost threefold as well.

Voice vs. exit

In most areas of Michigan the producers can choose to belong to a cooperative, to be a non-member customer of a cooperative, or to sell their milk to an IOF (free-rider problem). This means that cooperatives have to compete for members. The members' voice is better heard when there is a threat of exit, and slacker managers and ignoring cooperatives will be quickly excluded.

Competition among cooperatives has, however, led to a waste of resources. In some cases a member may belong to two competing cooperatives. Another problem is that the various cooperatives may offer different services to members. A "limited-service cooperative" may ride free at the cost of a "full-service cooperative» that provides market stabilizing services external to "limited-service cooperatives".

In a cooperative, there is no exit without voice. When a cooperative member has informed the cooperative that he is about to leave, the cooperative in most cases tries to talk the member back during the time of 30 days' notice. This means that the reasons for exit reach the management of a cooperative and that they know that the information is valid. If the problems are solvable, attempts will be made to solve them within the time of notice. This confirms the assumption that there cannot be effective voice without exit, but also that there cannot be effective exit without voice (see Chapter 2.2).

A processor has the alternatives of buying directly from the producers, choosing among several cooperatives, or buying from another IOF. Wholesalers and retailers may either have their own processing facilities or alternatives to buy from. Consumers can usually choose from among various manufacturers. E.g., liquid milk in a store may include various brands, a private label and various package sizes.

It may be concluded that the exit option is available at each level of the system. This improves the efficiency of preference articula-

tion, but leads in some cases to a waste of resources because of increasing competition. There is a chance of shortsighted decisions in cooperatives because of ''too'' responsive cooperative members.

7.3.4 Performance

Synchronization coordination

(a) Overall balancing

Similar to the case in Finland, the major party coordinating the total milk supply and demand in the U.S. has been the government. Coordination has occurred indirectly through butter and cheese purchases, and through issuing a base producer milk price but allowing more variation in prices than in Finland. This has provided a more accurate price and better incentives to reduce costs, but at the expense of increased uncertainty. Because of the absence of regional and structural goals in the dairy production, production in the U.S. has developed towards more concentration than in Finland.

While price policy has been the predominant means of manipulating the market in the U.S., direct administrative regulative policy through quotas and high entry barriers has dominated in Finland.

The total supply and demand of milk in the U.S. in 1970—87 is presented in Figure 7-6.

As shown in Figure 7-6, U.S. dairy production has experienced surplus problems in the 1980's. In 1983 an attempt was made to lower the price support. Because of the high assetfixity at producer level, this made every U.S. dairy producer pay for the surplus. As can be seen in the Figure, an immediate effect was noticeable, but then supply increased again.

The Food Security Act of 1985 provided an 18-month program to reduce the dairy production capacity in the U.S. The program was very similar to the Finnish milk bonus scheme presented in Chapter 5. The main difference was that in the U.S. the farmers were asked to bid for terminating their milk production for five years, whereas in Finland the government made a bid to all the farmers. Like in

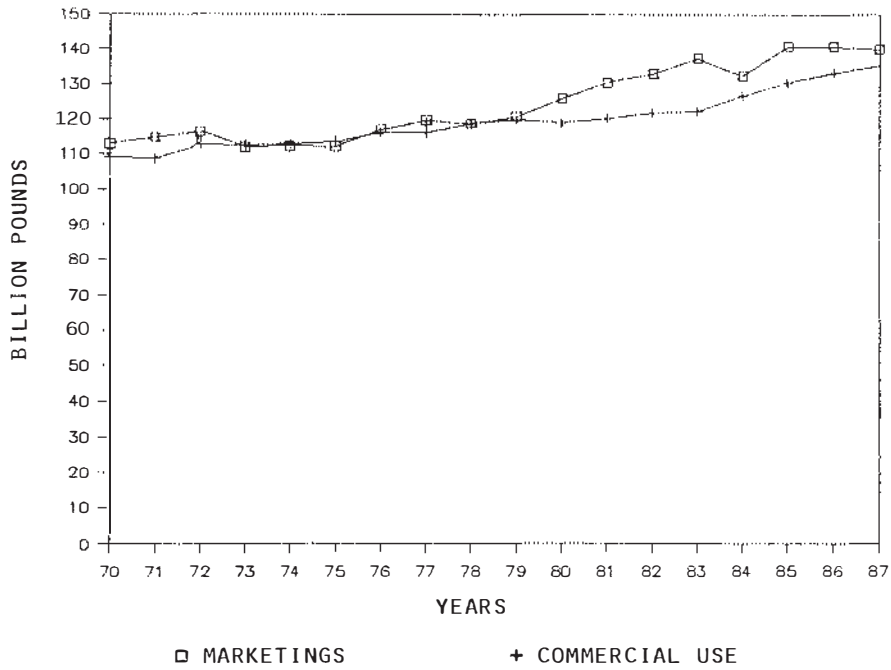


Figure 7-6: U.S. milk marketings and commercial use of milk 1970—87.
Source: Anon. 1988h.

Finland, the program had a significant effect in reducing the production. According to HAMM and SPEICHER (1986), 11.6 per cent of Michigan's dairy cattle were slaughtered due to the program. Also as in Finland, the dairy producers most willing to quit seemed to be the farmers having the largest number of alternatives outside dairy production (highest salvage value of their total operation and skills). In counties close to the Detroit area, about 20 per cent of milk marketings were terminated, while the proportion in the most remote counties in the Upper peninsula varied from 0 to 5 per cent. HAMM and SPEICHER have observed significant milk shortages in certain geographic areas due to the program.

Bidding by the producers instead of the government perhaps increased the efficiency of public resources by decreasing the proportion offered to producers quitting despite the program. The U.S. program also created some opportunistic differences when some producers were able to get a bid accepted which was four times that of their neighbors' under similar conditions.

It seems that the market has not worked well in improving the coordination of total supply and demand of milk. Transaction-specific assets are able to explain a major part of the failure of a pure price solution. Buy-out programs which increase the salvage value of dairy operations have proved more effective. From the standpoint of regional policy it has been favorable that their effect was weakest in the most remote areas, but not necessarily from the point of view of long-range production policy.

(b) Component balancing

So far the coordination of the supply and demand of milk components has not been a large problem in Michigan. The skimming of milk and the decreasing butter sales have been compensated by increased cheese and ice cream consumption. From now on, however, the growth of cheese consumption will not be sufficient to balance the decrease in other fat consumption, which will shift the balancing to governmental butter purchases.

The U.S. milk pricing system is under evolution. Milk quantity and fat yield were previously the only bases for pricing, but the cooperatives have started to present modified payment schemes favoring either non-fat solids or protein. Like in Finland, farmers have resisted the change (human fixed assets).

In Finland the most critical transactions in component balancing were TRC's 1—3, 8 and 11 (see Figure 4-7). In addition to those, the Michigan milk marketing system seems to have two more component balance coordinating transactions, namely TRC's 7 and 9 (see Figure 7-1). This does not necessarily mean that the Michigan system is more capable of performing component balancing, since the division of milk flows into several transaction points from TRC 5 onwards restricts the variety of alternatives available for balancing. In TRC 9 a questionable way of balancing is used: the variation of solids in liquid milk products.

Due to the considerable difference in the fat content of milk — Michigan having an average 3.7 % and Finland 4.3 % — the problem as regards fat is much greater in Finland than in Michigan. The question arises: How can Michigan produce milk of 3.7 % fat and 3.2 % protein, while Finland has difficulties in decreasing the 4.3 % fat at the same time maintaining the 3.2 % protein level? Among possible explanations are cow breed (TRC 2), feeding practices (TRC 1), farmers' skills, and climatic differences.

In both systems the ultimate component balancing occurs in TRC 11 through governmental purchases. This automatic balancing provides weak incentives to the system to adjust.

(c) Seasonal balancing

The relative seasonal variation of milk production in Michigan in 1979 and 1987 is shown in Figure 7-7. The variation is smaller than in Finland (see Figure 5-11).

Cooperatives play an important role in sea-

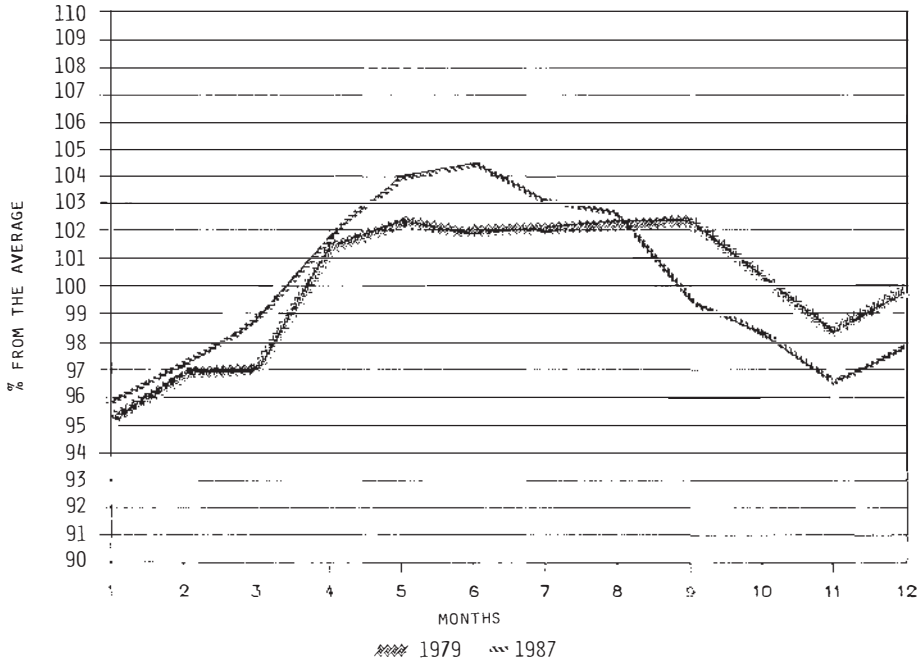


Figure 7-7: Seasonal fluctuation of Michigan milk production in 1979 and 1987.[7]
Source: Anon. 1980 and Anon. 1988f.

sonal balancing in Michigan. The area from which liquid milk is hauled to urban centers varies according to season. In the season of low production, the milk hauled, e.g., to the Detroit area comes from much further than during the high production season. Similar to Valio, both statewide cooperatives are centralized and coordinate the seasonal variation mainly by command.

Michigan has used a so-called base-excess plan to decrease the seasonal variation in production. According to the program, farmers who produced more than the base quantity defined by average production were paid less for the excess. The program was successful, and seasonal variation decreased to the present 7 per cent. When the gains of the program, however, became smaller than its transaction costs, it was terminated in 1985.

The effectiveness of price to affect seasonal balancing can be explained with the absence of significant transaction-specific assets in making the change. In Michigan, as in Finland, seasonal balancing is mostly question of balancing the costs of production with the gains at processing level. Like in Finland, the producer and the processor levels are the immediate payers for the extra capacity necessary for seasonal peakloads.

Adaptation coordination

Response to new consumer demands in Michigan has occurred basically in two ways: through structural changes to meet the changes in distribution requirements, and through the introduction of new products.

The changes in the commercial restaurant industry have increased the consumption of such dairy products as cheese (Figure 7-4) and gourmet ice cream. Especially the cheese category has grown in sales. An increased demand of cheese for pizzas, cheeseburgers and fast foods of Mexican origin has contributed to the establishment of mozzarella cheese plants.

It is difficult to analyze the efficiency of

[7] The difference in the number of days in each month has been adjusted.

Table 7-2: New product introduction, advertising and sales in seven selected food categories in the U.S. in 1987. Source: Anon. 1987g.

Category	New products		Advertising,		bill.US$ Per item	Share of sales, %
	No.	%	Total	%		
Bakery foods	931	15	253	7	0.27	8
Beverages	832	14	1515	43	1.82	15
Cereals	92	1	514	14	5.59	5
Condiments	1367	22	222	6	0.16	5
Candy, gum & snacks	1145	19	569	16	0.50	6
Meat	581	10	191	5	0.33	38
Dairy	1132	19	303	9	0.27	23
Total	6080	100	3568	100	0.59*	100

adaptation coordination, but some idea within selected food categories is given in Table 7-2. The figures are only indicative. The contents of the categories are not necessarily exclusive.

Table 7-2 shows that the number of new introductions has been very extensive in the dairy category. Advertising expenditure, however, is low compared to most of the other categories presented. The number of new dairy product introductions approximately corresponds to their share of retail sales.

The number of new products does not necessarily describe the progressiveness of the dairy industry. The category includes several non-dairy products such as juices, and a large proportion of the products are not strictly "real" new products but different flavors of yoghurts, ice creams, etc. A majority of the new product ideas come from new product development departments, but the few really successful ideas come from the market.

According to HAINES, the dairy processing industry seems to be less progressive compared to many other food industries. As in Finland, "real" new products often first come from small independent firms, and are then adopted by the larger ones. The dairy industry is having problems in responding to new opportunities.

[8] The following statements are based on discussions with Dr. William HAINES, Director of Food Industry Institute, Michigan State University. Initially, the analysis of the properties of the U.S. dairy industry was intended to be based on information collected by a questionnaire sent to 10 selected companies. Unfortunately, only one answered!

Thus, the situation is very similar to that in Finland. However, the explanation for it may be different. In Finland, the absence of exit and the preferences of cooperative members may have prevented efficient adaptation. In Michigan, the structure of the liquid processing industry is almost atomistic, preventing firms from investing in market research and new product development.

Distribution of costs, benefits and risk

Costs and benefits seem to be distributed more according to behavior in Michigan than in Finland. The benefits of increased production efficiency remain better among the farmers. If a processor invents a good product, there is not such a risk of losing that product to other processors by command from "above".

Similarly as in Finland, the cost of surplus overall production and of fat overproduction is mainly borne by the state, and some producers and processors may even benefit from the fat surplus.

7.4 ROLE OF COOPERATIVES IN THE U.S. MILK MARKETING SYSTEM

As mentioned, about 80 per cent of the milk in Michigan is collected by cooperatives, and the proportion is increasing. The NC 117 report (Anon. 1978) states that "cooperatives are the primary institutions available for the balancing or coordination function as milk requirements vary for a given market. In areas

in the U.S. where milk producers are not effectively organized, coordination failures can generate substantial costs across the entire milk industry. E.g., in California where only about 50 per cent of the Grade A producers are members of dairy cooperatives, there has been a frequent incidence of milk being shipped out of plants in a market because of excess supplies from distant points.''

Among the reasons why the cooperative grew in importance in the dairy assembling stage are the economies of arranging the collecting routes by a cooperative instead of each individual processor doing it. Farmers could not always find a buyer for their milk and felt uncertainty about locating a continuous market for their highly perishable products. This kind of asset-fixity made farmers vulnerable to opportunistic behavior by the milk buyers. Although cooperatives have discontinued fluid milk packing and cheese making, they have maintained the powder-butter plants, which can be used to prevent an oversupply of perishable milk. Cheddar cheese plants used to perform the same task before restrictions concerning whey disposal were issued. These restrictions made the cheddar plants expensive fixed investments requiring a stable operating capacity. When cheddar plants could no longer be used for balancing, the cooperatives were able to sell them as well.

The cheese-butter-powder plants still play a key role in balancing within one year. Longer-term balancing is conducted by governmental purchases.

There has been a debate recently concerning the over-order premiums negotiated by the cooperatives. Those against cooperatives say this is a monopoly profit collected by the cooperatives when exercising their considerable market power. The cooperatives, on the other hand, claim that the premium compensates for the cost of coordinating the supply and demand by, e.g., providing storage in TRC 5 (Figure 7-1). Despite the fact that the cooperatives cannot earn monopoly profits in the basic meaning of the word, it is possible that the statements of both sides are true.

It seems that the Michigan dairy cooperatives are more oriented towards bargaining with processor and manufacturer firms than is the case in Finland. The difference may be explained by the fact that Finnish cooperatives perform most of the dairy processing, and the major organization they bargain with is the government. Michigan's weaker, federated cooperative organizations perform lobbying towards state authorities in a similar way as in Finland.

