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Exploring the Road to Agricultural Sustainability by Assessing the EU Debt Influencing Factors

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Abstract: The importance of agricultural financing in ensuring food security and safety, jobs, poverty reduction, economic growth and more recently, climate change mitigation, natural resource conservation and sustainable development imposes periodic analysis of the factors which might influence the farmers' financial situation, in order to improve it. One way of assessing this is to analyze the agricultural debt. In this context, based on previous models, the paper aims to assess the impact of specific factors on the agricultural debt level in the European Union during 2008–2015, as these should be considered in future common agriculture policies as well as in achieving sustainable agriculture. The research was conducted based on econometric techniques, by applying panel models in the Eviews 7.0 software-64 bit version. More than 20 variables were considered in the analysis. Some of the findings suggest that an increase in subsidies as well as the share of cash flow in the total existing capital would determine considerable reductions of the total debt. Decoupled subsidies seem to have a higher impact than coupled subsidies on short term debt, while its value is between the one found for coupled subsidies in the case of long term debt. Large farms/companies, to which decoupled payments are granted, have higher debts on long run and on total debt. The same units, to which coupled subsidies were granted, have smaller short-term debt. In contrast, the increases of labor costs, fixed costs, and crop/livestock costs lead to an increase in the total debt, since the farms require additional financial resources to cover the expanded costs. Also, the results suggest that short-term debts are mainly formed of long-term loans that reached maturity. In this case, the authors support the idea of differentiated financing programs for the agricultural activities because of their peculiarities and reinforced by the need to turn the intensive agriculture into a sustainable and plentiful one.

Keywords: agricultural debt; cost; crops; livestock; payments; subsidies

1. Introduction

Having access to financing resources is essential for the development of any economic sector. Even so, this is a particularly important issue for the agricultural sector, as the shift from subsistence agriculture to commercial production farming was strongly desired [1]. Nowadays, another shift is targeted, the one towards sustainable agriculture [2]. The problem of finding financing resources is closely related to the forecasts according to which the earth's population will reach 9.1 billion inhabitants by 2050 [3]. If the current population of about 7.6 billion is considered [4], then an increase of about 1.6 billion people in absolute values, respectively 21.33% in relative values is expected. According to the G20 Agri-finance Report [5], agricultural output should increase by 70% to meet the 2050′s population food needs, considering also the climate change, the urbanization process and the pressure on agricultural land. According to the same report [5], more than three quarters of the low-income population lives in rural areas. A total of 80% of them depend directly or indirectly on agriculture. Therefore, in poorer countries, agriculture is a key sector in ensuring economic growth, offering most jobs and accounting for 20% of the GDP. In contrast, in developing countries, agriculture is characterized by low productivity rates and by the lack of considerable efforts to sustainably accelerate the growth of the sector.

Similar to other sectors, those who decide to invest in agriculture, either local farmers or foreign investors owning plantations, processing factories, storage facilities or fertilizer-processing enterprises, need financing from third parties to develop their business. The lack of financial support could lead to poor business activities because of further rising problems, such as the impossibility to acquire knowledge or innovative technologies [6]. Badulescu et al. [6] also found that the supply of financing is lower in rural tourism business than in the urban tourism business. In addition, Drăgoi et al. [7] emphasizes the financial challenges faced by the public administrations from poorer areas to co-finance local projects. Doran et al. [8] believes that investing in agriculture is one of the most effective ways to promote food security and reduce poverty. The poverty rate could be reduced up to four times compared to other sectors [9]. In a more specific study, some financial difficulties of the farmers are debated considering the multiple implication of agricultural production [10]. Further, Vasile et al. [11] emphasizes the importance of the financial support in developing the organic agriculture sector which contributes to sustainable development. In addition, Lango [12], de Fazio [13], and Zolfani [14] highlight the need for investment in turning all agriculture into a sustainable one, to help stabilizing the environment and ensuring global food security. Aghion et al. [15] builds a strong case on the importance of knowledge spillovers from the auto-industry to other industries in the same area. They consider that if one industry turns to a sustainable activity, the others would follow, if there aren't any financial restraints such as debts, as Aldiero and Vinci [16] support the idea that sustainability is a key issue for every firm/company. This does not exclude agricultural companies.

