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RESEARCH ARTICLE

Measuring the Economic Contribution of Agricultural Cooperatives to the National Economy: The Case of Greece

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Abstract:

Aims:

The purpose of this work is to determine the contribution of agricultural cooperatives to the Greek economy.

Background:

Agricultural cooperatives in Greece offered the maximum to agriculture, but their contribution to the overall economy of the country was not sufficiently studied. This work deals with the offer of the operation of agricultural cooperatives in key sectors of the economy.

Objective:

The object of this study is the agricultural cooperatives in Greece and the benefits to the Greek economy from their activity.

Methods:

The method of analysis used is that of the input-output method and the estimation of multipliers in specific sectors of the economy that were considered important.

Results:

The findings of this study show some interesting facts and reveal the financial contribution of agricultural cooperatives in several sectors of the economy. The sector that seems to have the most significant contribution is total production, which is essentially the country's GDP growth. The contribution to employment growth is also very important in working income. Another interesting finding from the multiplier estimate for the action of agricultural cooperatives in Greece is not the total number of economic impacts directly related to the operation of agricultural cooperatives but the positive contribution of individual cooperatives to the national economy.

Conclusion:

Empirical analysis showed that only companies of secondary agricultural cooperatives and tertiary cooperatives were included to address mainly practical issues such as data availability. The final result indicated that cooperatives contribute to a satisfactory degree to the national economy.

Keywords: Agricultural cooperatives, Cooperatives, Financial contribution, Input-output analysis, Agricultural, Economic gain.

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1. INTRODUCTION

Agricultural cooperatives are among the oldest and most enduring forms of economic and business activity. Although cooperatives worldwide include some of the largest companies, they are generally overlooked in the prevailing finance and management theory. As a business model, cooperatives have been placed in the "Third Sector" along with non-profit and social organizations. However, they are not created for social purposes, despite social functions. Most are driven by economic gain combining individual interest with social benefit in the direction of development centered on the desire for freedom and democracy underpinned by altruism and solidarity. Under these conditions, the Agro-Cooperative movement can contribute both to the modernization of

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agricultural production according to the demands of the time and the competition and to creating sustainable business units with competitive market standards that reflect the preferences of consumers. This brief report examines the nature of the cooperative business model and its role in a "Fourth Sector" [1, 2].

The importance of agricultural cooperatives for the development of the sector and its contribution to the economic development of many countries has led to increased interest in measuring the impact of cooperatives on the economy. The economic value that agricultural cooperatives can offer farmers and local communities has been described in both an international and Greek context, but their broad value can sometimes be ambiguous and requires empirical evidence of their contribution to the local and, consequently to the national economy [3, 4]. Agricultural cooperatives can act as agents of local financial support, providing a level of stability and improved market efficiency in a local economy which indirectly contributes to the economic development of the country [5 - 7].

However, due to their unique nature, finding the most appropriate method to measure their economic impact both locally and nationally presents significant difficulties. The methods chosen should take into account two key elements; first, compared to alternative forms of businesses, cooperatives embody a unique business model with unique outcomes, including contributing to market normalization, goods and services in the local community, as well as to the economic stability of local communities [8, 9].

As such, the suitability of standardized methods of measuring the financial contribution of a business sector to compare the unique outcomes of cooperatives requires consideration [2, 10]. Second, it is important to distinguish between the impact in a local and national context. Seemingly, cooperatives are likely to contribute more to the local economy than other companies in view of the fact that they belong to the people who use them. For example, cooperatives buy more supplies and means of production from local markets and return their net profits to the local market [11].

This means that agricultural cooperatives trade a variety of outputs as well as inputs, which creates problems for inter-company comparison between agricultural cooperatives as not every product is equally profitable and every product contributes to the cost of cooperatives. While this is useful as it provides information relative to increasing or decreasing the production of this product, it is not precisely defined. In addition, technological development is changing economies of scale in cooperative enterprises [12].

2. THEORETICAL FRAME

2.1. Framework for Measuring Economic Impact

The agricultural cooperative is an important institution as it offers benefits not only to producers, but also to workers and rural communities in terms of employment in many countries, including Greece. Agricultural cooperatives, therefore, can perform various functions in market economies based on cooperative values and principles that are rarely addressed in the financial literature. In essence, this analysis reflects the need for the size of the business activity carried out by agricultural cooperatives to be measured [3, 6].

