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The Greek Unions of Agricultural Cooperatives as efficient enterprises

*Panagiota Sergaki and Anastasios Semos**

Abstract

This paper investigates the efficiency level of Unions of Agricultural Cooperatives (UAC) and Investor-Oriented Firms (IOF) in Greece. Data have been collected over a period of six years for UAC (1995-2000) and of five years for IOF (1995-1999). Financial analysis results were used with the help of 3SLS technique in a four equation simultaneous model in order to estimate those parameters, which would determine the efficiency level of the UAC and the IOF in Greece.

Keywords: *agricultural cooperatives, investor-oriented firms, efficiency, simultaneous equations*

Introduction

Profit is one of the most important parameter for the viability of a firm. Unions of Agricultural Cooperatives (UAC), a particular form of enterprise suffer from low level of profitability. This notice is very worrying as agricultural cooperatives represent the interests of a significant percentage of Greek producers. In order to understand the actual financial situation of UACs we compare their efficiency level with that of food manufacturing Greek private firms which are the main competitors of cooperatives for the Greek market.

This paper also examines the efficiency determinants of UACs and IOFs with the help of cross section and time series firm level data on 93 greek UAC as well as on 3281 greek manufacturing firms. For this purpose, a theoretical model within a system of four simultaneous equations has been developed presenting as dependent variables profitability, size, financial and business risk. Data have been drawn from PASEGES and personal interviews for six years for UACs (1995-2000) and from ICAP for five years for IOFs (1995-1999).

Firstly, a short profile of UACs is presented with some basic financial indicators of UACs as well as of IOFs for comparative reasons. Then, it is presented the model specification for the estimation of efficiency determinants and the measurement of variables. Further down, it is shown the 4-simultaneous equation model analysis with the help of a constructed panel data 3SLS technique. Finally, some interesting concluding remarks are included.

* Panagiota Sergaki, Phd, Agricultural University of Athens
Anastasios Semos, Associated Professor, Aristotle University of Thessaloniki

Financial Data Analysis

In the year 2000, 118 UACs operated in Greece. For the study of their financial elements, their balance-sheets were assembled from 1995 until 2000. Also data were used that the Greek Federation of Agricultural Cooperatives (PASEGES) has collected with the help of a questionnaire that had been dispatched to all UACs in Greece and concerns their recent financial and technical elements.

For comparative reasons, the respective data were also collected from the Investor-oriented firms (IOFs) that had more than ten permanent employees from 1995 to 1999. Regarding UACs in the year 2000, their average:

turnover	was	7.97 mil. €
product sales	were	4.13 mil. €,
commodities sales	»	4.68 mil. € and
services sales	»	0.74 mil. €

In general, many cooperatives have negative net positions, low working capital and their funds are either not adequate or are not satisfactorily exploited. Until recently the practice of state protection of UACs has been quite common by subsidizing their activities. However, protection and subsidies may not lead to achieving the aim of developing the technological potential, but on the contrary they may create side effects: inefficiency, technological stagnancy and waste of resources.

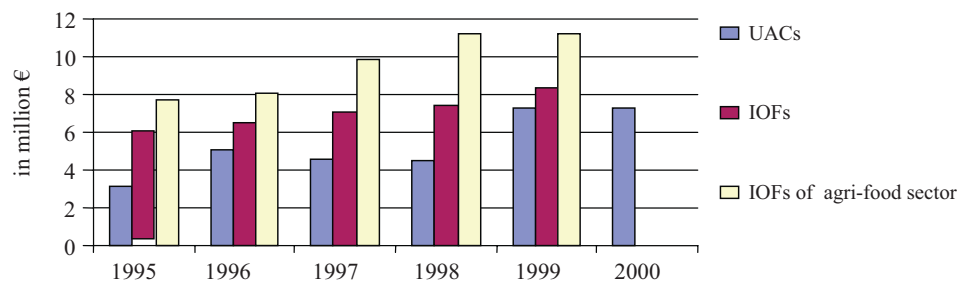
Nowadays, because of the withdrawal of state protection, the cooperatives are seeking for non-members investors who will finance part of their activities (Drimer, 1997). In this way, the operating capital is increased and through the development and possibly the more reasonable capital management that is owed to the influence and control exerted by investors, the net position of the cooperatives is increased. The stable increase in the number of members – users, in the customers and the development of new activities, is important for the attraction of new financial resources that will enhance their competitiveness. The cooperative collaboration with a large number of customers and members – users attracts new capitals that can finance part of its activities and ensure its enlargement without increasing the level of financial risk for the cooperative. Furthermore, it reduces the level of business risk since it creates the conditions for stabilizing profits through the risk distribution achieved by undertaking a variety of activities. The attenuation of financial and business risk results in the reduction of the total risk for the cooperative, which is particularly appreciated by the members who are risk averse (Egerstrom 1996, Dijk, Nilsson and Kyriakopoulos 1997). Further down, we are going to compare financial indicators of UACs and IOFs:

a. Sales & Net Profits

Diagram 1 illustrates the average sales of UACs, of private firms of all the industrial sectors as well as of agri-food manufacturing sector for the period under review. The average sales of UACs have improved during the last years, even though they still remain quite far behind the private companies and mainly private companies that are involved in the agri-food sector. The small size of UACs further complicates the implementation of costly competitive strategies, such as the diversification of products, advertisements, the variety of activities, the investment in research and development and the creation of appropriate distribution channels compared to private companies. More-

over, the fact that many UACs are decentralized impedes communication and increases the cost of goods and raw material transport. Apart from the sales level, net profits as well as net profit margins between UACs and IOFs reveal the same image. Average net profits are negative for the UACs while they are positive for the IOFs (Diagram 2 – table 1).

Diagram 1. Comparison of average sales between greek UACs, IOFs of all the industrial sectors as well as the IOFs of agri-food manufacturing industry

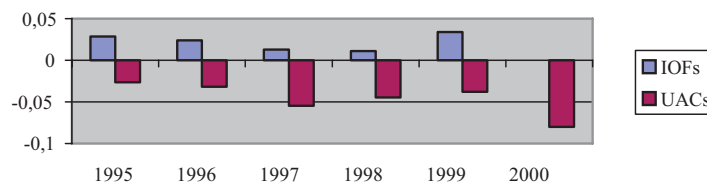


Source: elements from

i) balance-sheets of private enterprises (ICAP 1995-1999) and

ii) UACs (from personal collection of balance-sheets and from Greek Federation of Farmers Cooperatives- PASEGES, 1995-2000)

Diagram 2. Comparison of net margin of profit between Greek UACs and IOFs



Source: elements from

i) balance-sheets of private enterprises (ICAP 1995-1999) and

ii) UACs (from personal collection of balance-sheets and from Greek Federation of Farmers Cooperatives- PASEGES, 1995-2000)

Table 1. Comparison of average net profits between UACs and IOFs in million €

Year	Average net profits of UACs	Average net profits of IOFs
1995	-0.084	0.528
1996	-0.550	0.587
1997	-0.592	0.469
1998	-0.386	0.440
1999	-0.263	0.557
2000	-0.420	0.435

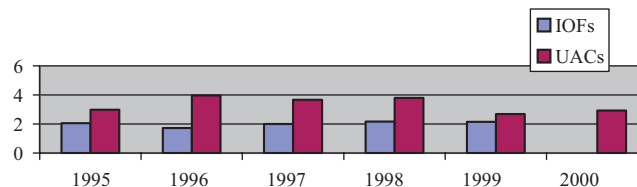
Source : PASEGES 2002, ESYE 2002

b. Leverage level

The leverage indicator reveals the company's degree of solvency that is its ability to respond to its long-term obligations to make payments. High indicator values show a small participation of private capitals as well as high loans, which both increase the financial risk level. Lack of private capitals, which most cooperatives have to deal with in Greece, leads to inability to implement competitive strategies and integrated trading policy. This inability results in a limited potential for product modernization, promotion and trading as well as high production cost. All these result in reduced sales and low profit margin. Moreover, lack of private capitals leads to an increase in loan capitals, in other words to higher leverage level. Despite the fact that cooperatives do not desire high risk levels, high loans are a fact and are mainly used to cover current needs and obligations and not to develop investment plans, thus leading to a low (and many times negative) profit margin.