In the current context, there are several factors which stand as impediments to the development of financing possibilities for the agricultural sector. Problems related to business financing in rural areas arise both in underdeveloped countries and in developing countries. These problems include transaction costs, the risks associated with the agriculture field and the lack of financial sector development. According to IFAD [17], rural transaction costs are much higher than urban transaction costs because the population is highly dispersed, and the infrastructure is poor.

The financing of agricultural activities must take into consideration their risks. There are production risks related to drought, floods or pests, as well as risks linked to the low ability of producers to provide collateral guarantee, either because they are not the landowners, or because their properties have very low values which cannot be used as guarantees [17–19].

From a financial systems perspective, there are situations, especially in developing countries, where the system is not adapted to the agricultural sector, as it lacks specific financial services or innovative tools. Even if financial services are available, they may not be appropriate for all agricultural activities. For example, in seasonal activity, financing is needed at certain stages of the production process. In the same time, financial services can only be applied at a general level without being appropriate to the considered situation. In this case, several additional programs of financing the agriculture were developed and implemented, and the European coupled and decoupled payments are relatively successful instruments which are part of those programs [18,20,21]. Yet, further development of specially designed financial programs must be implemented for the peculiar agricultural sector.

The purpose of this research is to assess the impact of specific factors related to the agricultural activity on the farmers' borrowing process, in order to find which of the factors positively and negatively affect the debts. The analysis also aims at comparing the obtained results with the state of the art in the field while providing explanations by considering the economic approach. The analysis serves to revealing some agricultural particularities of EU Member States, in order to enable specific financing programs for the farmers. In addition, the findings could represent an indicator of the status of the sustainable development in the agricultural sector.

The study begins by presenting the current situation and concerns regarding the financial needs of the agricultural sector, as well as their motivation. The structure of the remaining paper is divided in several sections. Section 2 refers to the literature review which aims to provide evidence on two directions: the studies which focus on the factors that impact the debts in the case of agricultural entities, and the studies which focus on the objectives of farmers and policy makers in the agricultural sector in what concerns mainly financial and sustainability aspects in the field. In other words, it presents an evolution of concerns, opinions and results of different studies and approaches that led to the existing knowledge in the field of agricultural debt, the selection of the reviewed articles was made randomly from the Web of Science and Scopus database. Section 3 presents the methodology of research, both with models of estimation and with the significance of the variables included. Moreover, the methodology of research reveals both similarities and differences with other studies. Section 4 refers to the results found from the OLS simple pool analysis (the basis analysis). Section 5 reveals the robustness analysis where the authors used adjusted models that correct the autocorrelation and the heteroskedasticity between the cross-sectional data. Section 6 focuses on discussing the results and the effects of independent variables on short/long term debts, emphasizing the difference between them. Section 7 provides information about the conclusions of the research, its value added, its problems and further development of it. Some concluding remarks end the present study.

2. Literature Review

Agriculture stands out as a different kind of economic activity, one that has its own rhythm of development and change resilience. Even so, it employs many people all around the world and it should offer food security for a constantly growing population [3]. Also, agriculture is the main source of income for the poor, so an increase in the agricultural sector should reduce social disparities and poverty quickly and efficiently [9]. Such an increase may be translated in a need for external financing, such as FDI and remittances [22], which is not new, as several authors [19,23] explained. Research [18] reveals that the increased need for financing appeared when technological innovations started to focus on agricultural activities. That was the moment when the size of the farm started to matter [24–26]. Large farms received intense subsidizing [27] that diminished the risk of investing in new technology, thus, they managed to increase their production yields. This was a risk that smallholder farms could not afford [19]. Besides subsidies, the USDA [28] speaks about another form of financing agricultural activities, through credits. Yet, the suggestion is to help the farmers get rid of debt. Following this suggestion, Musser et al. [19] includes risk taking into the analysis of optimal farm capital structure. His study reveals that small farms are more willing to accept lower competitive returns than large farms because of their high rates of self-employment and business ownership. Also, age is another influential factor in getting a credit, considering that, [19], elderly people are associated with less likelihood of relying on debt to finance the agricultural activities. Other factors such as education or farm size have a double role, as Sebatta et al. [29] and Barham et al. [30] revealed. The contracted credits positively influenced the level of education of the borrower and of his children, and determined an increase in farm size, which, in turn, positively influence the granting of future credits. Also, Sebatta et al. [29] and Gine et al. [31] observed that factors such as the existence of saving accounts and mobile telephony access are favorable in getting a credit. The educational factor directly influences the strategic management of a farm and reduces the common hazard, which leads in assuming more risky investment decisions [20,21,23].