Externalities provide explanations for the absence of cooperatives in many lines of dairy processing in the U.S. Competition within a state and between states has forced the processing units to perform in a more competitive environment than in Finland. The absence of the external goals of food security and rural settlement has allowed the measurement of efficiency in purely monetary terms.

The fact that assets are fixed at dairy production level is a TRC explanation for why cooperatives still dominate in transactions between production and processing. The coordination of the seasonal variation of supply has evidently turned out to be most efficient when carried out by national cooperative networks.

7.5 CONCLUSIONS

The major differences between Michigan and Finnish dairy marketing system have been briefly described above. As a general conclusion it can be said that the marketing system is amazingly similar, even though there are differences explained by the different environment, past decisions and culture. The major problems, i.e., surplus production, component and seasonal balancing, and deficiencies in adaptation coordination, seem to be alike. The extent of the problems appears to be somewhat smaller in Michigan mainly because of the less extreme weather conditions. The institutional arrangements are naturally different, but the tasks they perform are often the same.

Table 7-3: Differences in selected factors of performance between the Michigan and Finnish dairy marketing systems.

	Michigan	Finland
Price stability		+
Pricing accuracy	+	
Industry bargaining	—	+
Individual/group bargaining	+	—
Incentives to reduce costs	+	—
Technical new product development	+	—
Market adaptation	+	—
Product management	—	+
Promotion of dairy products	—	+
Raw material differentiation	+	—

Differences in the performance of the two systems are presented in Table 7-3.

Price stability is definitely better in Finland, but at the cost of the accuracy of the pricing. The centralized dairy marketing system with close connections to the centralized farmers' organization has given strong negotiation power to the Finnish dairy industry. The bargaining position of small local and regional groups, in turn, is stronger in Michigan.

Because of the better pricing accuracy, the incentives to reduce costs at producer level and also at processing level are more effective in Michigan. The Finnish export subsidy system seems to be very resistant in that sense.

The centralized dairy marketing system has allowed a more advanced technical new product development system than what is generally the case in Michigan. The large and relatively rigid Finnish system, on the other hand, has become more immune to changes in consumer preferences. The bigger number of small independent processing firms and the threat of competition from other states have made the Michigan system more flexible to respond to new demands, although the dairy subsector seems to be below the average in that sense in Michigan as well.

There is also a structural explanation to the difference in the sales promotion. The rigid system which tends to resist change has an incentive to increase the promotion of existing products in an effort to raise their sales, without being forced to make considerable changes in the products themselves.

Michigan's more diversified system with less obligations for equal treatment allows better raw material differentiation. This system has been very suitable for the relatively unchanged preferences until today. Future needs for, e.g., more varieties of cheeses may, however, challenge the present system.

8 CONCLUDING REMARKS AND FUTURE RESEARCH NEEDS

8.1 WHAT WAS DONE

The initial problem of this research work was to gain a better understanding of matching the ultimate supply and demand for milk at various steps of the production-distribution sequence. The issue was considered as a major problem of agricultural marketing economics. The tentative assumption was that neither the so-called pure market nor administrative policies are capable of dealing with all the issues involved in coordination. The purpose was to assess the suitability of price or regulations in solving various coordination problems.

In many sections of the agricultural marketing system, cooperatives seem to be dominant. In fact, as exchange institutions they appear to have properties that differ both from markets and from administrative transactions. Special emphasis was, therefore, given to cooperatives. Already when constructing the general framework of this study, direct applications to cooperatives were provided after each main concept.

The research problem was narrowed down to four specific objectives: (1) to provide an explanation for the current dairy marketing structure, (2) to point out the specific problem areas in coordination, (3) to suggest institutional changes to improve the situation, and (4) to attempt to predict the effects of changes.

It has been very difficult to analyze the question of coordination in a subsector such as Finnish agriculture because of the large number of tasks given to the system. This study is among the first attempts to include prices, regulative policies, social goals, etc., into the same analysis in the manner they exist in real life.

Coordination of supply and demand throughout the various steps of the production-distribution sequence seemed to involve two dimensions that conflict to some extent: synchronization and adaptation coordination. The former refers to fine-tuning the system to perform the current tasks as smoothly as possible. The latter refers to the ability of the system to renew itself according to changes in the environment.

Exchange was considered as the main focus in examining coordination. It was noted that changing the rules of exchange affects the distribution of costs, benefits and risk in a similar way as changing the prices. The research strategy adopted was to first examine the effect of rules, i.e. institutions, on the exchange. After that, price could be analyzed by traditional economic means.

The framework in this study, termed Marketing Systems Analysis, consists of parts of various concepts. The basic setting to be studied is (1) how preferences are expressed to the marketing system and (2) what the circumstances are in each transaction in question.

Two basic ways of facilitating changes in the marketing system were considered. Voice, the political way, was found to be richer in information but to involve problems regarding representativeness. Exit, the market way, was considered representative, but lacking information about the content of preferences. Cooperatives were found to have properties that combine both modes of preference articulation.

Similarly, there are two basic ways of arranging transactions: exchange in the market and inside the organization. Exchange in the market was considered as a more effective way of coordination, but with limits in safeguarding against information impactedness. Information impactedness causes problems in the market exchange if human beings have bounded rationality and behave opportunistically in an uncertain environment, with a possibility for mutual agreements. Thus, if the circumstances of a transaction include properties of information impactedness, there is a tendency to shift the transaction from the market into the organization. E.g., if there were uncertainty about obtaining a combine harvester for rent from the (rental) market at the time of harvesting, it would pay for the farmer to buy a harvester regardless of the higher capital costs and, thus, to shift this transaction into his own command.

Between the extremes for arranging a transaction, i.e., the market and the hierarchy, there is a continuum of exchange institutions. These include different kinds of delivery contracts as well as cooperatives. According to transaction cost economics, the most effective way of arranging a transaction is when the transaction costs are smallest. Transaction costs may also affect production costs. Transaction costs economics states that there are three main dimensions in a transaction which cause the arrangement of the exchange to move away from the market towards the hierarchy: (1) asset-fixity, (2) uncertainty, and (3) frequency of transactions. If purpose-specific investments have been made, having considerably less value in alternative uses (such as a cowshed) in an uncertain environment, there is a tendency to protect these kinds of investments against possible opportunistic behavior. When the transactions are of a recurrent kind, special arrangements will decrease the transactions costs. If a farmer selling milk every day had to obtain bids from several buyers every time he sold the milk, he probably would suggest a longer-range delivery contract to save the time spent in receiving bids for other purposes. The fewer the fixed assets, the smaller the uncertainty, and the lower the frequency of transactions, the more likely it is that the transaction will be arranged through the market.

An application of transaction cost economics was chosen as the core of the Marketing Systems Analysis framework. The choice was based on the capabilities of the theory to deal with alternative exchange arrangements in a way having connections to more traditional economic tools of analysis, which was a part of the chosen research strategy. However, the field of application, i.e., Finnish agriculture, involves so many parties and goals that defining whose transaction costs were to be taken into account was difficult. The theory was expanded by adding the factor of property rights, which define the division of costs, benefits and risk among the parties.

More emphasis was also added to the evolutionary features of institutions. This was because exchange institutions are often an outcome of past events, and changes occur by remodeling the existing institutions. The applied paradigm was that of situation-structure-conduct-performance, where (1) the dimensions of transactions (situation) affect (2) the market, where legislative and trading structures (structure) in turn shape (3) the behavior of participants (conduct), and (4) where the outcome of the system (performance) is measured by synchronization and adaptation coordination, and by the distribution of costs, benefits and risk. This addition provided a bridge to the so-called industrial organization (IO) framework, within which an attempt was made to improve the operationality of the application by empirically analyzing a market system. Although it was expected that all of the factors mentioned above would not be equally relevant, this addition provided a rationale for examining coordination in a subsector.

The Marketing Systems Analysis framework was applied to the dairy subsector, in which coordination problems are significant and have been difficult to analyze. Consider-

ing those not familiar with the Finnish dairy subsector, an extensive description of the subsector was made using the framework to explain the current structure. For purposes of the analysis, the dairy marketing system was divided into tasks which, in principle, could be organized by using various institutions starting from the "pure" market and ending with the "pure" hierarchy. By using transaction cost economics, an attempt was also made to explain why the system is arranged the way it is.

Four major problems were analyzed, key problem areas defined, and improvements to arrangements suggested. Brief analyses using traditional economic means were conducted of the coordination problems pointed out by the Marketing Systems Analysis framework. A scenario was made about the development of the structure as predicted by the framework. A short comparative analysis was also carried out between the dairy marketing system in Finland and that in Michigan, USA.

8.2 CONCLUSIONS ABOUT COORDINATION IN THE FINNISH DAIRY SUBSECTOR

Recall the hypotheses based on the framework: (1) the greater the asset-fixity, the more difficult it is to rely solely on the market, (2) the greater the degree of uncertainty, the more integration exists, (3) the more externalities or other parties, the more integrated structures can be found, and (4) the greater the frequency of transactions, the more specialized exchange institutions can be found.

Fixed assets such as cowsheds and dairy farmers' skills, which have considerably less value in alternative uses, or perishable milk, which loses its value quickly if not processed, are vulnerable to the opportunistic behavior of buyers. Protection of the value of the fixed assets was among the most significant reasons why milk processing in Finland took the form of a cooperative. The high frequency of transactions between dairy producers and processing plants made it possible to decrease the transaction costs through long-term delivery contracts.

Uncertainty concerning the weather conditions, together with high asset-fixity, would easily have led to high price fluctuations, if regulative policies for the pricing of milk had not been applied. It was possible to secure the dairymen's income in the 1950's because of the high proportion of the agricultural population and its political power. External goals for agriculture and dairy farming such as rural settlement and food security made it easier for the rest of society to accept strong governmental involvement. The decreased importance of dairy farming in rural settlement and the diminished political power of the farming population may change the attitudes of society in the near future. The changing property rights of farm assets such as the use of fields may narrow the farmers' possibilities to shift the cost of, e.g., pollution to the rest of society.

Unified products marketed under the same brand name, the high concentration of the retail level, and the surplus export system are among reasons for separating the marketing and processing activities. The decomposition of these activities leads to a situation where the responsibility for the coordination of the product mix shifts to a central unit, allowing the dairy plants to concentrate on processing. The centralized organization has sufficient negotiation power towards the retailing industry and is able to provide such marketing services to member dairies as they would be unable to obtain alone.

The complex legal structure and the emphasized role of the government as a negotiation party facilitates the evolution of the market and trading structures towards a centralized negotiation party from the dairy farmers' side as well. Separating political negotiations from milk marketing activities has shifted the collective role of the cooperative organization partly to the Farmers' Union.

Thus, the actors affecting the dairy marketing system are not only the producers, the intermediaries and the consumers. The govern-

ment and the Farmers' Union play an important role in shaping the environment in which the dairy marketing system operates. This favors regulation vs. price, and centralized standard operating procedures in the coordination of supply and demand. Limited exit possibilities inside the system have effectively prevented the problem of free riders.

Regulative policies, high involvement of parties outside the functional milk marketing system, centralized standard operating procedures in product management, and limited exit possibilities have been supported effective synchronization coordination in the system. The same properties in connection with dairy cooperative members' voice over market demand have acted as preventive forces for effective adaptation coordination.

The dairy subsector has properties which prevent coordination through haphazardly evolving markets. A major part of the obstacles can be explained by fixed assets. Because of climatic conditions, asset-specificity seems to be a more significant problem in a country such as Finland, where dairy farming occurs on the frontier of climatic possibilities.

The task of securing the food supply gives agriculture a special position among the sources of livelihood in every country. Due to the northern geographic location and to unfortunate past experiences, it plays an emphasized role in Finnish agriculture. Being the most important field of agricultural production, dairy farming carries the main responsibility for this. Since dairying is the most important profession in the rural areas of the scarcely populated country, it acts as a special factor in maintaining the rural areas settled and the regional structure functioning for other professions as well.

The issues of food security and rural settlement are external goals given to Finnish dairy production by society. The matching of milk supply with demand and the existence of the external goals make the problem of coordination more extensive than just a question of profit maximization. Improvements in coordination are often a compromises between conflicting goals whose order of preference has to be decided upon by the participants by political means.

Society has been able to develop circumstances for dairy production in which the set goals are met and dairying is effectively protected against the uncertainty of environmental conditions. This has occurred at the cost of weakened incentives to efficiency and to responsiveness to changes in society. The mismatch in coordination is being corrected at an increasing cost to the government. Intensified international competition and other related factors predict that some changes in the dairy marketing system will have to take place. Perhaps the pricing system will have to become slightly more flexible in order to provide incentives to adaptation and cost reduction. A total deregulation of the dairy marketing system cannot, however, improve coordination.

8.3 CONCLUSIONS REGARDING THE PROBLEMS CONSIDERED

8.3.1 Overall balancing

Since the late 1960's the problem in the overall balancing of the supply and demand of milk has been caused by the decline in consumption without any decline in supply. Attempts have been made to solve the problem by various administrative means. Their success has not been very good, although during the past few years the decrease in supply has been noticeable.

It was calculated that a supply of 2020 million liters per year would be sufficient to cover the present demand in Finland also during the lowest production period. This means that supply could decrease about 25 per cent without causing problems in product management. However, this kind of a decline would mean a considerable reduction in the total number of cows needed for production. The prospects for increasing the quantity of milk consumed are few.

It is not viable to further decrease the average size of the herds because their size is al-

ready so small, or to lower the inherent production of individual dairy cows. It was noted that the only feasible way of reducing the supply would be to decrease the number of production units. With an average of 13 dairy cows per herd it would take about 27 000 such herds, instead of the present nearly 60 000 herds, to produce enough milk for domestic consumption. This would in turn mean that the ability of dairy production to maintain the rural areas settled would decline considerably.

Both price and administrative means as ways of facilitating exit from dairy production were analyzed. Because of the high degree of fixed assets causing a large difference between the acquisition and salvage values of investments, the production price of milk would have to be brought down so much in order to cause exit that it would cause serious problems for the remaining dairy producers. E.g., the value of a cowshed in alternative uses than for keeping dairy cows would be considerably smaller, which would retain a farmer in the dairy business even with a milk price insufficient to cover the fixed costs. Factors such as dairymen's specific skills, dairy cows, cow feed machines, etc., work in the same direction. Despite the economic principle that a decline in price decreases supply, it would not have the desired effect in dairy farming because of the fixed assets involved. On the contrary, a decline in price would endanger the economic means of livelihood of the farmer family, which would cause the need to raise the quantity produced.

The government has made bids for exit from dairy production in the form of milk bonuses. The latest in January 1988 promised 1.20 Fmk for each unproduced liter of milk for five years. As predicted by the Marketing Systems Analysis framework, those most willing to quit were the dairymen and dairy operations having the most alternatives outside dairy production, i.e., those whose mental and physical assets were least fixed. About 28 per cent of the farmers in southern Finland, who have more farming and other employment alternatives outside dairying, were willing to take the offer, whereas the proportion of northwestern farmers was only 5 per cent. The larger farms and the younger farmers also seemed to be more willing to quit dairy production. This means that the bonus system is likely to make the most economic dairy production units to quit, which has already happened to some extent. From the point of view of rural settlement, the bonus system has worked in the right direction.

Because of surplus production, the government decided to use administrative means and issued production quotas for dairy farms in 1985. Since these quotas are similar to production licenses with no alternative value, they were, as also the present framework would predict, capitalized as the dairy farm's fixed assets raising the threshold to quit dairy production. Because of its considerable effect on a farm's sales price, the quota increases the production costs of milk.