This is a useful starting point to identify the unique contributions of cooperatives in relation to other forms of business organization. To determine how these "deeper effects" can be quantified, a number of international publications have provided important insights into how the contribution of agricultural cooperatives to the local and national economy can be reliably measured [13].

Among other things, the different functions of cooperatives are supported by other external market players and serve as vehicles for social innovation, support social entrepreneurship, to promote ethical business practices and to assist in growth [14]. While the economic literature has focused mainly on the structure of ownership, operation and control as sources of difference in agricultural cooperatives, it is argued that this focus presents an incomplete picture. Principles of cooperation can provide additional knowledge to address issues in areas with low labor mobility, prevailing market failures, oligopoly markets and labor-intensive industries, where cooperatives could be an effective business model. They can also provide information on the strategies and survival in the global markets of successful cooperatives and can ultimately contribute to a country's economic development [15]. Therefore, the focus and purpose of this study is to try to assess the overall financial contribution of agricultural cooperatives to the rural development of the country and, consequently, their contribution to the national economy. In addition, analysis of the financial contribution of agricultural cooperatives enables understanding of the direct activity of the cooperative sector, as well as the value of financial ties with other businesses, households, and the overall economy of the country.

The applied methodologies were evaluated on a case-by-case basis over time and classified in groups based on the method for each case. The most appropriate and common methodologies for measuring the contribution of a business sector, such as cooperatives, in the local or national economy, include:

(a) The "enumeration" approach. The "head-count" approach starts by recording and estimating the relative size of a sector by simply inventorying the assets held, the amount of capital investment, revenue and profits generated, and wages and dividends paid, among other indicators [15]. The advantage of this approach is the limited amount of information required in its computational simplicity. Conversely, it does not fully provide a measure of economic impact, *i.e*. the results are impossible to generalize as the method does not capture the "multiplier effect" nor does it produce indirect and induced results. In addition, it is a static measurement, recording the impact of a sector at a single point in time.

(b) The input-output analysis. In brief, an input-output (I-O) model includes a matrix that describes, in value, the sales and purchases of goods and services between all sectors of the economy over a given period. The columns in the table represent the market sectors in economy or demand, while the

rows represent the sales or supply sectors. For each financial sector, total sales must be equal to total markets [16]. It should be noted that the input-output model presents a snapshot of the economy which details the sales and purchases of goods and services between all sectors of the economy for a certain period within a conceptual framework derived from economic theory. The algebraic manipulation of the empirical I-O model, that is, the inversion of the matrix, enables the effects of the change in demand on the products of a sector throughout the economy to be determined. Impacts are calculated on the basis of revenue from the sale of produce, the number of jobs created, wages and benefits paid to employees, the total money spent on other variable inputs, and payments to cooperative farmers. This economic activity generates additional income and there is an increase in demand for agricultural products, *i.e*. food. To meet this new, higher level of demand, producers must increase the production of agricultural products, which means that they must purchase additional supplies and means of production, actions that require additional professional services such as agricultural services and additional work. Therefore, these sectors' involvement increases their production and corresponding inputs to meet the new level of demand. That is to say, increased production of agricultural products results in increased demand, and resonates in the economy as a whole, thus, the multiplier effect. Besides the multiplier estimates, the input-output analysis calculates for the direct, indirect and induced effects of the change in economic activity and the total economic impact is the sum of all effects. These direct, indirect and induced outcomes are defined as follows: The direct results are due to the actions of a company, and in this case to agricultural cooperatives, as a result of the change in final demand. The indirect effects are created, in the regional economy studied by the markets, by the company to face the change in the final demand.

The advantages of the input-output model are the limited data requirements and the relatively simple application and presentation of the results. It also facilitates the comparability of results between sectors and countries. Its main disadvantage is the assumption that the input supply is completely elastic and infinite [11, 14, 17].

(a) The social accounting matrix approach. The Social Accounting Matrix (SAM) models work in the same basic way as the input-output models, *i.e*. with the same set of assumptions and solution method. The important difference is that they do not focus on productive activities but describe the structure of an economy in terms of the relationships between production, income distribution, consumption of goods and services, savings and investment, and trade [18].