In a more recent study Monke [18] confirms that agriculture is an economic activity that possesses more risk of not repaying the debts, so credit institutions must take several factors into account when they receive a credit demand. In this case, small farms are less likely to receive a credit and are more exposed to loss [32–34]. According to Monke [35] loans are offered only for three types of activities: operating activities for feed, seed, fertilizer, or fuel granted for short term period, installment activities for equipment or breeding livestock granted for medium financing needs and real estate loans offered for long term financing of land, buildings, and homes.

International efforts were made to supply agriculture with financial resources [36–38]. For example, the Farm Credit System of the USA, was used as a last resort financing source [18,39] which was created especially for the risky agricultural activities, its result being the development of the rural areas. Another example is the voucher system used in Tanzania for fertilizers [40], which is a system that failed since the vouchered amount was too small to be used. Toby and Peterside [41] and Ayeomoni and Aladejana [42] suggest that a boost from the authorities' part in African countries is necessary in order to favor crediting to farmers. Another author [43] reveals that the preferred form of financing agriculture in the Sub-Saharan countries is from another activity, which turns agriculture into a hobby or a second job. India, on the other hand, proves to have a credit-dependent agriculture, even though the crediting conditions are difficult [37].

Europe has its own special form of supporting farmers, through subsidizing. By direct payments on the utilized agricultural area or on the number of animals in the farm—decoupled payments [44] and by offering a support for a minimum quantity of products—coupled payments [44], the EU agriculture reached its objectives of offering food security to the citizens and became a lead producer of agricultural products in the world [45]. Also, at the EU level, loans are provided from financial institutions at a preferential interest rate, over a long period of time and with a reduced collateral security. For those who carry out farming activities, the goal is to develop agro-tourism or food processing/distribution or to invest in equipment to ensure sustainable performance. Micro-credits may also be granted for a short period of time and do not require a collateral guarantee for the purchase of equipment, increase in value added and quality of production or livestock, with the purpose of developing strategic Community projects [46].

Nowadays, both researchers [12,13,47–50] and institutions, such as FAO [50]; UN [3] EU [2,45], agree on the fact that agriculture should become more sustainable. Since climate change became the most feared threat to human kind and agriculture impacts heavily on it [3], there is an increased need for financing the changes towards sustainability, while still ensuring food security for the whole population [12].

In China, Hu and McAleer [51] consider that the agriculture should turn to sustainability measures as most of the capital is foreign; a different attitude would mean capital shortages for the farming activity. The EU also considers that the regulations of direct payments (coupled and decoupled) are the booster of general agricultural change [52], based on the best practices cases which were enabled [53]. Hence, the EU, through the Common Agricultural Policy, aims at supporting European farmers with financial aid for changing the current intensive agriculture into a more sustainable one [2]. Ecorys et al. [52] concludes that the greening options were not a priority for most farmers as higher flexibility was granted through the measures of subsidizing in Pillar I. In this case, the current EU consultations [54] emphasize the importance of direct payments in achieving agricultural practices by creating benefits for the environment. At international level, several projects can be mentioned as they emphasize the need and the impact of adopted agriculture policies. Thus, a document of the European Commission [55] shows the way in which the aid granted managed to contribute to the agriculture development. In this regard, the following programs are mentioned: the "Micro-projects Programs" in Ghana, the "Promoting Rural Development amongst Farmers" in Cameroon and the "Productive Safety Net Program" in Ethiopia.