Making the quotas tradeable would prevent them from being fixed assets. Tradeable quotas would facilitate exit because now the quitters would benefit from selling the quotas separated from the farm. However, tradeable quotas would not prevent an increase in production costs, since they would have to be purchased anyway. While farm-specific quotas are good from the viewpoint of the rural settlement policy but negative from the viewpoint of production economics, making quotas tradeable would reverse these effects. A proposed compromise would be to give the quotas to the dairy processing plants. It would depend on the rules of quota reallocation into which direction this would work. The fact is that the quota would then be a fixed asset for the dairy plant, increasing the production costs of milk and efficiently preventing entry into the dairy processing business.

Fixed assets are the major hindrance to the overall balancing of the supply and demand of milk. Because of the fixed assets, in order to cause exit the price of milk should be so low that it would have serious side effects. The bonus system seems to be effective, but because of a higher rate of fixed assets among

farmers having less alternatives outside dairying, the bonuses cause the exit of producers whose production possibilities are not the worst. The bonus does not make the fixed assets more redeployable, e.g., through guidance about alternative sources of living. This means that the risk in quitting is high, and the price of exit has to be relatively high as well.

In contrast to the prevailing system where the fixed assets of dairy production are protected by regulations and cooperative transactions, it was suggested in this study that the fixed assets could be made more redeployable through the establishment of a cooperative adjustment fund (CAF). This would be an effective new institution which would facilitate exit from dairy production. The most significant feature of the fund would be that a dairy cooperative would not just be a collective of producers, but would also take responsibility for exiting dairy farmers. This would decrease the transaction costs of exit in many ways. The fixed assets of current dairy production would become more redeployable if an existing, familiar organization were utilized. The acquisition value of a new profession could become lower if the value created during the dairy member patronage could be used for this purpose. The remaining milk producers should have an incentive to support this change. The uncertainty related to exit would be reduced when one and the same familiar cooperative would support the shift process by means of extension, education, marketing and product development services, etc. The security problems during the development period concerning the property rights to the innovation would be more easily arranged as well.

The Marketing Systems Analysis approach predicts that also the coordination authority given to dairy cooperatives might be a good solution. The proposed cooperative adjustment fund would be able to smoothen the asset-fixity problem and reduce the uncertainty regarding the production shift.

8.3.2 Component balancing

During the last 20 years the consumption of milk components has been continuously changing towards dairy products containing less butterfat. The marketing system has been slow in adapting to the change. Because of this, there is a mismatch between the supply and demand of milk components, especially butterfat.

Changing the composition of milk according to the changing demand is limited by the technical interdependency of the components. The Finnish climate with its short summers makes the cows produce more fat than they would produce in southern countries. Changing the components through cow breeding may take at least 10 years before any results are brought about. Some immediate results may be reached by changing the feeding habits.

It was found that the incentives and possibilities of dairy producers to adjust milk composition according to changed demands were rare. While the shares of the components in the raw milk price paid was 39 per cent for fat, 36 per cent for protein and 25 per cent for liquid, the demand for the major dairy products at the retail level by milk component was 23 per cent for fat, 42 per cent for protein and 35 per cent for liquid. Thus, the demand for the components is not reflected in the producer milk price. Fat is overpriced, whereas liquid and protein are underpriced. The incentives to producers to change the composition are weak.

It was further calculated that the coefficients corresponding to the relative values at retail level should be 1.3 for 1/10 per cent of fat and 3.0 for 1/10 per cent of protein. Since this calculation was made, Valio has changed its pricing very close to these figures.

Changing the component pricing at producer level will not, however, improve coordination immediately because of the inability of the producers to adjust. The present cows are fixed assets and new breeds are not even available yet. Because of fixed assets, a rapid change in component pricing will easily make the producers worse off. On the other hand, cattle breeders have until now stated that they

would not change their breeding programs before they see that the change is profitable to farmers. When such cows are bred in the future, they will not be adopted by the producers if they are not profitable. Thus, there is a "Catch 22" situation, in which neither price nor administrative means alone can solve the mismatch, but have to be used simultaneously.

Dairy cooperatives seem to be in a unique position to make the change happen without causing problems to producers' fixed assets. Voice and price can be simultaneously used, as a direct application of the Marketing Systems Analysis framework predicts. Cooperatives could begin the change by altering their internal pricing and passing this change to producers in the pace of their ability to adapt to the alteration. Voice could be used towards cattle breeders, extension workers, etc. Personal trust between the member and the cooperative could be used to reduce the uncertainty regarding the continuity of the change.

A calculation was also made of the effect of another extreme, i.e., making butterfat as a marginal product at processing level. It was found that an increase of 0.5 Fmk per liter in the price of consumption milk and an increase of 5 Fmk per kg in the wholesale price of cheese would compensate the raw material value of butter while maintaining the income at the present level. Butter could be sold at retail stores at 20 Fmk per kg. The export subsidies of butterfat would decrease significantly.

8.3.3 Seasonal balancing

In Finland the seasonal fluctuation of milk production is high. When consumption remains relatively stable, there is a seasonal mismatch between the supply and demand of milk. Coordination of seasonal fluctuation has been conducted mainly through product management. During the last 10 years, seasonal producer pricing has grown in importance, and seasonal fluctuation has diminished.

Balancing the seasonal fluctuations of milk supply and demand seems to be a problem that can be coordinated by the market solution by using seasonal pricing, since there are no significant fixed assets that resist the change. In fact, it seems that the prevailing seasonal price differential is sufficient to bring about the change. However, this will happen slowly because of information adaptation and because the shift is easiest along with the renewal of the cattle.

The existence of cooperatives is important in protecting against the possible opportunistic behavior of milk buyers. Long-range commitment would create shorter-run asset-fixity problems if the transaction between dairy producers and the first handler firms were completely conducted by the market.

Despite reduced seasonal fluctuation, product management still remains an important coordinating function. Adjusting the area from which liquid milk is hauled to consumption centers by using central planning seems to be an efficient way of conducting this task of coordination. Transaction cost economics does not predict that, e.g., inter-dairy transfer milk markets would lower the transaction costs.

In the prevailing system the consumer price does not reflect the seasonality of production. The processing level seems to carry out the balancing. An interesting question remains unsolved: Who is actually paying for the peakload? How would the performance differ if consumer prices were seasonally differentiated? It is for society to decide which consumers will be paying the cost of either extra capacity or temporary shortages.

8.3.4 Adaptation coordination

The rapid change from a rural society into a post-industrial society has led into a rapid change in living styles as well, which in turn has affected food consumption patterns. Increasing incomes and technological development have made the change possible. The development has had different effects on vari-

ous consumers, and has led to increasingly diversified and rapidly changing consumption patterns.

The food system has responded to the changes by concentration and specialization. Value added has shifted from farms to the farm input industry and forwards to food industry. In 1960, the value added at food processing level was about 33 per cent in the farm input industry, 47 per cent on the farms, and 20 per cent in the food processing industry. In 1985, farm inputs represented 50 per cent and the food industry 33 per cent, while the relative value added on farms had decreased to 17 per cent. A similar development has occurred in consumer households. Tasks have shifted to the processing industry and the distribution system as well as forwards to, e.g., the appliance industry.

The total consumption of dairy products has been continuously declining since the end of the 1960's. It could be concluded that the proportion of dairy products in the consumer diet is diminishing. Another conclusion could be that the dairy subsector has not been adaptive enough in competition with other products. Some evidence of this can be drawn from the consumption figures of individual dairy products. The consumption of products such as yoghurt, skim milk and desserts, which meet the consumer preferences for convenience and less fat, has been continuously increasing. Thus the downward trend seems to be due to too large a proportion of traditional products such as butter and too small a proportion of products reflecting new consumption patterns.

Lack of effective adaptation coordination is due to factors that were created to ensure effective synchronization coordination. Dairy producers established the cooperatives to protect their fixed assets. Their interests are still concentrated on selling their existing product, not changing the product. This may put the cooperative management in a difficult position as regards correct behavior: whether to listen to the members or to the dairy product consumers' preferences. Thus, protecting the fixed assets seems to hinder adaptation coordination. Regulative policies, lack of market incentives, and lack of consumer's exit possibilities seem to work in the same direction.

Along with the development of technically well-functioning, hygienic production lines for such bulk products as liquid milk and butter, the entire dairy processing industry became very technically and biologically oriented. Performance is still very much judged by technical and biological criteria. When these criteria do not reflect consumer preferences, mistakes and lost opportunities may occur.

Technical and biological business aspects are emphasized in the development of new products. Technical innovations are stressed at the cost of the marketing function which converts information from the market into product concepts. The small marketing department of Valio is overloaded with promotion programs and lacks the capacity to act as a link between the market and the new product development process. The emphasis on advertising the existing product concepts can also be seen as evidence of slowness in adaptation.

The export system designed for dispensing of surplus dairy production, does not provide incentives to adaptation coordination for international markets. E.g., it was found that Finnish Emmental cheese (Finlandia) was sold in the U.S. at a considerably lower price than Swiss Emmental or Norwegian Jarlsberg. The latter cheeses were considered brand names, while Finnish Emmental was regarded as a bulk product. The profitability of the export business should be the basis for export decisions, not just the quantity exported. Otherwise, high-quality bulk products will be exported at too low a price.

Decreasing the value of raw milk in final dairy products, attempts to change the local dairy cooperative structure into a regional structure, deregulation of retail prices, and the expected increase in the international competition between dairy products may threaten the current structure of the Finnish dairy marketing system. According to transaction cost

economics it can be predicted that dairy processing may be separated from milk collecting and transferred to investor-owned firms. Dairy cooperatives could concentrate on the area where they are superior, i.e., milk collecting and collective bargaining. Furthermore, there is a possibility that two national cooperative organizations will be formed: the larger one consisting of regional cooperatives, and the smaller one of local cooperatives not willing to join the regional cooperatives. In addition to the two cooperative organizations, individual domestic and international dairy processing firms may appear as well as retailers' backwards integration to the dairy processing business. This development may make it necessary to restructure the entire agricultural income system.

8.4 COMPARISON WITH THE MICHIGAN DAIRY MARKETING SYSTEM

A somewhat lower rate of asset-fixity, i.e., more alternatives to dairy production, somewhat less uncertain weather conditions, and the absence of external goals such as the rural settlement policy, leave more room for the market in the Michigan dairy subsector than in the Finnish system. This does not mean the absence of the government; it is only involved more indirectly by affecting, through export decisions, the raw milk market prices of hard products (Grade B), which in turn affect the Federal Milk Marketing Order system in liquid milk markets. The system allows the milk price to reflect the supply and demand conditions, but it can be controlled by government purchasing policies.

Asset-fixity in Michigan is, however, high enough to keep the dairy producers' cooperatives dominant in milk collecting, as is the case in Finland. Because of more exit possibilities on both the producer and the consumer side due to interstate competition, the processing of milk is more diversified.

Independent of the political, economic, cultural, structural and climatic differences involved, the problems of the Michigan dairy marketing system seem to be amazingly similar to those in Finland. Michigan also faces a problem of overall balancing causing a surplus of milk, although not as large as in Finland.

The average fat content of milk is only about 3.7 % compared to 4.3 % in Finland. Climatic differences explain a part of the difference. Due to the lower fat content, the surplus fat has not been such a large problem in Michigan as it has been in Finland. So far the increased cheese and ice cream sales have absorbed the extra butterfat. But this means seems to be closing up, and the fat problem can be predicted to increase.

The difference between the lowest and highest month of production in Michigan is from 0.95 to 1.05 times the average. Seasonal fluctuation of production exists, but it is not as large as in Finland. Climatic differences explain a part of this as well. Effective seasonal pricing has also contributed to the decrease of seasonal variation. The rest of the coordination of seasonal variation is conducted by product management. As in Finland, national dairy producer cooperative organizations play a key role in adjusting the area from which liquid milk is hauled to the main consumption centers.

As a conclusion of synchronization coordination in Michigan it can be said that the problems seem to be more due to the properties of the transactions of goods rather than to the institutional arrangements in transactions. The hypothesis drawn from the theory that, given the nature of the product, similar coordination problems exist even in different environments and institutional arrangements, was confirmed. Climatic differences explain a major part of the lower extent of problems in Michigan in synchronization coordination than in Finland. This has allowed more market to the Michigan system, which in turn has increased both the production efficiency and possibilities for adaptation coordination.

According to experts, the dairy subsector is not particularly adaptive in Michigan either, compared to the other food industries. However, total consumption of dairy products has during the last 25 years remained relatively stable in Michigan, even increasing in the 1980's. This competitiveness of dairy products in the consumer diet may be interpreted as better adaptation to changing preferences than is the case in Finland, where the total consumption has been declining. However, it should be borne in mind that the consumption of dairy products has traditionally been at a much higher level in Finland, and a downward trend is, therefore, more likely.

The way of dealing with each coordination problem may be different although basically the tasks are the same. Differences in culture together with the past development of institutions explain a major part of this.

The liberalization of international trade will be as difficult for the Michigan (and the entire U.S.) dairy marketing system as it will be for Finland. The role of the U.S. government in balancing the fluctuations will have to be reorganized if trade is liberalized.

8.5 CONCLUSIONS REGARDING COOPERATIVES AS COORDINATING INSTITUTIONS

Fixed assets seem to explain a major part of the limitations in using the market to solve the current problems and in using administrative regulations in the dairy marketing system. Based on the Marketing Systems Analysis framework developed in this study it can be concluded that cooperatives are able to decrease transaction costs in certain kinds of transactions.

Cooperatives are able to deal with fixed assets in two ways. Firstly, they can protect fixed assets against opportunism by cutting incentives to such behavior in a transaction. Secondly, in some cases cooperatives seem to be able to make some fixed assets more flexible by decreasing the difference between the salvage and acquisition values of investments, as in the case of the cooperative adjustment fund proposed above.

Simultaneous use of price and voice is more effective in making changes to the prevailing system than either one of them alone. A well-functioning cooperative is able to solve such marketing problems that neither the market nor the administration can. This is the case in readjusting the composition of milk, where a change in component pricing alone may only make those producers who are unable to respond worse off, while pure administrative means do not make the change profitable to the producers. Because they are able to use voice and price at the same time, cooperatives are in a good position to break the circle when price alone cannot effect a change and when pure regulative policy is unable to provide incentives to change.

The external effects of cooperatives are sometimes crucial for a well-functioning marketing system. E.g., the seasonal pricing system, which was considered as an effective means of seasonal coordination, would have to be considered in a different light in a pure market situation. The absence of the present cooperative system would open the way for opportunistic behavior of individual milk buyers. The external effects of a "competitive yardstick" seem to be important.

There is a limit to the number and variety of tasks a cooperative can conduct without losing its identity. In accordance with thev-hierarchical decomposition principle of transaction cost economics, the Marketing Systems Analysis framework also suggests a separation of the tasks important for coordination from those difficult to appraise by nonmonetary means. Cooperatives have difficulties in conducting complex tasks with strong interests outside the scope of the members. Similarly as in a situation of increasing heterogeneity of the members, it seems difficult to fit the heterogeneity of other interests into the properties of cooperatives. Situations such as the case of butter/vegetable fat mixes which involved combining the preferences of both dairy producers and consumers, may lead to

stagnation. The management of a cooperative may find it difficult to decide whether he should listen to the members' voice or to the market.

The meaning of the principle of equal treatment should be reconsidered. The prevailing perception of equal treatment as similar treatment seems to destroy incentives to improve the performance both among members and in the dairy processing system.

8.6 APPLICABILITY OF THE MARKETING SYSTEMS ANALYSIS FRAMEWORK

An often heard excuse for difficulties in economic analysis in agriculture is the role of "external" effects of regulations, political decisions and the voice of various interest groups acting "against economic logic". The present framework has capabilities to deal with a variety of aspects in real-world circumstances.

There are no visible problems in using the approach in marketing systems analysis in other fields of agriculture, nor in fields outside agriculture. E.g., rural development through non-agricultural sources of livelihood is facing major problems in this area, which could be analyzed using the present framework.