Thus, a SAM model is a more complete database than the trading matrix of an I-O model. Transactions recorded in SAM are not limited to buying or selling goods and services (as in model I-O) but can incorporate any type of transaction. This includes transactions during the production process, such as the purchase of intermediate goods and the recruitment of agents. It also includes current transactions with institutions (households, businesses, and government), such as inter-institutional transfers and the payment of various taxes, and additional capital account transactions of institutions, such as savings and investments. Finally, it can include any international transaction, such as foreign direct investment and foreign trade [19].

The main feature of the SAM model is its focus on the distributive aspects, for example, the estimated effects in a SAM model are broken down into fractions with excellent analytics. Thus, SAM models are better adapted when special attention is paid to economic growth instead of simple economic growth. The approach has mainly been used by academics to analyze the economic impact of tourism. Since it works with the same basic case set as the I-O models, the SAM method can be criticized for many of the same reasons as the I-O. That is, the SAM approach also uses fixed productivity ratios, is static, and does not consider the behaviors and responses of producers and consumers to price changes [20, 11].

(a) The computational model of general equilibrium. The Computable General Equilibrium (CGE) computational model includes not only cross-sectoral links but also models for purchases of goods and services and factors that influence markets, recognizes resource constraints, shapes consumer spending, and allows for government spending and taxation. More specifically, in a general equilibrium computational model (CGE), each transaction flow in the social accounting matrix (SAM) is divided into two components, namely price and quantity, which may be adjusted according to the growth of the economic activity of the examined sector.

From a technical point of view, a general equilibrium model (CGE) consists of a system of (a) simultaneous equations, that is, supply and demand equations describing the behavior of economic agents; and (b) macroeconomic constraints, that is, macroeconomic variables and balances, such as investments and savings, and payments. CGE models can be static (timeless) or dynamic (explicitly looking at time and time-related adjustments) and solved by equilibrium calculation, that is, equilibrium is achieved when a price operator is found that “clears” all markets, while satisfying all macroeconomic constraints. Despite their long-term use in economic policy analysis in general and their growing popularity in regional policy analysis, computational general equilibrium (CGE) models have not yet become the dominant approach to regional economic development policy analysis. The methodological improvements that are likely to lead to the wider use of CGE models in the practice of economic development are empirical evidence and the capability to record the relevant policy elements and the structure of the study area [21]. A typical CGE model will measure the overall change in economic output through its impact on GDP, while also providing output for individual sectors. Impact on key variables such as employment or public revenue will also be part of the model output. The most obvious advantage of the general equilibrium computational model (CGE) is the more realistic assumptions on which it is based in that it represents the whole economy and considers resource constraints and the reactions of producers and consumers to price changes. CGE models provide information on the economic impact of specific activities occurring in a country, and which of those positively or negatively affect the economy as a whole. The benefits of

additional production do not have to be the same as the value of production.

Of both the CGE and I-O models, the I-O model ignores the interactions between industries, thus maximizing the impact on gross government product and labor. Meanwhile, CGE modeling also allows different results to be distinguished in other areas. However, given the specific aspects of the activities, CGE models need to be adapted to take account of this [6, 17, 22 - 25].

3. METHODS

3.1. Input-Output Analysis (I / O)

The description of the above methods and the presentation of their respective data requirements, as well as the combination of the data with the calculation method and how well the model reflects the reality, emphasizes that the input-output model (Input-Output) is the most common tool for financial impact analysis in general, but also for measuring the financial impact of cooperatives. It also seems that all methods that measure the financial contribution of cooperatives, when treated like other business structures, cannot assess the unique value of cooperatives for their members and communities, such as the compensatory power in the market and goods and missing services. Neither do they take into account the contribution of cooperatives to the long-term development and resilience of the communities in which they operate, which is perhaps the most important measure of their financial impact. Therefore, a further analysis should be carried out if an accurate estimate of the total contribution of cooperatives in their communities is to be achieved. Most importantly, there is the possibility of extending existing methodologies to ascertain the contribution of cooperatives in improving market power, the participation of some goods and services that have been omitted and the contribution to local economic stability to understand the widest possible and real economic impact of cooperatives [11, 21, 22, 26, 27, 29].