As it can be seen in the Diagram 3, cooperatives are faced with a higher leverage level than private companies. However, Investor-oriented firms also have quite high values, which mean that they use loan capitals for their investments to a great extent. The difference between these two categories lies in the use of loan capitals. Cooperatives usually use them to settle their current obligations, while private companies use them for their investing activities. Therefore, the net profits of UACs are becoming more and more negative, while the net profits of private companies are not affected in the long-term.

Diagram 3. Comparison of leverage level (total liabilities / net worth) between UACs and IOFs of Greek industry



Source: elements from

i) balance-sheets of private enterprises (ICAP 1995-1999) and

ii) UACs (from personal collection of balance-sheets and from Greek Federation of Farmers Cooperatives- PASEGES, 1995-2000)

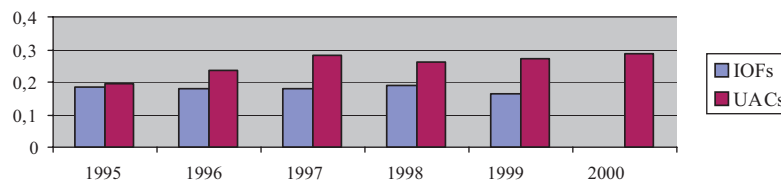
c. Business risk

The agri-food sector is made up of some large companies and many smaller ones that survive with difficulty within the highly competitive market environment. During the last years, the absolute size of production has increased in all industrial sectors with a significant increase in the market shares of companies involved in the service delivery sector and a respective decrease in the market shares in the primary and manufacturing sector (Anheier and Bener, 1997). These incidents forced many manufacturing and trading companies to be merged / taken over by larger or be closed. It is a paradox that cooperatives, which are by nature more risk averse than private companies due to their members composition and their management policy (Garoyan, 1983), find it difficult to adopt methods of external enlargement that lead to the reduction in the risk degree they

are facing. As it is shown in Diagram 4, UACs face higher levels of business risk than IOFs. In order to minimize this risk it is necessary to increase their profitability and stabilize it at higher levels.

The majority of the UACs face difficulties in surviving in the market. Further down, we are going to investigate which are the parameters that affect the efficiency level of UACs and IOFs.

Diagram 4. Comparison of business risk level between UACs and IOFs of Greek industry



Source: elements from

- i) balance-sheets of private enterprises (ICAP 1995-1999) and
- ii) UACs (from personal collection of balance-sheets and from Greek Federation of Farmers Cooperatives- PASEGES, 1995-2000)

Model specification

One of the major aims of companies is to maximize their profits. Other than this aim, to examine the effectiveness of the company, it is necessary to further explore some of the company's features such as: the growth rate of the company, the variety of activities developed, its size, the level of its financial and business risk, its export intensity etc. These features affect not only profitability, but also a series of other "success measures" of today's companies that finally affect its viability.

There are strong theoretical grounds for believing that market share is one of the major factors that affect profitability. A high level of profits indicates a sales increase and thus a market share increase. The bigger size gives the potential to the firms to exploit the economies of scale either because of the use of technology that makes them more productive or because they can have better administration that allows them to have more effective organisation as well as more equitable investment choices. Consequently, bigger enterprises are more likely to enjoy bigger and more stable profits.

The relationship between profitability and size is also affected by the company's leverage level (financial risk). The total capital cost that a company uses depends on the cost of each capital category (share capital, debt capital etc.) and this capital's composition. The change in composition results in the reduction or increase of financial risk that in turn affects the cost of each capital category. An increase in loans may contribute to an increase in the payment required by lenders due to an increase in the risk that the company confronts, in other words it may lead to an increase of debt capitals cost. Shareholders are also likely to demand a greater compensation for their capitals, which is equivalent with an increase in the cost of private capitals (Kotopouli V., 1991).