The framework has been based on transaction cost economics and developed further to deal with the problems of economic coordination. It can be used both to explain current institutional arrangements and to design new exchange institutions. In the former, the addition of evolutionary features is important as well as the application of the situation-structure-conduct-performance paradigm to act as a rationale in collecting empirical information. The definition of property rights determining whose costs are taken into account as transaction costs, seems to be crucial in analyzing the performance of alternative new exchange institutions.

The Marketing Systems Analysis framework is also capable of making comparisons of marketing systems in different environments. It can be used to explain differences in institutional arrangements and in the performance between the marketing systems of different commodities.

Partly because the development of the framework is still at an early stage, it lacks formal, systematic and quantifiable factors, which especially the tradition of natural sciences is used to. This is also due to the fact that in order to take research into real-world conditions, factors not having common dimensions for measurement and comparisons have to be taken into account.

A vast array of concepts is needed to both "internalize" the way of thinking, and to consider the variety of problems found by the approach with appropriate concepts and by analysis methods. The analysis also requires a good understanding of the underlying factors of the subsector examined. This takes much more time than the research report is able to show.

The validity of the predictions made using the Marketing Systems Analysis approach is not easily appraised. Institutional changes often happen slowly. Circumstances may change along the way. If the prediction and the actual future differ, it is also hard to say whether the change is an outcome of the actions caused by the prediction.

The combination of situation-structure-conduct-performance with transaction cost analysis proved to be useful in the systematization of the empirical work, but will need further development.

8.7 FUTURE RESEARCH NEEDS

The present study is among the first attempts to apply this kind of an approach to the difficult problem of coordination of supply and demand. Although the framework remains far from completion, it seems that the start is promising enough to give reason for further development. The method of empirical analysis needs defining. A better understanding of the subsector to be analyzed will be needed as well.

Comparisons of several subsectors and their ways and reasons for organizing various transactions would add to the knowledge about finding solutions and improvements to exchange problems. Although the results are not one-way solutions, even some improvements in coordination problems may prove at least as valuable to the system as, e.g., some technical improvements.

There is no empirical evidence about the effects of institutional reforms suggested by the Marketing Systems Analysis approach. Information about this will have to be established. Evidence of improvements would often require new kinds of data collected according to the needs of Marketing Systems Analysis. The power of this framework in analyzing the urgent exchange problems of developing countries should also be tested.

Exchange institutions are often external to individual economic actors. Despite the effect of the properties of these institutions on each actor, it is not sufficiently in the interest of an individual to try to improve the institutions. This may be a partial explanation for the negligence of this area of study. Thus, the initiative for macro marketing economic research should probably come from society.

It seems that societies are becoming increasingly organized, complex and more difficult to comprehend. The development of analytic tools to deal with the problems of such societies with real-world assumptions is urgent and it is already under way. Marketing Systems Analysis as an extension of TRC provides a fruitful framework for the further understanding of coordination.

Exhibit 1

TRANSFER PRICING BETWEEN VERTICAL PROFIT CENTERS — A CONCEPTUAL NEOCLASSICAL ANALYSIS

"Perhaps the most significant management innovations in recent years — the establishment of divisional profit centers and decentralized operations — were designed to combat the problem of increasing costs of coordinating large-scale enterprises." (PAPPAS & BRIGHAM 1979).

Transfer prices influence the output of each division of a firm and, hence, the output as a whole. If the output of the divisions is not right, the firm is not operating at the optimal level. Transfer prices also determine divisional profits, bonuses, etc., providing incentives to develop the divisions according to their means of control and promotion.

PAPPAS & BRIGHAM examine transfer pricing in the context of a two-division firm producing a single product. The other (upstream) division is the manufacturer and the other (downstream) is the distributor. The total profit maximizing output level is, naturally, MR = MC.

Figure E1-1 shows a situation in which the manufacturing division is not able to sell the product externally. The net marginal revenue (MR_{FIRM}--MC_{DISTR}) for the distribution division shows the marginal profit for that division prior to taking account of the costs of the product that has been transferred to it from the manufacturing division. Similarly, the manufacturing division's marginal cost curve is nothing more than the firm's marginal revenue curve less the marginal cost of the distribution division.

According to PAPPAS & BRIGHAM, if the firm's marginal revenue and marginal cost are equal at Q* units of output, then obviously the distribution division's net marginal reve-

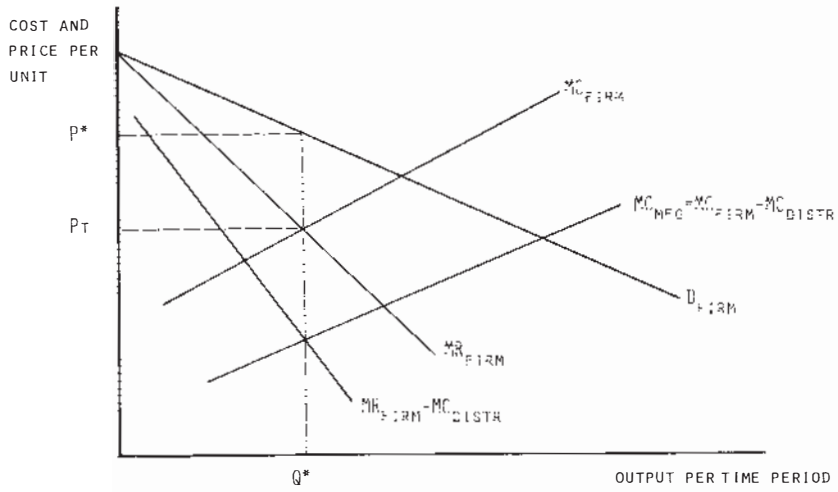


Figure E1-1: Transfer pricing with no external market for the intermediate product.
Source: PAPPAS & BRIGHAM 1979.

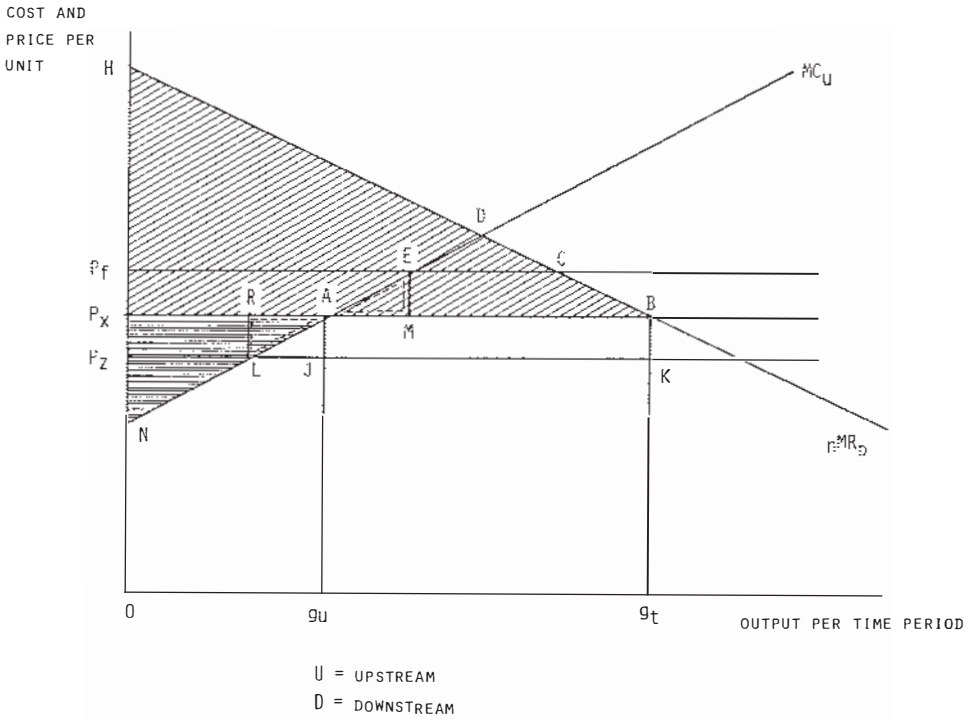


Figure E1-2: Transfer pricing with an external market for the intermediate product.

nue must be equal to the manufacturing division's marginal cost at that same output level.

Thus, if $MR_{FIRM} = MC_{FIRM}$

then $MR_{FIRM} - MC_{DISTR} =$

$MC_{FIRM} - MC_{DISTR} = MC_{MFG}$

From this PAPPAS & BRIGHAM conclude that the correct transfer price for an intermediate product with no external market is the marginal cost of production. This is the total market price P_T in Figure E1-1.

Figure E1-2 examines a situation in which a competitive market for the intermediate product exists.

The competitive price is OP_x. The manufacturing division produces $P_xA = g_u$, and the company buys from the market $AB = (gt - gu)$. The firm's total profit is P_xBH (distribution) + NAP_x (manufacturing).

Now, let us force the transfer price of the intermediate product from P_x to P_f, which is above the market price. The manufacturing division produces P_fE and the distribution division buys MB from outside. The profit is $P_fCH + EMBC$ (distribution) + NEP_f (manufacturing), which is decreased by AME. If the price is forced down to P_z, the profit will be decreased by RLA. Thus, in competitive markets where there is an external market for an intermediate product, only a competitive market transfer price for the intermediate product leads to profit maximizing for the whole firm.

Transfer pricing is an interesting question when examining pricing practices between cooperative members and a dairy processing plant, with transportation costs included, as well as when studying the pricing practices between local dairy cooperatives and the central cooperative.

Exhibit 2

COOPERATIVES IN THE LIGHT OF TRANSACTION COST ECONOMICS

The properties of cooperatives will be discussed below according to the dimensions of transactions and the principles of organizational design presented in Chapter 2.4. Cooperatives will be examined in the light of (1) asset-fixity, (2) uncertainty, (3) externalities, (4) hierarchical decomposition, and (5) frequency of transactions.[1]

1. ASSET-FIXITY

Cooperatives and market power

According to SHAFFER (1986), the cooperative mode of coordination is particularly adapted to deal with the problem of asset-specificity. Effective coordination through the market is difficult because of uncertainties and potential for opportunism. Coordination within the hierarchy, inside a firm, may involve large investments such as vertical integration to farming in order to protect transaction-specific investments. The effects of bureaucracy may grow enormously.

Cooperatives have a potential of decreasing the uncertainty related to fixed assets, while simultaneously maintaining "market-like" incentives (WILLIAMSON 1985).

As presented in Chapter 2, scholars such as Galbraith argue that organizations typically try to decrease uncertainty by gaining market power. In the presentation of the theory of contestable markets, BAUMOL (1982) argues that the immobility of assets, rather than industry concentration per se, allows the exercise of market power. The absence of fixed assets would lead to perfect competition because of costless entry into and exit from an industry, even when there are only a few firms in the industry at a time.

BAUMOL, PANZAR and WILLIG (1982) stress that in order for market power to arise, assets must be immobile on both sides of the market. Even if a farmer had fixed assets, this would not be enough for his trading partners to collect transactional rents if his assets were entirely mobile (costless entry and exit of competitors). As STAATZ (1984) puts it:

"In other words, asset-fixity in farming creates the potential for farmers' trading partners to earn rents by exercising market power, and the asset-fixity in the marketing and farm supply industries allows the trading partners to exploit that potential."

Cooperatives can be efficient in preventing the opportunistic behavior of actors in markets having fixed assets on both sides of the market. This may be a partial explanation to the observation that cooperatives in subsectors such as milk production (highly transaction-specific assets on both sides: on the farm and in the dairy plant) seem to be more successful than those in subsectors such as potato and fresh cabbage growing (high asset-fixity only on the production side).

Probably the most visible reason for the establishment of farmers' cooperatives has been the need to create a countervailing power in order to equalize the uneven negotiation positions between small, sparsely located farmers with high asset-specificity and large, well-informed merchants (GEBHARD 1916).

STAATZ (1984, p. 171) considers farmers to have basically two ways of exercising countervailing power to increase their incomes, which he sees as obviously the most impor-

[1] A similar categorization is used by STAATZ (1984).

tant reason to form cooperatives. These two ways are: (1) redistributing the existing income in the farmers' favor, and (2) increasing the efficiency of the economic system. STAATZ continues:

"Advocates of collective action by farmers have long argued that markets in which farmers face highly concentrated input, marketing, and processing industries generate a fundamentally unjust distribution of income, both in terms of the income received by farmers as a whole compared to other participants in the economy and in terms of the inequality of incomes among farmers that results from merchants playing one farmer off against another."

In Finland, where family farms and the principle of self-sufficiency have been dominating, the impact of opportunistic behavior of merchants has probably been the major reason for the establishment of cooperatives. Small family farms needed a countervailing power against, e.g., merchants who bought grain from the indebted farmers in need of money for a cheap price in the fall and resold the same grain in the spring at twice the price (ALANEN 1964, p. 201). The customary practice of self-sufficiency according to which selling of butter was considered "a shame on the house" (ALANEN 1964, p. 202), made Finnish farmers inexperienced for an exchange economy. The cooperatives' role as a mode of collective action was much more important than at present, when the Farmers' Union has adopted a significant part of this function (OLLILA 1985). The rural people's ability to act collectively, which has been significantly contributed to the development of cooperatives, still plays a very important part when rural people demand governmental support for their actions.

STAATZ also reports that cooperatives have a role in counteracting an undesirable regional distribution of income. The investments of IOF's come from metropolitan financial centers and the profits return to these places. Cooperatives rebate net margins to patrons or invest them locally (OLLILA 1985), which leads to higher local multiplier effects.

Besides the impact of the cooperatives' countervailing power on income redistribution, also some sociological effects can be found. The diminishing population of the farming communities seems to view cooperatives as a means of feeling togetherness in a society ruled by the urban majority.

Some fixed assets may require a large threshold payment (lumpy inputs). Cooperatives may gather enough members together to enable a joint investment. E.g., vegetable growers may build a cooled storage together as a cooperative. If the storage were an IOF, the possibility for opportunistic behavior at vegetable harvesting time when the need for storage is most urgent would cause uncertainty.

Entry/exit barriers

Entry barriers are often related to economies of scale. Large investments require resources that exceed the scope of small units. A cooperative reduces entry barriers.

According to PORTER (1980, p. 22), substantial economies of scale are usually associated with specialized assets, which increase exit barriers. In a cooperative, exit may take place sequentially and the use of transaction-specific assets can thus be prolonged.

Personal relationship and trust

Personal relationships have been traditionally considered as negative in a theoretical economic market. In a market where standardized goods are sold, e.g., on an auction basis, discrimination among persons involved in bidding distorts the perfect market ideal. However, in transactions where all the characteristics of the goods are not observable or where uncertainty is high and where, thus, contracts are incomplete, personal trust can be a very effective function of coordination. Trust reduces transaction costs. In a modern economy, complex transactions develop com-

munication economies to decrease transaction costs. Transaction-specific skills and languages develop, and personal and institutional trust relations evolve. WILLIAMSON (1979) calls this idiosyncratic contracting. SHAFFER states that relational contracting, especially, relies on trust.

Cooperatives were born to fight for honest trade and trust between themselves and their members (GEBHARD 1916). Personal relationships between members and management were inbuilt into cooperatives because of member influence through political processes.

The potential to use trust and personal relations to improve coordination is probably a central problem in large cooperative organizations. Despite the weakening of individual members' voice, a cooperative organization is open to opportunistic behavior as well. The likelihood for opportunism can sometimes be even higher than in IOF's because of poor control and inadequate measures of a cooperative organization's performance.

Preservation of market options

One of the most often heard arguments supporting cooperatives has been the fact that they promise to guarantee a market for the products also during seasons of low demand. With such a promise it pays the members to make a transaction even on less favorable terms compared to the cooperative's competitors.

This kind of warranty is understandably very important to farmers with a high degree of asset-specificity. E.g., a farmer who invests in a dairy operation might be in a very risky situation for 15—20 years with his amortization if there was no guarantee for product demand.[2]

Among the reasons for why cooperatives are better suitable than IOF's to preserve market options are:

(1) A processing cooperative is able to adjust the producer price afterwards using patronage refunds, if prices are volatile also on the next level, whereas an IOF would attempt to pass the risk to producers.
(2) In declining markets a cooperative will help producers to look for alternative ways of marketing the fluctuating levels of production, whereas a processing IOF has to consider other product lines of its business as well as other investment possibilities.