The input-output analysis method measures the economic impact that businesses have on their local economies. It is a model of the economy and is applied in a defined area such as a prefecture or a country and shows how it is possible to determine the interactions and economic behavior in said economic area within a particular sector. It measures the flows of financial transactions of the sector in view of the overall economy. The model predicts the effect of a certain change in production on final demand in the economy. In this case, it concerns the change of production by the various companies belonging to the cooperatives. The effects of this change can be described as direct, indirect and induced. These direct, indirect and induced effects are defined as follows [29, 30]:

(a) The immediate results are due to the actions of the cooperative enterprise as a result of the change in the supply and consequently in the final demand.

(b) The indirect effects are created in the regional economy under study, by the markets and by the cooperative enterprise to face the change in the final demand. An example would be the inputs purchased by the company in response to the change in production to meet the new final demand.

(b) The induced effects are changes in local household expenditure due to changes in income (mainly wages) as a result of the direct and indirect effects of changes in demand.

These effects are expressed in the form of multipliers. The multiplier summarizes the total impact or contribution that can be expected from the change in a given economic activity. For example, the entry of a new production unit or an increase in exports by a local company creates economic changes that can have additional effects on the overall economy. That is, multipliers measure the economic impact of new production or new exports, including related activities.

Multipliers are measures by which a total final change of size to the initial state can be evaluated. Four multipliers commonly used to estimate the effects of economic change, such as the increase in output resulting from the increase in sales and demand, typically referred to as final demand in multiplier analysis, are:

(1) Production. The production multiplier estimates the total change in local sales or in a country. The multiplication of the sales increase in the case of the export sector with the production multiplier gives an estimate of the total sales increase for the study area, including the export sales. The output multiplier is used to evaluate the interdependence of sectors in the local or national economy.

(2) Employment. Communities often want to know the number of jobs that will be created as a result of a new economic activity. The employment multiplier measures the total change in employment resulting from the initial change in employment of a manufacturing and exporting sector. The additional employment in the new production output for export multiplied by the employment multiplier for the production unit gives an estimate of the total number of new jobs created in the study area (*i.e*. prefecture, region or state).

(3) Income. The income multiplier measures the total increase in income resulting in the local economy from an increase of 1 euro to the income received by the workers in the export unit. Multiplying the change in initial income by the income multiplier for the production unit provides an estimate of the income increase for all individuals in the study area resulting from the initial development of a production unit.

(4) Value-Added. The value-added multiplier estimates the added value of a product or service as a result of the economic activity. Value-added includes employee compensation, tax on production and imports, and property and other property income. The sum of the value added of all businesses in a situation is equivalent to Gross Domestic Product [16, 25, 26, 28, 29, 30].

This analysis makes various assumptions about the economy and its reaction to the changes applied. The assumptions that apply to the model include:

- The supply of labor and other resources is sufficient and does not change prices.
- The percentage of imports in relation to the economy as a whole will not change with demand.
- The consumption of households will change depending

on their income.

-Production technology is known and stable, resulting in continuous production factors.

- There are no economies of scale.
- There is no substitution of inputs due to price changes.

3.2. The Structure of the Model

The analysis of the model for application in this study is the Input-Output system (I-O) and the Social Accounting Matrix (SAM). A system of linear equations is used to identify the interdependence of enterprises, which in this case are the agricultural cooperatives in the country's economy. SAM (Social Accounting Models) analysis is an extension of I-O that includes institutions, households, governments, investments and trade. This accounting system oversees all financial transactions in a public economy and is considered essentially a complement to the input-output model [11].

Based on Wassily Leontief's general theory of production, which stems from the idea of industrial interdependence in an economy, input-output tables were created, which formed the basis for Input-Output analysis [9]. The most important element of the model is the production sectors. That is, cooperatives produce with the means at their disposal, creating financial transactions by selling and buying goods and services among themselves during the production process. Thus, an intermediate demand may arise at one stage if the exchange of output from one sector is used as input from another. Total production demand includes consumption in local and state communities and consumption of products produced within the region by cooperative industries, households and governments outside the region. The collection of goods and transactions of services at all levels and between all these factors are recorded in an entry-exit table. The resulting table represents the total exchanges in a given economy [6, 13].