When debt capitals are used to make investments, they also contribute to the increase of the company's size. In other words, financial risk, under certain conditions, positively affects the company's profitability and size.

The relationship between the company's profitability and size can be expressed in a system, where profitability and size are endogenous variables in the limitation of financial risk.

$$\begin{aligned}\text{Profitability} &= f(\text{size, financial risk}) \\ \text{Size} &= f(\text{profitability, financial risk})\end{aligned}$$

However, the level of financial risk also depends on the companies' profitability, since the greater the profits are, the more the lending possibilities increase. Moreover, financial risk also depends on the companies' size. The larger a company is, the more its lending possibilities increase. In large business sizes, management often doesn't mainly aim at increasing sales (maximization of profitability), but at further developing the business, a fact that involves increasing debt capitals in case they don't wish or cannot use private capitals. Thus, financial risk can be considered to be an endogenous variable of the system, since it depends on the company's profitability and size.

Based on the above remarks, the system is formed as following:

$$\begin{aligned}\text{Profitability} &= f(\text{size, financial risk}) \\ \text{Size} &= f(\text{profitability, financial risk}) \\ \text{Financial Risk} &= f(\text{profitability, size})\end{aligned}$$

Other than better organization and more efficient operation, the large size of companies provides the possibility to implement expensive strategies for the diversification of their products resulting in reducing the risks confronted and receiving larger and more stable profits, thus reducing the business risk of companies.

According to Hurdle (1974), the structure of the sector, where a company is activated, largely determines the level of business risk that is inversely proportional to financial risk. A stable oligopolistic sector with prospects of enlargement creates a reduced business risk for its companies and hence, they can handle a greater financial risk. However, it should be stated that since every company has its own indifference curve for total risk (business and financial risk) – profitability, even if it faces a smaller business risk than another due to the structure of the sector it belongs to, it can deal with a larger total risk depending on the indifference curve it selects.

Consequently, business risk can be considered as an endogenous variable of the system, since it depends on profitability, size and financial risk.

$$\begin{aligned}\text{Profitability} &= f(\text{size, financial risk, business risk}) \\ \text{Size} &= f(\text{profitability, financial risk, business risk}) \\ \text{Financial Risk} &= f(\text{profitability, size, business risk}) \\ \text{Business Risk} &= f(\text{profitability, size, financial risk})\end{aligned}$$

The evaluation of the above system is impossible due to identification problems. Due to this problem and the fact that there are many more variables that affect the above mentioned endogenous variables, some predetermined variables are also inserted in the system equation, which are associated with endogenous variables based on economic theory.

Most studies use OLS to estimate single equation relationships assuming unidirectional causality running from profitability to size and then to risk. Some, however, suggest not only that profitability influences size and risk, but that size and risk are likely to feed back and influence profitability too. Thus, a single equation model would suffer

from simultaneous equation bias, and it would produce weak and inconsistent relationships.

For these econometric reasons a four-equation model was developed in which profits, market share, financial risk (leverage) and business risk are jointly determined. The model was tested using panel data for all the IOFs of all the manufacturing industrial sectors that employed more than 10 people from 1995 to 1999 (3281 firms) and for the Unions of Agricultural Cooperatives that have available data (93 out of 118) from 1995 to 2000 in Greece. The model takes the general form provided below:

$$\begin{aligned} PR &= f(\mathbf{MS}, \mathbf{FR}, \mathbf{BR}, \mathbf{X}) & PR : \text{profitability} \\ MS &= f(\mathbf{PR}, \mathbf{FR}, \mathbf{BR}, \mathbf{\Psi}) & MS : \text{market share} \\ FR &= f(\mathbf{PR}, \mathbf{MS}, \mathbf{BR}, \mathbf{Z}) & FR : \text{financial risk} \\ BR &= f(\mathbf{PR}, \mathbf{MS}, \mathbf{FR}, \mathbf{\Omega}) & BR : \text{business risk} \quad \text{and} \\ & & X, \Psi, Z, \Omega : \text{vectors of exogenous variables} \end{aligned}$$