2. UNCERTAINTY

Flexibility of prices

SHAFFER (1986) states that the relative flexibility or stickiness of prices is a critical factor in coordination and involves complex relationships. Planning is based on projected prices and, thus, the plans in an uncertain world are seldom fulfilled.[3] In food production where yields, production plans of competitors, demand, etc., are not easily predictable, planning may be especially difficult.

If prices are fixed (but the environment is still unpredictable), price flexibility cannot be used to direct the already produced products to their best possible uses. Thus, if the predictability of market conditions increases, allocative efficiency decreases. Governmental attempts to influence the functioning of the marketing system have provided incentives to behavior otherwise uneconomical, causing a slack in the economic system. E.g., the taxation practices of Finnish farms have been said to lead to uneconomical overmechanization and preference for new machines over used ones.

Cooperatives have a certain limited capacity to guarantee forward prices since they have potential to influence production plans through information provided to members

[2] STAATZ (1984, pp. 294—298) confirms that this kind of rule does not solve the problem of coordination but transfers the problem to the farmers whose marginal costs are high, benefiting simultaneously low marginal cost producers.

[3] To correct an incorrect plan may require much more "political energy" than was required to make the corresponding decision about the incorrect goals. This can cause incorrect action even in a situation where more correct information would be available. (OLLILA 1987a).

and contracting with members, and simultaneously to influence downstream participants through collective bargaining, contracting and promotion. If cooperatives represent a significant proportion of a particular market, this could improve the match of aggregate production with demand and at the same time maintain a "workable" price stability and coordination.

The contingency pricing system of cooperatives, according to which members receive, not just the initial price, but also a patronage refund depending on the earnings of the cooperative, also has a price stabilizing effect in uncertain circumstances. The advantages of contingency pricing mentioned by STAATZ (1984, p. 188) are that it helps firms on both sides of the market to avoid the costly mistakes of committing themselves to prices that are either too low or too high in the light of changing and not-fully-known supply and demand conditions. However, it may also render costly renegotiations of contracts in situations where one party feels that it has been treated unfairly in evolving market conditions.

Point of time in the production-distribution sequence at which terms are determined

Predictable terms of trade facilitate planning and coordination. Errors in expectations when preparing plans of activities cause a misallocation of resources. "The length of the contract relative to the production planning is critical. For example, contracts for hogs longer than the gestation period would reduce errors in planning the number of hogs to breed, but would not solve the problem of planning investments in confinement housing, which might have a useful life of 20 years." (SHAFFER 1986). A 20-year contract would cause difficult problems in changed market conditions, especially for the buyer.

The food system, in most cases, has several features that are either beyond the control of the parties or that occur in too short a time to be able to contribute to planning.

Cooperatives offer their members a contract which is more like a contingency agreement with an obligation to deliver the members' goods (to provide a certain service) but with the price depending on the performance of the cooperative. Thus, a cooperative can reduce the uncertainty of investments made in advance (fixed assets) by guaranteeing a market less open to opportunistic behavior than what an IOF could offer. The cooperative pooling agreement may reduce price variability but still maintain some dynamics in the system, which would be much more difficult to achieve, e.g., by a governmental agreement.

If the cooperative were capable of attracting a significant proportion of the producers of a particular commodity, it would also reduce the uncertainty of the non-patrons of the cooperative. Because such agreements would necessarily involve contingencies difficult to specify in detail in advance, it would require either very complex contracts or great trust between the parties. It may be assumed that the trust between a member and a cooperative would be deeper than between two independent firms with differing goals encouraging them to act opportunistically.

Thin markets

In a thin market it is a question about the representativeness of the market and the ability of the market to absorb variations in deliveries.

An open auction market or exchange can be characterized as thin if only a small part of transactions occur through this institution and a significant proportion are, e.g., private treaty transactions. In this case the market functions with information about demand and supply which may be insufficient. The variations in the quantities sold through the market institution may cause price variations unrelated to the actual total volume marketed.

As example of markets with a limited capacity to absorb the day-to-day variations in quantities delivered, SHAFFER mentions city markets for perishable fruits and vegetables. In such markets two or three loads too many

of a particular commodity delivered on a particular day may result in prices below the cost of transporting the commodity to the market. The prices in the vegetable terminal market in Finland can be very volatile and unpredictable. E.g., in the summer the price of cucumber or tomato may sometimes be only a fraction of the production costs.[4]

Cooperatives could help to provide information about private treaty transactions. Because owned by members, cooperatives would be in a better position than either private IOF's or the government to gain reliable information about private treaty transactions. The dual role of cooperatives (see Chapter 2.2) makes it possible to affect the members' intentions as well. Therefore, there would be an opportunity for an iterative process of action and transaction coordination to smoothen the flow of products and the fluctuation of prices in changing market circumstances. The problem would be to gain a large enough market share for sufficient influence in the market. Avoiding the problem of free riders might also be difficult.

Risk reduction through pooling

High seasonal fluctuations of production cause an unstable flow of income to farmers. The increasing specialization of farmers raises uncertainty either because of "having put all the eggs into one basket" or because of the chance for opportunism caused by short peak loads. The increasing amount of purchased inputs may deepen the problem.

Uncertainty has been the main reason leading to the administered price formation of the most of the traditional farm products in Finland. It has often been argued been that administered prices have distorted the incentive structure causing a need for readjustments in Finnish agriculture.

Other means of coping with uncertainty have been on-farm diversification and, as in the U.S., futures markets. Pooling through cooperatives may be especially relevant in economies where futures market or similar institutions are poorly developed. A stronger impact of administered prices may become an increasing solution for uncertainty in almost all European countries.

STAATZ (1984, p. 190) mentions three reasons for farmers pooling through cooperatives. First, the uncertainties related to agricultural production may be so great that lenders will require a large risk premium when loaning to farmers, particularly if the purpose of the loan is simply to stabilize farm income.[5] Secondly, pooling may involve less transaction costs than other forms of insurance. The decision to use a cooperative for this purpose may not require more than one decision, i.e., to join in. Thirdly, a farmer in declining markets may see a chance to transfer some of the income of producers of more favorable crops through a cooperative to himself. STAATZ further discusses the properties of cooperatives as institutions where winners chronically support losers and where, thus, members insure themselves with "other people's money".

Transparency

The transparency of a market refers to the extent to which the terms of all transactions are open to all participants in the market. Transparency to those not present in the open auction market is dependent on the accuracy and extent of market news reporting. Posted price markets are transparent, but appearance may be deceptive if individual deals are negotiated or if quantities are uncertain. The absence of transparency hinders coordination, increasing transaction costs, uncertainty and errors in resource allocation.

Cooperatives may improve transparency by

[4] Consumers have a hard time understanding that the quality of vegetables can be the best when their prices are the lowest.

[5] In Finland, forest income has traditionally been the balancing factor in farming, either as direct income or as a bond for getting loans. Reliance on forests has, however, decreased, e.g. because forests have often been separated from the farms to other children than the one who inherits the farm.

providing information that would otherwise be insufficient. Cooperatives may be used to counteract the lack of open information in private treaty markets. In cases when private treaty markets involve complex and incomparable contracts, cooperatives could provide, not only information on contract terms and legal advice, but also standardized contracts. According to SHAFFER, improved information may be one of the most important outcomes of bargaining, contributing to more effective coordination.

Specification

Specification coordination refers to the extent to which the characteristics of a product or service transferred through the market are known to the parties, and the extent to which preferences concerning these characteristics and the costs of obtaining particular characteristics are communicated between potential participants in the market.

Thinking of a product or service as a "utility bundle" describes the large number of characteristics involved, whose value varies in different uses and among different users (OLLILA 1986c). The combination of the characteristics incorporated in a product affects its cost. Characteristics without value in a particular use create unnecessary costs. The number of products produced by a particular producer affects the scale economies of production. "Matching characteristics produced with consumer preferences is a horrendous problem fraught with uncertainty." (SHAFFER 1986, p. 17). When all preferences cannot be satisfied with one utility bundle and one bundle satisfying all preferences costs too much, specification is a compromise between these.

"Spot markets deal in products already produced. Producers selling in these markets have to speculate about not only the bundle of characteristics desired by potential buyers but also about the products likely to be presented by other suppliers which will affect the demand for their products. The market feeds back information to producers in the form of prices in the case of auction markets and the amount of sales at different prices in posted price markets. Auction markets tend to provide more immediate and more discriminating information than posted price markets but in both cases the quality of information is very limited and uncertain. To which of the many characteristics were the buyers responding?[6] Was the price or the volume of sales related to a particular quality characteristic or to other factors? In spot markets buyers can respond only to product characteristics presented. The response does not reveal preferences for products with different bundles of product characteristics than those presented in the market. Buyers typically have little incentive to communicate information about more desirable characteristics. The buyer does not know the production possibilities for different bundles of characteristics. Some characteristics of products cannot be observed and buyers may purchase based on false expectations, sending false messages across the market. That is, a purchase may be taken as an expression of preference for future products of the same characteristics but may not have such meaning." (SHAFFER 1986, p. 18)

Communication concerning the different possible and desired characteristics of food products in the complicated modern food marketing system is a major problem of this study. The bureaucracy of the industries participating in the food system may not have incentives to transmit information about the desired product characteristics to their suppliers. Rigid governmental statutes supplemented with governmental bureaucracy are likely to hinder the dynamics of the marketing system.

Auction markets are able to deal with already existing characteristics made explicit to the buyers. In private treaty markets the characteristics can be more widely negotiated, but information about the transactions is sel-

[6] The same problem can be found in elections, where each candidate represents a bundle of thoughts only a part of which are explicit.

dom made explicit to other participants in the market. Posted price markets cannot create price information in the short run. Contracts in a changing environment may either be incomplete or raise the transaction costs significantly. If contracts are standardized, the benefits of information exchange are lost. Thus, no "perfect" transaction institution can be found. However, certain product and environment characteristics are less volatile to distortions, and so the proper design of market institutions can prevent some dysfunctioning.

Cooperatives have two options in creating and collecting information about transactions: (1) they can use market information and let it affect specification (exit), and (2) they also have an option to negotiate the characteristics of transactions (voice). HIRSCHMAN states that the voice option, i.e., influence through negotiations (democratic processes in a cooperative), carries more information than the exit option (decision to buy or not to buy). In cooperatives, the market (exit) can be used if the existing characteristics of goods are sufficiently known by the parties. Negotiations (voice) requiring more transaction costs can be used if the potential characteristics of products or transactions are not sufficiently made explicit. Patrons can require the cooperative to collect information on all the possible characteristics for the members. This kind of information collecting and patron education is not possible in IOF's where the benefits of such activities may be captured by rival firms. Cooperative personnel should have fewer incentives to act opportunistically in this case than the personnel of an IOF. The problem of impacted information should, thus, also be smaller in a cooperative.

Cooperatives could carry out joint research about consumer preferences for patrons not able to do this individually. The cost of preventing the benefits of the information gathering from being passed to rivals would be less a problem in cooperatives than in IOF's, because the benefits to the members come mainly through this service and not through the economic profits of the cooperative.

Structure

According to CAVES (1982, p. 16) the main elements of a market structure are: (1) seller concentration, (2) production differentiation, (3) barriers to the entry of new firms, (4) buyer concentration, (5) height of fixed costs and barriers to exit, and (6) growth rate of market demand. SHAFFER (1986, p. 28) states that structure is a market characteristic of importance to coordination performance because it is associated with market power or capacity to influence terms of trade and trading relationships. Market structure not only influences coordination but is also influenced by the nature of the coordination problem, as firms seek to reduce or mitigate the consequences of uncertainty.

Large firms try to reduce the uncertainty related to large investments and transaction-specific assets with planning, administered prices, gaining market power by large market shares, and securing demand by sales promotion efforts (GALBRAITH 1967). Large firms are necessarily bureaucratic, which — when combined with all the efforts to protect against uncertainty — leads to very sticky prices for their products, especially on the down side. This improves the predictability of the planning sector's own prices and leads to contractual arrangements facilitating private treaty markets. Private treaty markets can be rich in information and, thus, improve coordination. When subsectors dominated by planning hierarchies are supplemented by posted price retail markets, this may be a hindrance to the adaptation coordination of upstream firms, e.g., agricultural producers in food marketing systems. SHAFFER states that this kind of situation is also very risky for new entrants even if the prices are attractive, because of the potential response of large firms designed to protect their market share.

Large planning sector firms can contribute to the coordination of markets by stabilizing

them. But at the same time market sector firms, acting in an atomistic market as price takers, may be forced to take on more of the burden of adjustment than what would be their "fair share". This kind of situation can be easily imagined in relations between a farm and the food industry. Thus, in markets consisting of both a few large planning sector firms and many firms coordinated by atomistic markets, the added uncertainty, volatility of prices, and troubles in adjustment become the problems of the small atomistic firms (farms).

Cooperatives may reduce the concentration of markets. The establishment of a cooperative, or even a threat of it, may change the behavior of concentrated markets, contributing to improved coordination. The properties of cooperatives as a "competitive yardstick" as presented by NOURSE (1922) are well documented, e.g., in the Finnish agricultural history of this century. According to SHAFFER (1986, p. 31), this also suggests that cooperatives have advantages as a coordinating mode in oligopolistic markets.

The members of a cooperative (farmers) can use similar sales promotion activities, e.g. advertising, as large planning sector organizations in reducing the uncertainty in the demand of their products. This would be economically impossible for individual farmers, as would be the prevention of the benefits from going to others. Cooperatives are able to reduce this kind of free-rider problem.

Contingencies and settlement

Either promises or rights to goods or services are traded. Uncertainty is present in all transactions. Some features of the goods may be unknown or, if a forward contract is in question, the future circumstances are uncertain. Efficient coordination across markets requires a definition of the contingencies in a process for settling, in case of a failure to meet the terms of the promise.

WILLIAMSON (1979) categorizes contracts in transactions as follows:

(1) If information considering the transaction in question is perfect and all the contingencies made explicit, it is a question about classical contracting.
(2) If the authority of settlement of disputes is given to a third party, it is a question about neoclassical contracting.
(3) In complex transactions the development of transaction-specific administration brings a third kind of contracting, i.e., relational contracting.

"In a spot market the time between transaction and delivery is short and the promise is to deliver the product as it appears to be. Of course, not all the product characteristics are observable. There is, for example, a promise that a fertilizer or pesticide is formulated according to description. There may be an implied warranty that if the product is not as represented, damages may be due. But costs of settlement may be high." (SHAFFER 1986, p. 21)

The case above represents classical contracting. If a third party is authorized to inspect the product before delivery, it is a question of neoclassical contracting. If the period between contract and delivery is long, more and more changes in the environment may take place. The price of oil may rise causing problems in meeting the agreed price, the need for a particular pesticide may disappear because of improved products available, etc. If it is possible to reach such a relational contract, it may be a very effective means of coordination. Negotiations about all the possible contingencies in a situation of uncertainty may be both very difficult, time-consuming and expensive.

Cooperatives' transactions with members are contingent upon the performance of the cooperative. Despite temporary pricing, the final price depends on the cooperative's performance. The contingent nature of transactions between members and their cooperative differentiates them from both usual market transactions and firms' internal transactions. In market transactions, uncertainty about the future price of the finished product, e.g., is

the buyer's risk regardless of whether the transaction takes place in an auction or posted price market. In a cooperative the risk remains with the members, and the distribution of its effects depends on the rules (SOP's) of the cooperative. The members of a cooperative may have other opening options for transactions as well. This feature makes the transactions between a cooperative and its members different from firms' internal transactions. SHAFFER (1986, p. 22) finds characteristics of relational contracting in transactions between a cooperative and its members, and suggests a comparison of cooperative with relational contracting to be instructive.