Most studies [15, 17, 30 - 32], mainly use the method "Input-output analysis" to estimate the added value of cooperatives in the economy.

The model also estimates the impact of a given change in output on a final demand within the economy. It can be valued at the cooperative sector level or for a specific cooperative [33]. The various links and effects of a change can be direct, indirect, or induced. Input-output analysis, first developed by W. Leontief [34], evaluates the various transactions that occur in the economy and uses them as data to assess the economic impact of any changes in the economy. The various studies carried out with the input-output model would show the direct and indirect effects, which industries benefit most such as the number of jobs created, wages, estimates of indirect taxes and subsidies created. Thus, the input-output model is based on the relationships between different economic sectors using revenues, salaries, taxes and other expenses.

3.3. Estimation of Multipliers

On the one hand, the previous analysis showed the importance of the different effects, and on the other hand, the need to evaluate the multipliers. These effects are expressed in the form of multipliers. In economics a multiplier is expressed by a simple formula [28]:

Multiplier = (Total change) / (Initial change))

In economic phraseology, multipliers are classified into two broad categories depending on their final expression [17]. Formula I reflect the direct and indirect effects and Formula II includes the induced effects along with the direct and indirect effects. The indirect effects are those associated with changes in companies that have been delayed due to increased demand from the industry directly affected. Therefore, the Type I multipliers are calculated as follows:

Multiplier Type I = (Direct and Indirect Effects) / (Direct Effects)

By analogy, the Type II multiplier is expressed by the ratio that is included in the numerator above:

Multiplier Type II = (Direct, Indirect and Induced Effects) / (Direct Effects)

Economic multipliers provide estimates of the total impact resulting from the initial economic output to final demand. The higher the multiplier, the greater the impact on the local economy or the country's economy.

4. RESULTS AND DISCUSSION

Economic multipliers derived from any analysis, such as input-output (IO), consist of three parts. The first is the immediate or initial result, which records the event that caused the initial change in the economy. Here, the cause of the change directly contributes to the economy by employing people and paying wages and incomes. Knowing the structure of the input-output model, the operation of the companies that caused the change will have an impact on the entire economy. This impact is the second component of a multiplier, the indirect effect. The third component is called the 'induced effect', which captures consumers' spending of additional income [15, 28, 35].

The state's economic activity produces the gross national product that affects and activates other parameters of the economy such as employment, income from work, and total income. These effects are characterized as direct, indirect and induced effects. For production, the direct effects are considered the production itself that is added to the national economy, indirect effects are all the economic activities derived and created from the specific production, and induced effects are taken as all forms of taxes and fees for the specific production.

In terms of employment, a direct effect on the economy is considered the total employment expressed in monetary units, indirect effects as the various labor contributions to social institutions, and induced effects as the contributions to the state in the form of taxes and fees. The direct effects on income from work arise from the wages payable on the work, while the indirect effects arise from the tax liability to the state and the induced effects from the net disposable income after the deduction of taxes.

The multipliers in this study were evaluated with the above-mentioned relations and in fact the multipliers of type II

were evaluated. For the estimation of the multipliers in the cooperative enterprises, data were obtained from the published balance sheets of eleven (12) of the main cooperative enterprises presented in the ANNEX for the year 2018.

The sectors of the economy that affect each cooperative enterprise with its operation and action are total production, employment (expressed in cost), income from work, and total income. These effects were either derived from the financial statements (balance sheets) of the year 2018 or some calculations were made with the necessary balance sheet items to determine the various effects in different sectors. The detailed results of the effects and the estimation of the multipliers for each cooperative enterprise are presented in the ANNEX.

As shown in Table **1**, the contribution of the estimated multipliers for each cooperative enterprise to the country's economy is positive. The multipliers not found to be smaller than the unit in any studied companies.

In such a case, the company would contribute negatively to the overall economy. As shown by the estimated multipliers, the largest contribution of cooperatives seems to be in production and income from work, while their contribution to the other sectors examined is not significantly less. In particular, multipliers significantly contribute to employment and the final economic result.

Cooperative enterprises as social and economic units generally show lower efficiency, resulting in smaller multipliers. Nevertheless, the results show a positive contribution to the national economy, particularly to the sectors of production, employment, labour income and total income.