Following the relevant literature, profitability is a major indicator of efficiency and is used in many empirical firm level studies. Also concentration and other independent variables, which affect industrial structure, should be included to give:

$$PR = a_0 + a_1 MS + a_2 FR + a_3 BR + a_4 CR_4 + a_5 DIV + a_6 CAPTURN$$

where: CR_4 : concentration ratio of the industrial sector,

DIV : diversification level of the firm

$CAPTURN$: capital intensity of the firm

Other than profitability, market share is a basic parameter for the examination of the efficiency level in empirical industrial studies. The theoretical model of market share equation (MS) includes profitability ratio, financial risk ratio, business risk ratio as well as growth rate ratio.

$$MS = b_0 + b_1 PR + b_2 FR + b_3 BR + b_4 GROT$$

where GROT refers to the growth rate of the firm

Since financial risk (FR) is correlated with some of the elements of market structure and profitability, it is desirable to include FR in the system of equations in order to explain the profitability level of the industry. The theoretical model of the financial risk equation includes profitability, market share, business risk as well as indicators of efficiency.

$$FR = c_0 + c_1 PR + c_2 MS + c_3 BR + c_4 NWTU + c_5 YOFES$$

where NWTU: net worth over turnover of the firm

YOFES: firm age

Finally, the business risk equation includes profitability, market share, financial risk ratio, turnover over the number of employees ratio as well as export intensity ratio.

$$BR = d_0 + d_1 PR + d_2 MS + d_3 FR + d_4 TE + d_5 EXAG$$

Where TE: turnover / # permanent employees of the firm

EXAG: export intensity ratio (exports / total sales)

Regression analysis results reveal the effects of independent variables on dependent variables for both IOFs and UACs.

Data and measurement of variables

A total of 3281 Greek manufacturing firms is examined for the years 1995-1999. Moreover, 93 UAC are used for comparison reasons for the years 1995 through 2000. Data for IOF are drawn from ICAP's annual reports. These reports provide individual balance sheet and income statement data for all manufacturing IOF. Data for UAC are gathered with the help of personal interviews as well as from their annual reports. The results of financial analysis are exported with the help of the 3SLS technique and describe the impact of several parameters on the efficiency of IOF and UAC in Greece. More specifically we include the following parameters in the model:

Profitability: net income over turnover of the firm

Market share: sales of each firm over the total industrial sales

CR₄: concentration ratio of the industry according to the sales of the four biggest firms of each industrial sector

Financial risk: total liabilities over net worth of the firm

Business risk: deviation of firm profit from the industrial average profits

CAPTURN: firm capital over its sales

Diversification: the number of different firm activities

Growth: annual firm sales over firm sales in the previous year

Export intensity: exports over total firm sales

Efficiency: a) net worth over turnover and b) turnover over the number of permanent staff

YOFES: firm age

No advertising sales ratio is included in this model as a separate market structure variable. Although advertising has often been treated as a market structure variable that has a separate positive effect on profitability, data are not available for the majority of firms and cooperatives and as a result it is not included.

Model Analysis

According to Hausman – Wu test (Martin, 1993; Greene, 1997) there is endogeneity problem in all equations and as a result an instrumental variable technique (3SLS-2SLS) should be used. (table 2). According to Langrange multiplier statistic ($\lambda = 4638.6$), there is also contemporaneous correlation bias across the four-equation system (the theoretical value of X^2 for 4 degrees of freedom is 9.49 at 5% level of significance). Finally, we test the existence of identification problems (order and rank conditions) in each equation separately in order to be able to apply a system of simultaneous equations. Results show that all four equations are over-identified. We can therefore apply 3SLS to jointly estimate the four equations (tables 3-6).