The special properties of cooperative transactions may have potential to improve coordination by affecting the division of contingencies of uncertainty. A member's delivery contract with the cooperative may function as "hedging" the risk of uncertainty. The division of the causes of uncertainty may be divided among the members (according to the SOP's) and, thus, their effects may be softened. SHAFFER suspects that these kinds of opportunities to improve coordination are missed by failing to have more explicit contracts with members.

A system with supply agreements between a cooperative and its members supplemented with relational contracting with buyers (processors) might replace the rigid governmental coordination while maintaining some incentives to adaptation coordination.

3. EXTERNALITIES

Cooperatives have potential to deal with some of the externality problems. They could lower the social fences (PLATT 1973) preventing the inspection of all the products and, thus, benefit all growers. Cooperatives could promote goods in cases where the costs for individual payers exceed the benefits because of externalities.

Externalities are created when a transaction incurs costs or benefits to third parties not involved in a transaction (free or unwilling riders). Externalities pose a significant problem in the coordination of supply with demand, especially in the farm commodity subsector. SHAFFER mentions an example where an individual farmer raises the production of a commodity with inelastic demand, thereby reducing the revenue of other farmers. This might not be a matter of social concern if the farmers increasing their production were simply more efficient than other farmers and, in fact, the marginal revenue from the increased production exceeded the marginal costs. But what if the increased production was based upon false expectations regarding prices, and the marginal revenue turns out to be less than the marginal cost? All farmers will suffer the consequences of the mistakes.

Public and non-marketable goods

One of the most interesting features of cooperatives is their ability to exchange both incompatible use and joint impact (public) goods.[7] Besides incompatible use goods such as a tractor, cooperative members may decide to organize training in maintenance, efficient use, etc., without the fear of an IOF that the targets of that investment are using the knowledge to benefit the competitor.

According to STAATZ (1984, p. 195), many of the "competitive yardstick" features of farmer cooperatives can be viewed as public goods. Farmers who feel that existing firms are not providing satisfactory services may establish a cooperative, which, in turn, may force the IOF's to improve their services because of competition. The non-member farmers are also able to benefit from the improved efficiency of the market.[8]

[7] By incompatible use goods are meant goods with no exclusion costs. Joint impact goods (public goods) are goods with exclusion costs leading to free-rider problems.

[8] There is an incentive for some farmers to ride free, i.e., to obtain the benefits without having to share the cost of cooperation. On the other hand, if the proportion of non-members compared to members becomes too small, there is a possibility that the market signals of the cooperative become unrepresentative.

STAATZ states that no independent IOF has an incentive to act as a "competitive yardstick", although the logic of a competitive market may force it to similar behavior. The market cannot channel the benefit from such behavior to the actor.

The cooperative principle of open membership is a powerful tool for preventing the negative effects of certain kinds of externalities. E.g., standardization can lower both transaction and production costs significantly. If standards are created through competition, a great deal of resources will be wasted before the winner has established its position.[9]

Because of open membership, monopoly power cannot be created. Creating such power is even more difficult because of the common collective decision that, e.g., a farmer cooperative has the obligation to buy all the specified products the farmer has produced (but the farmer does not have to sell all to the cooperative). In this kind of a situation, monopoly power through restricting the supply cannot be created.[10]

Exclusion costs become relevant if there is no effective way to prevent the utility from being utilized also by the persons dot paying the full cost (externalities). Exclusion costs are usually high with joint impact goods (that do not wear out with use: TV or computer programs, education, etc.) (SCHMID 1978).

The problem of free riders starts if the prevention of non-payers from utilizing a good cannot be arranged. E.g., let us suppose that it is advantageous to educate dairy farmers to produce the best possible milk for quality cheese. If an IOF invests in the education of its milk producers, it may happen that after the farmers have been educated nothing prevents them from acting opportunistically and starting to deliver their milk to the competitor firm, which can pay as much more as the other one has invested in producer education. If a cooperative educates its farmers, this kind of opportunistic behavior is not as likely, because: (1) the profit from the improved quality of cheese comes collectively to the producers (and, on the other hand, even one farmer under certain circumstances is able to spoil the others' production as well), (2) the paid patronage fee and expectations of increased patronage refunds because of improved quality increase the cost of exit, (3) loyalty is usually greater to the member's own cooperative than to a regular business partner, and (4) since the cooperative has collectively made a decision it is less likely that this decision will be cancelled for the reasons an IOF operator would suspect.

Open membership together with collective action have probably been the main reasons why cooperatives have performed very well in correcting market failures (RHODES 1985). Through collective action, small units have gained economies of scale and market power. Scale economies have been realized in joint processing operations, collective buying, information systems, hiring expertise for marketing, etc. Market power has been used to balance the negotiation power between small farmers and large companies, lobbying, etc. Organizing transactions between farmers and processors has succeeded better through cooperatives than through vertical integration. Because of problems of control, lack of incentives to flexible labor utilization, etc., even centrally planned economies are looking for means to decrease inefficiencies in basic food production.

Preservation of product quality

The quality of potatoes and vegetables has been a topic of readers' pages for a couple of

[9] In Finland the leading credit card firm representing Visa, OK and Eurocard is a cooperative called Luottokunta. Mr. Tapiovaara, the vice president of Luottokunta, sees that the cooperative form with its open membership has been the major reason that Finland has only had a maximum of 60—70 different credit card systems compared to nearly 200 in Sweden. After great confusion, a bitter drop-off fight has begun in Sweden in order to reduce the number of cards.

[10] Even if a cooperative would operate more profitably by restricting the supply, it has performed in the right way by acting according to the members' will. In this kind of situation the performance of a cooperative cannot be measured by micro economic measures (OLLILA 1986a).

years in Finland. The problem can be analyzed as follows: The products of the growers lose their "identity" before reaching the retailer and customer. The growers have no incentive to improve the quality above the minimum at the inspection point; on the contrary, there is an incentive to ride free with other growers' quality image and, when observed by customers, to cause externality costs in the form of a worsened image to all the growers.

Deterioration of product quality has been an incentive to firms to integrate vertically. KIRKMAN (1975) reports product deterioration problems of Californian citrus growers in the early 1900's as the reason for establishing the cooperative California Fruit Growers Exchange, later named Sunkist.

STAATZ (1974, p. 194) also mentions the willingness of farmers to integrate vertically on the input side. In new products in which the quality is difficult to examine ex ante (e.g., new pesticides, grain varieties, feed additives), there is a good possibility for opportunistic behavior. Along with the fast development of technology, the ability of an average farmer to be sufficiently informed about all the features of new products is almost impossible. Farmers may together hire specialized personnel to their cooperatives to avoid making decisions based on inadequate information and knowledge.

Brand label

Brand label, an explicit instance of product responsibility, could in some cases improve the consumers' possibilities to use past experience in the purchase decisions of food items. Brand labels could also carry the profit resulting from intentions to satisfy consumer preferences to the actors, as well as the punishment.

The Finnish vegetable industry is been attempting to acquire brand labels for vegetables (OLLILA 1986c). Processors and distributors have had some difficulties in preserving the quality of vegetables required for a good reputation of the brand name. From a processor's point of view, the cheapest way of preserving product quality is to integrate vertically partly or totally with production similarly as the Finnish Saarioinen company. Saarioinen either produces its own vegetables or requires special handling practices from producers.

If the farmers profit from the use of a differentiated brand label, establishing a cooperative would offer good possibilities, because a strong, well-known brand name requires a certain volume which an individual producer is usually unable to produce. Neither is it possible that each individual producer could have a strong brand name of his own without confusing the consumers. A cooperative would also maintain incentives to the members to contribute to the joint profit and it would have the means, either physical or social, to force the unscrupulous members to maintain the quality.

4. HIERARCHICAL DECOMPOSITION

Recall WILLIAMSON's hierarchical decomposition principle in organizational design:

"... internal organization should be designed in such a way as to effect quasi-independence between the parts, the high frequency dynamics (operating activities) and low frequency dynamics (strategic planning) should be clearly distinguished, and incentives should be aligned within and between components so as to promote both local and global effectiveness." (WILLIAMSON 1981, p. 1550)

STAATZ (1984, p. 198) states that with regard to this principle, farmer cooperatives have two potential advantages over IOF's attempting to integrate backwards through contracting direct ownership: (1) decentralization of farm decision making and (2) better flow of information.

Decentralization of farm decision making

A farm-cooperative system is actually a division of activities into "quasi-independent" subsystems, at the same time maintaining

high-powered incentives on both sides: at farm level and at cooperative level.

Many of the activities related to farming require a larger scale than an average farm can have. Most of the modern processing and marketing activities are examples of this. Vertical integration of processing firms into farming is not easy, either.[11] Several managerial decisions at farm level are highly time- and site-specific (STAATZ 1984, p. 198). Weather conditions, diseases, etc., are issues which require a certain degree of autonomy from the farm manager. If farm managers were not affected by high-powered incentives, the control problem would also be difficult. It seems to be difficult even on independent farms with hired employees.

Cooperatives provide a means for farming and processing systems to acquire large-scale advantages from certain functions but simultaneously maintaining the required high-powered incentives at farm level. The top management of the cooperative system can concentrate on important strategic questions while assigning part of the day-to-day operations to the member units. The market outside the cooperative still functions as (at least a partial) control system.

Improved market information

The information flow between members and their cooperatives would not be as disposed to opportunism as would be the information flow between two pure trading partners.

The possibility to simultaneously use both the exit and voice options provides better and more representative information about preferences and service specification. When customers having personal experience of the service offered have a legal right to affect the operation of their own cooperative, the specification of needed adjustment coordination decisions could be supposed to be more effective than either in a pure market or in integration where the representativeness of voice is questionable.

Federated v.s. centralized cooperatives

STAATZ (1984, pp. 200—202) discusses the properties of federated (second or third degree) and centralized organizational forms of cooperatives in the light of transaction cost economics. According to him, federated cooperatives allow greater farmer involvement in the governance of locals, which in turn can be an advantage in financing the cooperative, in responding to the local needs of members, etc. Centralized cooperatives, on the other hand, can offer certain operational and managerial efficiencies. STAATZ mentions advantages in using economies of size, minimizing idle capacity and responding quicker to market needs.

As disadvantages can be seen that federated cooperatives have difficulties in avoiding conflicts among cooperatives with different performance and in managing competition among themselves. Centralized cooperatives, in turn, are susceptible to member alienation and excess power of the professional management.

The question of cooperative structures is very relevant in Finland at present. The farmer's federated supply cooperative, Hankkija, is considering the liquidation of local cooperatives. The rural originated consumer cooperative SOK is slowly moving toward a centralized system as well. Valio, the central organization of farmers' cooperative dairies, in turn, is supposedly strengthening its regional units. STAATZ reports that Gold Kist and Southern States, two major agricultural cooperatives in southern U.S., have recently undergone a change to more centralized structure, while a major dairy cooperative in the Great Lakes area, Land O'Lakes, has developed hybrid structures. It would be interesting to compare the reasons for such development trends both in Finland and in the U.S. from the point of view of transaction costs.

[11] Because of the regional policy goals of legislation, the processing industry's possibilities to integrate backwards into farming are limited.

Protection against industry take-overs

With an increasing money market, a new feature is industry takeovers. A panic in the share markets may change an entire company ownership. Although this may sometimes be a healthy way of changing incompetent management and owners, it causes needless uncertainty. Rapidly growing small firms, especially, are in danger of being purchased by their large competitors, which in turn may lead to an increased concentration of industry.

The acquisition of a cooperative involves a considerable amount of transaction costs. In principle, open membership prevailing, it could be possible by having so many new members join the cooperative that it would lead to a majority at the next meeting. But since most cooperatives must take fundamental changes to two subsequent meetings, the take-over is not easy.

5. FREQUENCY OF TRANSACTIONS

"Uncertainty and the potential for opportunism increase when long-term contracting is needed to facilitate coordination. A participant is disciplined when he depends upon repeated transactions, the dissatisfied customer does not return as long as he has an alternative. In the case of frequent transactions learning takes place and search effort can be spread over a number of transactions. Relational contracting is fostered by repeated transactions." (SHAFFER 1986)

Contracts can also cause a fundamental transformation of transactions. After a binding contract has been made involving many bidders ex ante transaction, an ex post transaction may result in a monopoly situation.

Cooperatives can prevent such fundamental transformation. Their relational contract feature can reduce transaction costs but still maintain the members' possibility to make "inquiry buys" from outside (OLLILA 1985). Thus, reducing uncertainty by contracting may not necessarily hinder obtaining market information through acting in the market (exit option in HIRSCHMAN's terms). This information could be catered by both the members and the cooperative.

"A critical factor promoting cooperation is the fact that a subsequent transaction is expected. If the current transaction is the last, defection is likely. This suggests that cooperative policy promoting continued patronage by members including barriers to exit would discourage opportunistic behavior and facilitate contingency contracting under uncertainty and that such cooperatives might have an advantage over markets in coordinating requiring future delivery agreements." (SHAFFER 1986)

Loyalty (HIRSCHMAN 1970, pp. 76—105) to a cooperative can be expected to be greater than loyalty to a "strange" independent firm. This may make cooperatives more resistant to short-term difficulties. The sense of loyalty may make it possible for a cooperative to give suggestions about jointly preferable future behavior, e.g., about what and how much to produce.

Exhibit 3

MILK PRODUCER PRICE FORMULATION IN FINLAND AND ITS EFFECT ON MARKET COORDINATION

The producer price formulation process is here divided into 10 stages. Each stage and its effects on coordination is discussed separately.

1. Target price

- — According to the Farm Income Law. Negotiations between the government and the Farmers' Union.
- — The target price for milk with an "average composition" of 4.3 % fat and 3.3 % protein.
- — Revisions in prices usually two times a year, 1 March and 1 September.

2. Effect of milk composition on price

- — Target price for 4.3 % fat and 3.3 % protein milk.
- — ±0.1 % fat means ±2.0 p/l.
- — ±0.1 % protein means ±2.6 p/l.
- — The composition of each farm's milk is determined monthly according to the average of two tests.

3. Effect of milk quality on price

- — The quality is tested using the reductase test twice a month. As a result of the test, milk is divided into four categories.
  Bacteria are tested four times a year by official milk inspecting offices. As a result of the test, milk is divided into four categories.
  ⇒ Based on a combination of the two tests, the effect on the price of milk is the following:

Class I A	+ 3 p/l
Class I	Target price
Class II	— 4 p/l
Class III	— 20 p/l
Class IV	— at least 40 p/l

4. Effect of seasonal variation on price

- — Seasonal price variation is about 10 % above or below the target price.

GOVERNMENTAL SUBSIDIES:

5. Supplemental price support according to production unit size

- — Production less than 30 000 l/year
  + 23.5 p/l
- — Production 30 000—150 000 l/year
  + 12 p/l
- — Production 150 000 l/year or more
  Target price

6. Regional support

- — From 0 to 63 p/l, the average being 8 p/l.

REDUCTIONS TO PRICE SET ABOVE:

7. Milk export fee

- — In 1986 the fee was — 5.5 p/l. It is collected from dairies by lowering the patronage refunds (prices).

8. Above-quota fee

- — In 1986 the fee was — 205 p/l.

9. Fee to decrease fluctuations in export prices

- — The fee is — 2.8 p/l. It is paid to the exporting firms according to their export volume.

OTHER FACTORS:

10. Properties of individual dairies

- — The price actually paid to the farmers may differ to a significant extent depending on the local dairy cooperative's efficiency, product mix, financial conditions and future investment needs.

Exhibit 4

MINIMUM QUARTERLY PRODUCTION OF MILK

The calculation is based on the assumption that during the lowest production season there is no need for raw material for products manufactured during the high production season.