The findings of this study show some interesting facts and reveal the financial contribution of agricultural cooperatives in several sectors of the economy. The above findings are in line with the findings of social enterprises in other countries [36].

The multipliers of the agricultural cooperative enterprises estimated and presented in Table 1 show the interdependencies that are created throughout the economy. Starting from the multiplier of production it seems that every cooperative enterprise contributes significantly to the value of production. Some output multipliers (I_5, I_7) with their size show a significant contribution to the production value. Taking the multiplier Average 1.50, it seems that to produce a product worth € 1 an additional product is produced in the economy worth € 0.50. The employment multiplier shows a different picture in different cooperative enterprises. For example, in companies I_2, I_3, I_5, it is quite high, which means that these companies offer a significant number of jobs for each job they create within themselves. The average of employment multipliers (1.35) shows that for every 100 jobs created in cooperative enterprises, they are offered, on average, another 35 jobs in the economy. The income multiplier is derived from the wages of the employees in each company. This multiplier does not have large differences from business to business but is high enough in all businesses and on average. The creation of additional income for every € 1 of income in companies causes an increase in income from work in the economy by an additional € 0.45. Finally, for every euro of income generated by cooperatives, it causes the creation of € 0.33 in the total income of the economy.

The first important finding is that the agricultural cooperatives through the companies they create have a significant positive contribution to the national economy of Greece for the year 2018. The sector that seems to have the most significant contribution is total production, which is essentially the country's GDP growth. The contribution to employment growth is also very important to working income. Another interesting finding from the multiplier estimate for the action of agricultural cooperatives in Greece is not the total number of economic impacts directly related to the operation of agricultural cooperatives but the positive contribution of individual cooperatives to the national economy.

This study is subject to several limitations. The first limitation is that the findings represent only one productive period (2018) exporting multipliers this year. However, it gives an example that identifies the contribution of the cooperative sector to the economy. The way the multipliers are calculated in this study may trigger more up-to-date studies with more up-to-date data available in the future so that more time-consuming results and findings will be produced.

Another limitation arises from the fact that cooperatives in Greece are not fully organized, and the statistics required for analysis come from large cooperatives. For this reason, this restriction means that the contribution to the national economy for the year 2018 is a conservative estimate. Finally, the model used cannot predict what the economy would be like if there were no cooperatives that contribute significantly to the operation of the market. The findings of the financial implications of this analysis should be considered as minimal estimates of the actual contribution of the cooperatives to the Greek economy.

Table 1. The contribution of the economic activity of Cooperative enterprises to the various financial figures through the multipliers (2018).

Important Components of the Economy	Cooperative Enterprises - Multipliers											
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}	I_{11}	Mean.
Total production	1,13	1,42	1,46	1,60	1,91	1,64	2,2	1,31	1,31	1,38	1,16	1,50
Employment	1,33	1,64	2,01	1,32	1,58	1,19	1,16	1,09	1,05	1,08	1,40	1,35
Labor income	1,30	1,44	1,26	1,10	1,55	1,50	2,0	1,51	1,51	1,39	1,37	1,45
Total income	1,39	1,07	1,96	1,23	1,28	1,27	1,11	1,36	1,05	1,19	1,69	1,33
Mean	1,29	1,39	1,49	1,31	1,58	1,40	1,62	1,32	1,23	1,26	1,41	1,40

CONCLUSION

The aim of this paper was to examine the contribution of agricultural cooperatives to the overall national economy while a significant effort was made to quantify this contribution in important operational areas of the economy. The selection of agricultural cooperatives for this study was based on the unique operation and organization of cooperatives generally, but also their goal of combining social sensitivity with economic efficiency. As the estimated multipliers for each Cooperative enterprise show, their contribution to the country's economy is positive. In none of the studied companies the multipliers were found to be smaller than the unit. Otherwise, the company would contribute negatively to the overall economy. The largest contribution of cooperatives, as shown by the estimated multipliers, seems to be in production and income from work, while their contribution to the other sectors examined is not significantly behind. Multipliers show a significant contribution to employment and the final economic result.