Table 2. The Hausman – Wu test

<i>Equations</i>	<i>Empirical value</i>	<i>Theoretical value *</i>	<i>Endogeneity bias</i>
Profitability	7,34	F(3359,8413) = 1	Yes
Size	66,82	F(4371,5296) = 1	Yes
Financial Risk	2,25	F(3840,9423) = 1	Yes
Business Risk	1,05	F(2308,4606) = 1	Yes

❖ 5% level of significance

Table 3. Profitability equation of IOF and UAC

<i>Variables</i>	<i>3SLS (IOF) (fixed effect)</i>		<i>3SLS (UAC) (fixed effect)</i>	
	<i>coefficient</i>	<i>t-value</i>	<i>coefficient</i>	<i>t-value</i>
<i>MS</i>	42,38	4,48	0.88	*1.61
<i>TLNW</i>	0,58	11,78	0.40 ^{E-02}	*0.94
<i>RISK1</i>	-11,87	-11,11	-0.37	-7.52
<i>CR4</i>	0,09	2,39	-0.33 ^{E-02}	*-0.07
<i>CAPTURN</i>	0,43	56,77	0.17 ^{E-03}	0.11 ^{E-02}
<i>DIV</i>	0,03	*1,87	0.13 ^{E-02}	*0.11
R²	17,4 %		9,1%	
DW	1,9		1,9	
LM	10,7			
F	F (3359,8413) = 7,3			
Hausman Test	X ² /df 6= 10638			

❖ 10% level of significance

In the profitability equation (table 3) all the independent variables are statistically significant. The market share ratio, leverage, concentration, diversification as well as capital over turnover ratio have a strong positive effect on profitability. On the contrary, business risk has negative effect on profitability. This occurs because both business risk and leverage, which are negatively correlated, are included in the same equation. According to 3SLS method, R² is 17.4% indicating that the independent variables explain by this amount the variability of the dependent variable.

In the size equation (table 4) the market share is the dependent variable. Business risk (BR) has positive effect on size while business risk and leverage are negatively correlated. According to R², the independent variable explains by 3.1% the variability of the dependent variable. In the leverage equation (table 5) profitability as well as business risk has a positive effect on leverage while NWTU and market share have a negative impact on leverage. A 1% increase on NWTU level decreases the leverage level by 0.79%. R² is 69.2%. Finally, in the business risk equation (Table 6) market share and leverage have positive effect on business risk whereby R² is 70.7%.

Apart from the analysis of IOF, the impact of the same financial factors on Greek Unions of Agricultural Cooperatives has also been examined. In the profitability equation (table 3) only business risk has a significant negative effect on profitability. A 1% increase of business risk decreases profitability by 0.37%. In the size equation (table 4) only business risk has a positive effect on the size equation. 1% increase on business risk raises the size level by 0.09%. In the leverage equation (table 5) market share has a positive effect on leverage. Finally, the business risk equation (table 6) indicates that profitability has a negative impact on business risk whereby a 1% increase of profitability leads to decrease of business risk by 2.74%.

Table 4. Size Equation of IOF and UAC

Variables	3SLS (IOF) (fixed effect)		3SLS (UAC) (fixed effect)	
	coefficient	t-value	coefficient	t-value
PR	-2,98 ^{E-05}	*-0,08	0.14	*1.59
FR	-6,17 ^{E-03}	*-1,60	0.12 ^{E-02}	*0.99
BR	0,16	2,96	0.09	3.24
GROT	1,35 ^{E-06}	*0,24	-0.44 ^{E-03}	*-0.07
R ²	3,1%		7.6%	
DW	0,03			
LM	1,50			
F	F(4371,5296)= 65,97			
Hausman Test	X ² (4) = 0,61			

❖ 10% level of significance

Table 5. Financial Risk (leverage) equation of IOF and UAC

Variables	3SLS (IOF) (fixed effect)		3SLS (UAC) (fixed effect)	
	coefficient	t-value	coefficient	t-value
PR	3,65	13,07	59.18	*1.42
MS	-85,29	- 4,19	287.40	3.87
BR	21,21	12,68	7.28	*0.46
NWTU	-0,79	-12,82	1.17	*0.17
YOFES	1,88 ^{E-04}	1,26	0.85 ^{E-03}	*0.02
R ²	69,2%			
DW	1,9			
LM				
F	F(3840,9423)=2,3			
Hausman Test	X ² (5) = 212,4			