1. Quarterly consumption of milk in 1987

Quarter	Liquid products 1000 l	Cheeses 1000 kg	Butter 1000 kg	Powders		Other products 1000 kg	Raw milk
				Fat 1000 kg	Non-fat 1000 kg		
1.	249998	12936	7646	109	8275	10909	
2.	251698	14366	12295	109	8275	15284	
3.	256666	14691	11442	109	8275	15366	
4.	260667	16315	16242	109	8275	12259	
Total	1019029	58308	47625	434	33100	53817	
Coeff.[1]	1.05	10.51	1.00	8.29	11.03	1.03	1.032
Fat %	3.16	27.06	81.26	26.85	0.66	4.17	4.34
Protein%	3.24	26.00	0.75	26.00	35.00	5.00	3.24

2. Minimum quarterly liquid requirement

Quarter	Liquid products 1000 l	Cheeses 1000 kg	Butter 1000 kg	Powders		Other products 1000 kg	Total liquid 1000 k
				Fat 1000 kg	Non-fat 1000 kg		
1.	261873	135926	7646	899	60807	11279	478431
2.	263654	150952	12295	899	60807	15804	504411
3.	268858	154367	11442	899	60807	15888	512261
4.	273049	171432	16242	899	60807	12676	535104
Total	1067433	612677	47625	3596	243229	55647	2030207

3. Minimum quarterly fat requirement

Quarter	Liquid products 1000 l	Cheeses 1000 kg	Butter 1000 kg	Powders		Other products 1000 kg	Total 1000 k
				Fat 1000 kg	Non-fat 1000 kg		
1.	8267	3500	6213	29	55	454	18519
2.	8324	3887	9990	29	55	637	22922
3.	8488	3975	9297	29	55	640	22484
4.	8620	4414	13198	29	55	511	26827
Total	33699	15777	38698	117	220	2242	90752

[1] The coefficient tells how much liquid milk is needed for the product.

4. Minimum quarterly protein requirement

Quarter	Liquid products 1000 l	Cheeses 1000 kg	Butter 1000 kg	Powders		Other products 1000 kg	Total 1000 k
				Fat 1000 kg	Non-fat 1000 kg		
1.	8485	3363	57	28	2896	545	15375
2.	8542	3735	92	28	2896	764	16058
3.	8711	3820	86	28	2896	768	16309
4.8847	4242	122	28	2896	613	16748	
Total	34585	15160	357	113	11585	2691	64491

5. Quarterly fat surplus

Quarter	Liquid products 1000 l	Cheeses 1000 kg	Butter 1000 kg	Powders		Other products 1000 kg	Total 1000 k
				Fat 1000 kg	Non-fat 1000 kg		
1.	3098	2399			2584		8081
2.	3119	2664			2584		8367
3.	3181	2725			2584		8489
4.	3230	3026			2584		8840
Total	12628	10813	41569		10336		33778

6. Quarterly protein surplus

Quarter	Liquid products 1000 l	Cheeses 1000 kg	Butter 1000 kg	Powders		Other products 1000 kg	Total 1000 k
				Fat 1000 kg	Non-fat 1000 kg		
1.		1041			—926		115
2.		1156			—926		230
3.		1182			—926		256
4.		1312			—926		386
Total		4961			—3704		986

7. Minimum consumption

The minimum consumption includes products which have to be manufactured during a particular period (all liquid products, "other uses" of raw milk, and 90 % of the raw milk for cheeses). (See point 2.)

Quarter of 1987	Liquid products mill. l	Cheeses mill. kg	Other uses mill. kg	Non-fat solids mill. kg	Min. butter consumption mill. kg
1.	261.9	135.9	11.3	1.4	410.5
2.	263.7	151.0	15.8	2.3	432.7
3.	268.9	154.4	15.9	2.1	441.3
4.	273.7	171.4	12.7	3.0	460.2
Total	1067.4	612.7	55.6	8.9	1744.7

8. Calculation of quarterly minimum demand for raw milk

— No need for regional transport or transport of liquids within the quarter has been taken into account.

Quarter of 1987	A	B	C	D	E
	Milk production		Milk consumption		B—D
	Actual mill. l	Min. mill. l	Min. mill. l	Raw milk[2] mill. l	mill. l
1.	620.8	465.9	410.5	395.5	70.4
2.	757.0	568.1	432.7	415.3	152.8
3.	727.1	545.7	441.3	423.7	122.0
4.	586.7	440.3	460.2	440.0	0.3
Total	2691.7	2020.0	1744.7	1674.5	345.5

The minimum total production, 2020 million liters per year, is the quantity at which the milk requirement converted into average raw milk reaches the minimum during a certain quarter when using the actual seasonal fluctuation of production in 1987. In the calculation the difference between the minimum raw milk requirement and the quarterly consumption (B—D in column E) reaches zero in the 4th quarter at an average yearly production level of 2020 million liters.

[2] Minimum consumption converted into average raw milk.

Exhibit 5

CALCULATION OF MILK COMPONENT PRICES AT VARIOUS LEVELS OF THE MARKETING SYSTEM

The base data used for the calculation are Valio's 20 products which represent about 86 per cent of the domestic dairy product sales of Valio and its member dairies. The products are:

1. Liquid milk for consumption
2. Low-fat milk
3. Skim milk
4. Low-fat cream
5. Coffee cream
6. Whisk cream
7. Non-fat buttermilk
8. Asidophilus buttermilk
9. Flavored yoghurt
10. Low-fat yoghurt
11. Butter
12. Butter-vegetable fat mix
13. Emmental cheese
14. Edam cheese
15. Oltermanni cheese
16. Turunmaa cheese
17. Polar cheese
18. Feta cheese
19. Cottage cheese
20. Quark

The fat, protein and non-fat non-protein solids (which represent the value of milk liquid), the wholesale and retail prices are presented in the data table. In order to form a regression with approximately the right emphasis on each product, the product was adjusted according to its relative value of total sales.

Regressions of price with respect to fat, protein and non-fat non-protein solids were calculated at wholesale (TRC's 10 and 13) and retail levels (TRC 14). In addition to this, the terminal price of each component was calculated from the ratio between skim milk and whole milk used for the products and applying the transfer prices of these components.

The regressions at each level are presented in the following.

Component terminal price (TRC 8)

Model fitting results

Variable	Coefficient	Stnd. error	T-value	Prob (>ūTū
Constant	—0.227185	0.1192	—1.9059	.0599
fat	0.339367	0.001835	184.9601	.0000
prot2	0.344489	0.003767	91.4543	.0000
nfpsolids	—0.031114	0.013859	—2.2450	.0272

Further anova for variables in the order fitted

Source	Sum of squares	DF	Mean sq.	F-ratio	Prob (>F)
fat	8176.5913	1	8176.591	58338.5319	.0000
prot2	1226.8042	1	1226.804	8753.0312	.0000
nfpsolids	.7064	1	.706	5.0401	.0273
Model	9404.1020	3			

Component wholesale price (TRC's 10 and 13)

Model fitting results

Variable	Coefficient	Stnd. error	T-value	Prob (>uTu
Constant	37.43746	8.394484	4.4598	.0000
fat	0.078755	0.082555	.9540	.3427
prot2	0.321342	0.098855	3.2506	.0016
nfpsolids	—0.391228	0.09017	—4.3388	.0000

Further anova for variables in the order fitted

Source	Sum of squares	DF	Mean sq.	F-ratio	Prob (>F)
fat	12078.915	1	12078.91	2035.8738	.0000
prot2	5690.103	1	5690.10	959.0541	.0000
liq	111.689	1	111.69	18.8250	.0000
Model	17880.707	3			

Component retail price (TRC 14)

Model fitting results

Variable	Coefficient	Stnd. error	T-value	Prob (>ūTū
Constant	40.969285	15.348647	2.6692	.0090
fat	0.106744	0.150945	.7072	.4813
prot2	0.499291	0.180748	2.7624	.0070
liq	—0.427702	0.164869	—2.5942	.0111

Further anova for variables in the order fitted

Source	Sum of squares	DF	Mean sq.	F-ratio	Prob (>F)
fat	15249.067	1	15249.07	768.8012	.0000
prot2	9525.719	1	9525.72	480.2513	.0000
liq	.133.486	1	133.49	6.7299	.0111
Model	24908.272	3			

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SELOSTUS

Kysyntä ja tarjonta maidon markkinajärjestelmässä

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Tutkimuksen päätavoitteena on lisätä tietoa tuotannon ja lopullisen kulutuksen koordinaatiosta tuotanto- ja jakeluketjun muodostaman vaihdantajärjestelmän eri vaiheissa. Perusolettamuksena on, etteivät sen enempää niin kutsuttu puhdas markkinatalous kuin puhdas julkinen säätelytalouskaan ole kykeneviä selviytymään kaikista koordinaatiokysymyksistä. Tutkimus pyrkii arvioimaan markkinatalouden ja säädösten soveltuvuutta eri koordinaatiotilanteissa.

Maatalouteen liittyvissä vaihdantajärjestelmissä osuuskuntien merkitys on huomattava. Osuuskuntiin näyttääkin liittyvän ominaisuuksia, jotka poikkeavat sekä markkinoilla tapahtuvasta vaihdannasta, että organisaation sisällä tapahtuvasta virkamiesvaihdannasta. Osuuskunta otettiinkin tutkimuksessa erityistarkastelun kohteeksi.

Tutkimusongelma on rajattu neljään tavoitteeseen: (1) antaa selitys maidon nykyisen markkinajärjestelmän rakenteelle, (2) löytää kysynnän ja tarjonnan koordinaation ongelmakohdat, (3) esittää institutionaalisia muutoksia tilanteen parantamiseksi ja (4) pyrkiä ennustamaan ehdotettujen muutosten vaikutuksia.

Kysynnän ja tarjonnan koordinaatiolla näyttää vaihdantajärjestelmän eri vaiheissa olevan kaksi toistensa kanssa ristiriitaista tehtävää: synkronointi- ja mukautumiskoordinaatio. Edellinen tarkoittaa järjestelmän hienosäätöä suoriutumaan olemassa olevista tehtävistään mahdollisimman juoheasti. Jälkimmäinen viittaa järjestelmän kykyyn muuntua ja sopeutua ympäristössä tapahtuviin muutoksiin.

Vaihdanta eli miten hyödykkeen valmistusosat siirtyvät vaiheesta toiseen ja lopulliseen kulutukseen, on koordinaation tarkastelun kannalta keskeinen tutkimuskohde. Vaihdannan sääntöjen muutos vaikuttaa tuottojen, kustannusten ja riskin jakaumaan samalla tavoin kuin hintojen muutos. Tutkimuksessa selvitettiin ensin, mitä vaihdannan sääntöjen eli instituutioiden muutokset vaikuttavat vaihdantaan. Tämän jälkeen hinnan muutoksia tietyssä ympäristössä voitiin tarkastella perinteisin menetelmin.

Tutkimuksen viitekehys, joka nimettiin markkinajärjestelmäanalyysiksi (Marketing Systems Analysis), on yhdistelmä useista teorioista. Tutkittava perusasetelma on: (1) miten tarpeet ja toiveet eli preferenssit tuodaan vaihdantajärjestelmän tietoon, ja (2) millaiset ovat kunkin vaihdantatilanteen olosuhteet.

Vaihdantajärjestelmälle voidaan ilmaista toiveita periaatteessa kahdella tavalla. »Valinta» (exit) on markkinoiden vaikutuskeino, joka antaa järjestelmälle edustavaa tietoa esim. myynnin laskusta, mutta ei välttämättä tietoa siihen johtaneen tyytymättömyyden syystä. »Ääni» (voice), esim. puhelu vastuuhenkilölle mielipiteen ilmaisemiseksi, on poliittinen vaikutuskeino. Se antaa rikkaampaa tietoa muutosten syystä, mutta mielipiteen edustavuus on vaikeasti arvioitavissa. Osuuskunnalla on ominaisuuksia, jotka yhdistävät molemmat preferenssien ilmaisumuodot. Osuuskunnassa on siis periaatteessa mahdollista saada sekä edustavaa että sisällöltään riittävää tietoa järjestelmän muutostarpeista.

Vaihdanta voidaan niinikään suorittaa periaatteessa kahdella tavalla: markkinoilla tai organisaation sisäisesti hierarkiassa. Toimivat markkinat ovat tehokkain vaihdannan muoto. Epävarmuus, ihmisten rajallinen tiedon käsittelykyky ja vilpillinen oman edun tavoittelu voivat saada aikaan markkinahäiriöitä. Jos varma tieto olosuhteista olisi olemassa, markkinoiden pitäisi pystyä jakamaan tuotteen hinta siihen uhrattujen tuotantopanosten suhteessa kaikille tuotantoon osallistujille oikeassa suhteessa. Jos tuotantoon osallistujien sallitaan tehdä virhe, voi tuottojen ja kustannusten jakauma olla periaatteessa mikä tahansa virheiden summa. Todellisuudessa markkinat jakavat voimavarat paljon paremmin kuin täysin satunnaisesti, mutta ei välttämättä oikein.

Vaihdannan ääripäät ovat puhdas markkinavaihdanta ja puhdas hierarkiavaihdanta. Näiden välillä on eriasteisia markkinoiden ja hierarkian yhdistelmiä. Vaihdantakustannusteorian (Transaction Cost Economics) mukaan vaihdantajärjestelmä on tehokkain silloin, kun vaihdantakustannukset ovat pienimmät. Nämä kustannukset

muodostuvat mm. markkinatiedon etsinnästä, sopimusneuvotteluista sekä epävarmuuden tai opportunismin — tilaisuuden hyväksikäyttäjien — aiheuttamasta riskistä.

Vaihdantakustannusteorian mukaan kolme eri seikkaa aiheuttavat vaihdannan siirtymisen markkinoilta hierarkiaan: (1) tarkoitukseensa sidotut investoinnit, (2) epävarmuus ja (3) vaihdannan tiheys. Tiettyyn tarkoitukseen tehdyn investoinnin arvo on vaihtoehtoisessa käytössä selvästi pienempi. Jos esim. navettaa ei käytetä maidontuotantoon, investoinnille on hyvin vaikeata saada katetta muusta käytöstä. Kun maidon ostaja tietää, että navettainvestoinnin jälkeen maidontuottaja ei saa täyttä katetta investoinnille muuten kuin tuottamalla maitoa, ostaja voi alkaa laskea hintaa. Tarkoitukseensa sidotut investoinnit onkin järkevää suojata tilanteen hyväksikäyttäjiä vastaan esim. meijeriosuuskunnan avulla. Jos taas esim. jonkin tuotantoprosessissa tarvittavan panoksen saanti on epävarmaa, kannattaa tuo panos saannin varmistamiseksi valmistaa itse, vaikka saman panoksen saisi markkinoilta satunnaisesti halvemmalla. Jos vaihdanta tapahtuu useita kertoja, kehittyy vaihdantakustannusten alentamiseksi erityisjärjestelyjä. Maidontuottajan ei kannata parhaan hinnan saamiseksi järjestää joka aamu tarjouskilpailua maidostaan, vaan hän tekee sopimuksen pidemmäksi ajaksi useita vaihdantatapahtumia varten. Siis, mitä vähemmän on tarkoitukseensa sidottuja investointeja, mitä vähemmän on epävarmuutta, ja mitä ainutkertaisempi on tietty vaihdantatilanne, sitä todennäköisemmin vaihdanta järjestetään markkinoilla tapahtuvaksi.

Markkinajärjestelmäanalyysin perustan muodostaa vaihdantakustannusteoria. Maidon markkinajärjestelmässä on monta osapuolta ja näillä moninaiset tavoitteet. Siksi on tarpeellista määritellä kenen kustannukset otetaan vaihdantakustannuksina huomioon. Teoriaa laajennetaan siten, että omistusoikeus (property rights) määritellään vaihdannan neljänneksi ulottuvuudeksi. Koska vaihdantainstitutiot ovat muotoutuneet pitkän ajan kuluessa, painotetaan teorian evolutionistisia piirteitä liittämällä viitekehykseen teollisten organisaatioiden analyysiperinteen ideoita.