However, while for the purposes of the research a theoretical presentation of all aspects of the contribution of agricultural cooperatives to the development of the global agricultural economy and the agricultural sector in Greece was made, for empirical analysis, only companies of secondary agricultural cooperatives and tertiary cooperatives were included to address mainly practical issues such as data availability. The final result indicated that cooperatives contribute to a satisfactory degree to the national economy.

DATA AVAILABILITY

The data were collected from the companies of agricultural cooperatives and specifically from the balance sheets of those that are published in the newspaper of publication of balance sheets in Greece.

For the estimation of the multipliers in the cooperative enterprises, data were drawn from the published balance sheets of the year 2018, eleven (11) important Cooperative enterprises which are presented in the ANNEX. It is noted that the 11 cooperative companies produce a gross product worth € 421.7 billion.

Specifically, for the total production, data were obtained from the gross value of the total production. For employment, the data refer to the amount of the cost of each cooperative enterprise for the expenses of the employees except for their salary. The total amount spent by each company on employees' wages was used for labor income, and the total amount of taxes and other contributions (excluding employment contributions) contributed by each company to the state was used for total income.

The sectors of the economy that affect each cooperative enterprise with its operation and action are total production, employment (expressed in cost), income from work, and total income. These effects were either derived from the financial statements (Balance Sheets) of the year 2018 or some calculations were made with the necessary balance sheet data to determine the various effects in different sectors. The detailed results of the effects and the estimation of the multipliers for each cooperative enterprise are presented in the ANNEX.

CONSENT FOR PUBLICATION

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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ANNEX

List of Cooperative Enterprises.

a / a	Rank	Name of Cooperative Organization
1	I_1	Agricultural Poultry Cooperative of Ioannina PINDOS
2	I_2	Union of Agricultural Cooperatives of Naxos
3	I_3	"SEKAP SA" COOPERATIVE TOBACCO INDUSTRY GREECE SA
4	I_4	"ASSOCIATION OF FARMERS OF KAVALA COOPERATIVES"
5	I_5	AGRICULTURAL COOPERATIVE OF VERIA ‘VENUS GROWERS”
6	I_6	COOPERATIVE - GROUP OF DAIRY PRODUCERS OF THESSALY - PIERIA WITH D.T. THESgala Drink
7	I_7	AGRICULTURAL DAIRY COLLECTION OF KALAVRITA
8	I_8	AGRICULTURAL COOPERATIVE OF COW FARMERS OF PATRAS REGION SYN. ΠΕ
9	I_9	AGRICULTURAL COOPERATIVE OF ARKADIA "UNION"
10	I_{10}	AGRICULTURAL COOPERATIVE (AS) OF MESSOLOGGIO - NAFPAKTIA "THE UNION"
11	I_{11}	AGRICULTURAL COOPERATIVE OF VOLOS

I_1 Agricultural Poultry Cooperative of Ioannina PINDOS

Form of Influence	Total Production €	Employment Expressed in value 000 €	Labor income 000 €	Total income 000 €
Direct effect	250.074.161	8.222.298	12.057.328	26.534.462
Indirect effect	4.317.003	2.205.471	3.092.207	7.515.317
Induced effect	27.995.674	492.923	503.507	2.894.051
Total effect	282.386.838	10.920.692	15.653.042	36.943.830
Multiplier)	1,13	1,33	1,30	1,39

I_2 Union of Agricultural Cooperatives of Naxos

Form of influence	Total of production €	Employment Expressed in value 000 €	Labor income 000 €	Total income 000 €
Direct effect	20.006.761	6.484.032	554.226	7.240.416
Indirect effect	4.737.628	3.678.927	91.324	303.282
Induced effect	3.678.927	492.923	211.958	211.958
Total effect	28.423.316	10.655.882	797.508	7.755.656
Multiplier	1,42	1,64	1,44	1,07

I_3 "SEKAP SA" COOPERATIVE TOBACCO INDUSTRY GREECE SA

Form of influence	Total production €	Employment expressed in value €	Labor income 000 €	Total income 000 €
Direct effect	59.088.343	17.397.745	13.990.619	18.581.265
Indirect effect	9.911.625	14.204.480	3.484.865	3.860.263
Induced effect	17.109.381	3.484.865	213.862	13.990.619
Total effect	86.109.349	35.087.090	17.689.346	36.432.147
Multiplier	1,46	2,01	1,26	1,96