❖ 10% level of significance

Table 6. Business Risk Equation of IOF and UAC

<i>Variables</i>	<i>3SLS (IOF)</i> <i>(fixed effect)</i>		<i>3SLS (UAC)</i> <i>(fixed effect)</i>	
	<i>coefficient</i>	<i>t-value</i>	<i>coefficient</i>	<i>t-value</i>
<i>PR</i>	1,95 ^{E-04}	* 0,09	-2.74	-13.26
<i>MS</i>	4,87	4,45	2.29	1.57
<i>TLNW</i>	0,05	6,86	0.01	1.03
<i>TE</i>	-3,41 ^{E-11}	*-0,02	0.15 ^{E-11}	*0.04
<i>EXAG</i>	-1,52 ^{E-03}	*-0,39	0.02	*0.22
R²	70,7%		13.1%	
DW	1,9			
LM	4,3			
F	F(2308,4606)=1,05			
Hausman Test	X ² (5) = 93,075			

❖ 10% level of significance

Conclusions

Cooperatives have been portrayed as a form of business enterprise in a market economy, which is specially structured to serve the special needs and interests of its owner – members who have mutual benefits. Agricultural Cooperatives in the EU are presently in a state of transformation. The economic, social and legal environment of cooperatives is changing, resulting in the fact that the latter are accordingly in need of adopting new measures to adapt themselves to this new environment. To mention but a few of these changes: withdrawal of government from the market within the last decade, increase in international trade, new technological developments, changing consumer demands, concentration and integration process in other segments of the product and marketing chain and so on. All these factors have a major impact on the development of agricultural cooperatives, placing them under great pressure to adapt themselves to new realities (Bekkum, Dijk, 1997).

The level of sales has increased in recent years. However, the high leverage level as well as the high operating cost level results in difficulties in adopting expensive strategies that raise the competitiveness of the cooperative. The lack of capital leads to the increase in borrowed capital indicating higher financial risk. The net profit margin of cooperatives is negative from 1995 to 2000. On the contrary, the average profit margin on greek IOF is positive for the same period. The evaluation and comparison of the cooperatives efficiency with that of IOF is becoming imperative under these circumstances (Sergaki, 2004).

Comparing the results from the analysis of IOF and UAC we conclude that:

- In the profitability equation of IOF, size, leverage, concentration, capital/sales as well as diversification have a positive effect on a firm's profitability whereas business risk has a negative effect. In the profitability equation of Unions of Agricultural

Cooperatives, only business risk has a statistical significant negative effect on profitability.

- ❑ In the size equation of both UAC and IOF, business risk affects positively the size level.
- ❑ In the leverage equation of private firms, profitability, business risk as well as the age of the firm positively affects leverage level. On the contrary, market share as well as efficiency negatively affects the leverage level of private firms. The results of the leverage equation of agricultural cooperatives agree with those of private firms. The only exception refers to the positive impact of size on the cooperative leverage level
- ❑ In the business risk equation of IOFs, market share as well as leverage affects positively the business risk level. In the relevant equation of UACs, only profitability decreases the business risk level of the UACs.
- ❑ Small size UAC and IOF have no economies of scale. In addition, they face obstacles in applying competitive strategies and have higher production cost, low market share and low profit margins.

The following are some proposals to enhance the economy of UACs and IOFs:

- ❑ Increase of net worth for the application of competitive strategies aiming at the increase of firm's market share
- ❑ Increase of size through mergers
- ❑ Evaluation of alternative scenarios of external growth
- ❑ Adoption of competitive strategies (e.g. product differentiation, advertising, reliable distribution channels, R+D, innovations)
- ❑ Better exploitation of economies of scale
- ❑ Restriction of fixed costs and expansion to trade activities with greater value added
- ❑ Focus on specialized parts of the market which do not interest big firms

It is obvious that a number of exogenous variables and techniques affect the efficiency level of a firm or a cooperative. Consequently, testing the hypotheses against models with even more exogenous variables would be desirable for further research.

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