Markkinajärjestelmäanalyysiä sovelletaan maidon vaihdantajärjestelmän tutkimiseen. Sovellutusalueen valinta perustuu siihen, että tämän alueen koordinaatio-ongelmat ovat oleellisia ja, että niitä on ollut vaikeata analysoida perinteisin menetelmin. Maidon markkinajärjestelmän suhteellisen laajan kuvauksen jälkeen pyritään nykyisen järjestelmän muotoutumista selittämään teorian avulla.

Teoria tarjoaa loogisia selityksiä maidon vaihdantajärjestelmän rakenteelle maassamme. Vaikeissa, epävarmoissa sääoloissa palkkatyövoimaan perustuvan suurtuotannon olisi vaikeata sopeutua teräviin työhuippuihin. Kun huolimattoman työn, esim. kylvön jäljet ovat näkyvillä vasta syksyllä, ja sittenkin vaikeasti todennettavissa, on vastuu työstä luontevaa sitoa tuloksiin. Maidon pilaantuvuus tekisi puolestaan tuottajan alttiiksi hyväksikäytölle, jossa ostaja voisi iltapäivällä ilmoittaa maksavansa maidosta murto-osan tuotantokustannuksista, tietäen, että seuraavana päivänä pilaantuneen maidon arvo on jo olematon. Tuottajaosuuskunta tuntuu luonnolliselta tällaisen mahdollisuuden suojana.

Toteamuksena esitetään, että maidon markkinajärjestelmä selviytyy paremmin synkronointikoordinaatiosta kuin mukautumiskoordinaatiosta. Järjestelmä on pystynyt takaamaan kuluttajille maitotuotteiden saannin ja tuottajille vakaan hintatason vaikka ilmaston vaihtelut ovat suuret, ja vaikka maidon markkinajärjestelmälle on sälytetty maidon tuotannosta irrallisia tavoitteita, kuten aluepolitiikka. Tämä on tapahtunut vaihdantajärjestelmän mukautumiskyvyn kustannuksella. Mukautumiskyvyn hitauden aiheuttamat koordinaatio-ongelmat on ratkaistu ulkopuolisella mukautumisella, kuten maitotuotteiden ylijäämien viennillä valtion kustannuksella. Kun mukautumisen tarve on pienentynyt, valtaa on maidonjalostuksessa siirtynyt tuottajilta ammattijohdolle. Johto puolestaan on painottanut teknistä edistyksellisyyttä sen sijaan, että olisi vastannut nopeasti kulutusmuutoksiin.

Vallitsevan tilanteen koordinaatio-ongelmat jaetaan neljäksi osa-ongelmaksi:

— maidon kokonaistuotannon ja kysynnän tasapainottaminen,
— maidon eri komponenttien kysynnän ja tarjonnan tasapainottaminen,
— kysynnän ja tarjonnan kausivaihtelun tasapainottaminen, sekä
— järjestelmän sopeutuminen uusiin kuluttajien vaatimuksiin.

Kolmea ensimmäistä voidaan pitää koordinaation synkronointiongelmina. Neljäs on luonteeltaan mukautumiskoordinaatiota. Kunkin ongelman osalta pyritään analysoimaan markkinoiden (hinnan), virkamiespäätösten, ja osuuskuntien mahdollisuudet parantaa koordinaatiota.

Jo 1960-luvulta jatkunutta maidon kokonaistuotannon ylijäämäongelmaa kulutukseen nähden on pyritty ratkaisemaan erilaisin poliittisin keinoin, mutta heikohkolla menestyksellä. Vaikka tuotanto on viime vuosina ilmeisen tilapäisesti laskenut, voitaisiin kokonaistuotantoa tutkimuksessa esitetyn laskelman mukaan vielä vähentää viidesosalla ilman, että siitä aiheutuu ylipääsemättömiä ongelmia maitohuollolle. Maidontuotannon nykyistä rakennetta vähennys sen sijaan muuttaisi suuresti. Ylituotannon alentamiskeinoina analysoidaan tutkimuksessa hintamekanismin käyttöä, valtiovallan toimenpiteistä ja osuuskunnan käyttömahdollisuuksia vähentää maidontuottajatilojen määrää.

Sidottujen investointien suuri määrä maidon tuotannossa (navetta, karja, tuottajan ammattitaito jne.) saa aikaan sen, että lopettamiskynnys on korkea. Jotta hinnanalennus johtaisi lopettamispäätökseen, sen pitäisi olla suuri, mikä taas aiheuttaisi huomattavia muita haittoja. Pienehkö hinnanalennus saattaa päinvastoin johtaa tuotannon lisäämiseen, kun tuottajaperhe pyrkii säilyttämään tulotasonsa.

Valtiovallan toimenpiteistä bonusjärjestelmä näyttää toimivan niin, että ensin luopuvat sellaiset tilat, joille löytyy eniten mahdollisuuksia maidontuotannon ulkopuolella. Luopujat ovat maidon tuotantopolitiikan kannalta keskimääräistä terveempiä tiloja. Maidontuotantokiintiön hankaluus on se, että kiintiö pääomittuu maitotilan arvoon tarkoitukseensa sidotuksi investoinniksi, jonka arvo aikaa myöten ajautuu maidon tuotannon pääomakustannukseksi. Suomessa kiintiön vaikutuksia maidon hintaan ei ole arvioitu, mutta Kanadassa tehdyn arvion mukaan kiintiön arvo on 25 prosenttia maidon tuotantokustannuksista. Jos kiintiö annetaan meijerille, siirtyy myös arvonlisä meijerille. Maidontuotantokiintiö on panos, jolla on käyttöä ainoastaan maitoa tuotettaessa, ja näin ollen kiintiö korottaa entisestään luopumiskynnystä.

Sidottujen investointien ongelma voidaan ratkaista periaatteessa kahdella tavalla: investoinnit suojataan säädöksin, toimitussopimuksin, osuuskuntien jne. avulla, tai investoinneista pyritään tekemään vähemmän sidottuja. Tutkimuksessa ehdotetaan sopeuttamisrahastoa investointien vaihtoarvon parantamiseksi maidontuotannosta luovuttaessa. Rahasto toimisi meijeriosuuskunnan osana. Sen tehtävänä olisi auttaa maidontuotannosta luopujaa vaihtoehtoisen elinkeinon kehittämisessä. Tämä alentaisi joidenkin tuottajien luopumiskynnystä. Edun saisivat jäljelle jäävät tuottajat, joilla näin olisi kannustin osallistua luopumisen kustannuksiin. Esimerkiksi bonusrahojen ohjaaminen tämänkaltaiseen maidontuotannosta luopumiseen saattaisi olla tehokkaampaa kuin nykyinen suora maksu luopujalle, koska luopumissitoumuksen lisäksi luopujan vaihtoehtoisen elinkeinon löytyminen helpottuu ja epävarmuus luopumisen jälkeisestä toimeentulosta vähenee. Markkinajärjestelmäanalyysin mukaan sopeuttamisrahasto olisi ylituotannon vähentäjänä vaihdantakustannusten kannalta parempi ratkaisu kuin puhdas hinnan alentaminen tai kiintiö- sekä bonusjärjestelmä.

Maidon eri ainesosien kysynnän ja tarjonnan koordinaation tämän hetken suurin ongelma on maitorasvan ylituotanto. Maidon koostumuksen muuttaminen edellyttää pitkäaikaista naudanjalostusta. Pelkkä hinnoittelun muutos ei voi saada aikaan muutosta, ja tilanne on samanlainen kuin edellä esitettyjen sidottujen investointien tapausten kanssa.

Tutkimuksen mukaan maitorasva on ylihinnoiteltu, mikä kannustaa suurempaan rasvan tuotantoon kuin mitä tuotteiden kuluttajahintojen perusteella voitaisiin olettaa. Ongelmana on ollut, että lehmiä, jotka tuottavat vähemmän rasvaa ja enemmän valkuaista on ruvettu jalostamaan vasta viime aikoina. Tuloksia jalostuksesta saadaan aikaisintaan kymmenen vuoden kuluttua. Vaikka vähemmän rasvaa tuottavia lehmiä olisikin saatavissa, ei niitä kannattamattomina oteta käyttöön.

Maidon ainesosien kysynnän ja tarjonnan koordinaatio on tilanteessa, jossa tuottajat eivät kykene lyhyellä tähtäyksellä vastaamaan hinnanmuutokseen, mutta ilman hinnan muutosta ei pitkälläkään tähtäyksellä voida saada kannustimia muutokseen. Tutkimuksessa esitetään, että tilanne voitaisiin ratkaista osuuskunnan sisäistä hinnoittelua muuntamalla, ja siirtämällä hinnoittelun muutos tuottajien sopeutumis-mahdollisuuksien sallimalla vauhdilla tuottajamaidon hinnoitteluun. Tutkimuksessa esitetään mallilaskelma, jossa maitorasvasta tehtäisiin hinnaton marginaalituote, jonka arvo olisi 0. Tuottajan maidosta saama tulomäärä pysyisi ennallaan, jos kulutusmaidon litrahintaa nostettaisiin 50 p/litra ja juuston hintaa 5 mk/kg. Silloin voita saisi ostaa kaupasta 20 mk/kg, ja maitorasvan vientikustannukset pienenisivät.

Kausivaihteluun vaikuttaminen on tutkimuksen mukaan pääasiassa hinnoittelukysymys koska vaihtelu ei johdu kiinteistä investoinneista. Lehmien poikimisrytmin muuttaminen kevätpoikivista syyspoikiviin on mahdollista, mutta se vie aikaa ja vaatii taitoa. Tutkimuksessa pohditaan mahdollisuuksia ottaa käyttöön myös vaihtelevat kuluttajahinnat kausivaihtelun koordinaation parantamiseksi.

Yhteiskunnan muutokset heijastuvat luonnollisesti elintarvikkeiden ja maitotuotteiden kulutukseen. Lihasenergian käytön väheneminen vähentää energian, ja siten rasvan kulutusta. Kiihtyvä elämänrytmi ja pienet kulutusyksiköt suosivat ruoan valmistuksen antamista elintarviketeollisuuden tai ravintolan tehtäväksi, kun lisääntyvät tulot sen sallivat. Vaihdantajärjestelmän sopeutumisen mahdollistaa mm. tekniikan ja tiedon kasvu. Erikoistuminen ja tuotannon keskittäminen ovat olleet koko elintarviketalouden sopeutumiskeinot. Näyttää siltä, että maidon markkinajärjestelmä on onnistunut suhteellisen hyvin teknisten mahdollisuuksien hyväksikäytössä. Sen sijaan kuluttajien tarpeiden muutosten seuraamisessa ei ole kaikilta osin onnistuttu. Osasyynä tähän lienee se, että osuuskuntamuotoisessa maidonjalostuksessa omistajien tavoitteena on ennemminkin olemassa olevan tuotannon myyminen kuin oman tuotantonsa muuntaminen. Tämä saattaa osuuskunnan ammattijohdon ristiriitaiseen tilanteeseen heidän miettiessään, pitäisikö kuunnella markkinoita vai omistajan ääntä.

Markkinointitehtävä on maidon jalostusportaassa nähty pikemminkin olemassa olevien tuotteiden tehokkaana myymisenä suurin mainoskampanjoin, kuin kuluttajien toiveiden aktiivisena kääntämisenä uusiksi tuotteiksi. Markkinoinnin tehostaminen sen perimmäisessä merkityksessä, teknisen tuotekehityksen ohjaajana kuluttajien käyttäytymisestä saatavan tiedon avulla, on eräs avainkysymys.

Nykyistä maidonjalostuksen rakennetta uhkaavat seuraavat neljä tekijää: raaka-aineen osuuden pieneneminen lopputuotteiden arvossa, osuusmeijerijärjestön ammattijohdon tuntema tarve toimintojen keskittämiseen, vähittäishintojen säätelyn vapauttaminen, sekä odotettavissa oleva kansainvälisen kilpailun lisääntyminen. Vaihdantakustannusteorian mukaan voidaan ennustaa, että maidonjalostus saattaa eriytyä maidon keräilystä. Tuottajaosuuskunnat keskittyisivät maidon keräilyyn, kausivaihtelun alueelliseen säätelyyn ja yhteiseen edunvalvontaan eli toimintoihin, joissa osuuskuntamuoto on selvästi muita

vaihdantainstitutioita parempi. Jalostuksesta muodostettaisiin osakeyhtiöitä.

Mikäli osuusmeijerijärjestöä kehitetään alueosuuskuntien suuntaan, saattaa Suomeen muodostua toinen valtakunnallinen osuusmeijerijärjestö nykyisen rinnalle. Sen muodostavat nykyisestä irronneet meijerit, jotka eivät halua liittyä suunniteltuihin aluemeijereihin. Tämän lisäksi syntyisi uusia, yksityisiä maidonjalostajia: joko kansainvälisessä omistuksessa tai vähittäiskaupan omistuksessa olevia yksiköitä. Tällainen kehitys saattaa pakottaa koko maataloustulojärjestelmän uudelleenmuotoiluun.

Tutkimuksessa tehdään lyhyt vertailu maidon markkinajärjestelmien välillä Suomessa ja Michiganin osavaltiossa Yhdysvalloissa. Huolimatta ympäristöllisistä, poliittisista ja rakenteellisista eroista vaihdannan ongelmat ovat hyvin samanlaisia. Erot näyttävät olevan enemmän riippuvaisia vaihdannan ja vaihdettavien tuotteiden ominaisuuksista kuin vaihdannan institutionaalisesta muodosta. Markkinajärjestelmäanalyysistä on johdettavissa hypoteesi, että ominaisuuksiltaan tuotteiden vaihdannan ongelmat ovat samantapaiset riippumatta vaihdantaympäristöstä. Vertailu antoi väitteelle tukea, ja vallitsevat erot selittyvät pitkälle kulttuurieroilla sekä institutioiden historiallisella taustalla.

Silloin kuin markkinoiden toimivuuden esteenä on tarkoitukseensa sidottuja investointeja, osuuskuntien todettiin pystyvän vaikuttamaan niiden vaikutusten pienentämiseen kahdella eri tavalla. Ensiksi, ne voivat suojata tällaisia investointeja hyväksikäytön mahdollisuudelta poistamalla kannustimen hyväksikäyttöön. Toiseksi, osuuskunnat pystyvät tarvittaessa tekemään sidotut investoinnit vähemmän sidotuiksi nostamalla niiden jälleenmyyntiarvoa suhteessa hankinta-arvoon, mitä ehdotuksella maidontuotannon lopettamisen sopeuttamisrahastosta tavoitellaan. Samanaikainen »valinta» ja »ääni» -vaihtoehtojen käyttömahdollisuus sidosryhmien tarpeita ilmaistessa näytti niinikään olevan tehokkaampi muutoksen aikaansaannin väline kuin kumpikaan niistä erikseen.

Maatalouden taloudellisten ongelmien tarkastelun usein kuultu vaikeus on se, että sellaisten ulkoisten seikkojen vaikutukset, kuten poliittiset päätökset ja eri intressiryhmien edunvalvonta saa tarkastelun kohteen toimimaan »taloudellista logiikkaa vastaan». Tutkimuksessa kehitellyllä markkinajärjestelmäanalyysin viitekehyksellä on kykyä käsitellä tutkittavan järjestelmän erilaisia näkökulmia todellisissa olosuhteissa.

Tämä tutkimus on eräs ensimmäisistä yrityksistä soveltaa vaihdantakustannusteoriaan pohjautuvaa käsitteistöä kysynnän ja tarjonnan välisen koordinaation tutkimisen vaikeaan ja monitahoiseen ongelmaan. Huolimatta siitä, että viitekehys on kaukana täydellisestä, se näyttää riittävän lupaavalta edelleen kehiteltäväksi.

Markkinajärjestelmäanalyysin käyttö usean eri vaihdantajärjestelmän vertailuun niiden tavoista organisoida vaihdanta ja syistä tähän antaisi lisätietoa vaihdannan ongelmien korjaamisessa. Vaihdannan pelisääntöjen merkitys on korostumassa entisestään sitä mukaa kun yhteiskunnat organisoituvat yhä monimutkaisemmiksi ja vaikeammiksi hallita.