I_4 "ASSOCIATION OF FARMERS OF KAVALA COOPERATIVES"

Form of influence	Total production €	Employment expressed in value €	Labor income 000 €	Total income 000 €
Direct effect	29.471.158	2.723.319	2.662.363	5.749.983
Indirect effect	9.089.517	794.690	154.963	263.173
Induced effect	8.618.414	89.522	114.627	1.078.978
Total effect	47.179.089	3.607.531	2.931.953	7.092.134
Multiplier	1,60	1,32	1,10	1,23

I_5 AGRICULTURAL COOPERATIVE OF VERIA 'VENUS GROWERS"

Form of influence	Total production €	Employment expressed in value €	Labor income 000 €	Total income 000 €
Direct effect	61.770.520	5.209.692	6.641.707	18.957.239
Indirect effect	38.293.725	1.668.098	3.394.943	3.857.063
Induced effect	18.099.038	1.365.790	241.584	1.365.790
Total effect	118.163.283	8.243.580	10.278.234	24.180.092
Multiplier	1,91	1,58	1,55	1,28

I_6 COOPERATIVE - GROUP OF DAIRY PRODUCERS OF THESSALY – PIERIA.

Form of influence	Total production €	Employment expressed in value €	Labor income 000 €	Total income 000 €
Direct effect	20.245.688	7.563.933	2.592.427	3.218.367
Indirect effect	12.547.419	881.905	1.279.734	537.457
Induced effect	353.895	571.896	22.196	344.448
Total effect	33.147.002	9.017.734	3.894.357	4.100.272

Multiplier	1,64	1,19	1,50	1,27

I_7 AGRICULTURAL DAIRY COLLECTION OF KALAVRITA

Form of Influence	Total production €	Employment expressed in value €	Labor Income €	Total Income €
Direct effect	28.067.491	1.446.661	1.015.943	1.104.926
Indirect effect	18.559.742	140.201	304.783	95.554
Induced effect	15.296.401	95.554	711.160	25.995
Total effect	61.923.634	1.682.416	2.031.886	1.226.475
Multiplier	2,2	1,16	2,0	1,11

I_8 AGRICULTURAL COOPERATIVE OF COW FARMERS OF PATRAS REGION SYN. ΠΕ

Form of influence	Total production €	Employment expressed in value €	Labor income €	Total income €
Direct effect	5.330.014	1.326.498	893.637	2.915.071
Indirect effect	1.599.002	70.164	231.351	313.262
Induced effect	70.164	45.045	224.155	738.442
Total effect	6.999.180	1.441.707	1.349.143	3.966.775
Multiplier	1,31	1,09	1,51	1,36

I_9 AGRICULTURAL AND LIVESTOCK COOPERATIVE OF ARKADIA "UNION"

Form of influence	Total production €	Employment expressed in value €	Labor income €	Total income €
Direct effect	6.243.702	1.918.707	985.441	2.915.071
Indirect effect	1.857.897	58.567	23.107	313.262
Induced effect	76.905	28.096	25.076	738.442
Total effect	8.178.504	2.005.370	1.033.624	3.966.775
Multiplier	1,31	1,05	1,51	1,05

I_{10} AGRICULTURAL COOPERATIVE (AS) OF MESSOLOGGIO - NAFPAKTIA "THE UNION"

Form of influence	Total Production €	Employment expressed in value €	Labor income €	Total income €
Direct effect	10.466.003	1.812.621	1.267.333	4.202.294
Indirect effect	3.944.324	110.251	380.200	313.262
Induced effect	27.601	27.601	110.251	505.499
Total effect	14.437.928	1.950.473	1.757.784	5.021.055
Multiplier	1,38	1,08	1,39	1,19

I_{11} AGRICULTURAL COOPERATIVE OF VOLOS

Form of influence	Total production €	Employment expressed in value €	Labor income €	Total income €
Direct effect	16.724.919	2.470.232	3.135.478	7.210.357
Indirect effect	946.359	948.724	940.643	4.799.246
Induced effect	1.653.001	27.354	211.992	185.464
Total effect	19.324.279	3.446.310	4.288.113	12.195.167
Multiplier	1,16	1,40	1,37	1,69

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