The European Communication COM (2017) 713-final [2] suggests that direct payments should be linked to greening performance. However, this decision would generate financial loss especially for small farms, which also have a low level of capital. Further, these also have difficulties in obtaining a credit. In this context, differentiated forms of subsidizing for farms by dimension should be taken into consideration.

The importance of the subsidies was researched in various publications [21,56,57]. Their results suggest that they could be considered a safety net for the farmers, enabling them to obtain a credit for financing their activities. O'Toole and Hennessy [57] reveal that decoupled payments reduce credit constraints, while Ciaian et al. [21] argues that subsidies have a different impact on bank lending, as they can influence the granted amounts both positively and negatively. The effects are based on lending constraints, which small and medium-sized farms have, the period when subsidies are allocated (at the beginning or at the end of the production period), the type of loan and the type of subsidies, and the internal and external costs of financing. Given that financing through financial institutions is more expensive than financing through subsidies, subsidies will negatively impact the value of loans, even if the entity does not face certain lending constraints. This phenomenon is encountered when subsidies are paid at the beginning of the production season, which gives borrowers the opportunity to obtain financing in a cheaper way. On the other hand, entities are skeptical in contracting a loan either from a domestic or a foreign market when credit constraints occur. Under these circumstances, the subsidies have the effect of expelling/diminishing the loans. If subsidies are granted at the end of the production season, they can no longer be used for the purchase of raw materials, but they can be used as a collateral guarantee to obtain a loan at the beginning of the next season [21,58,59]. In the same matter, a survey by Kołoszko-Chomentowska [60] analyzes the effects of agricultural financing for ten Member States: Cyprus, Czech Republic, Estonia, Lithuania, Latvia, Malta, Poland, Slovakia, Slovenia and Hungary. The results indicate that those countries registered agricultural improvements after the EU accession, especially in terms of production factors and their efficient use [60]. Existing developments were due mainly to the subsidies granted through the Common Agricultural Policy [60]. In this regard, the sustainability of the agricultural entities was ensured in 2009 by using subsidies and no other forms of financing. Without them, the financial result would have been negative. The outbreak of the financial crisis overlapped with the increase in the number of loans granted and the decrease in fixed assets [60].

Other studies focus on the factors that may describe the agricultural crediting sector. In this regard, Betubiza and Leatham [61] assess credit at the level of agriculture. They concluded that rural banks are more focused on agricultural loans than similar banks in the urban area, location being an important factor. Consequently, these results are justified by the fact that the rural banks are mainly oriented on the development of the agricultural sector, while the financial ones that belong to urban area are focused towards satisfying a wide range of services. The results [61], also indicate lower contracted loans when the borrowers' agricultural area is larger. Betubiza and Leatham [61] conclude that urban financial institutions have a more diversified portfolio of clients and are more flexible in providing or not financing for the agricultural field. On the other hand, rural banks are developing their services for financing the agricultural sector. The existence of multinational banks also favors the granting of financing for the agricultural sector. In addition, capitalized banks provide more loans to agriculture than those who are not capitalized. There are more agricultural allowances available within profitable agricultural communities than in communities where farming activity is not sustainable. Borrowing is provided in those communities where the farmer's income is relatively constant and does not have a higher volatility. Landowners also have fewer real estate loans than those who rent out agricultural land, because of the lack of capital and higher financing needs. Also, the results suggest that as the associated risk gets higher, the financing for the agricultural sector will be lower.

Other authors [62] analyze the factors that influence financial institutions in lending farmers or agricultural entities in two USA states: Kansas and Indiana. Their results suggest that the degree of risk, the scoring function and the probability of default are factors that significantly influence the credit decision. Financing also depends on the bank's agricultural experience, the number of long-term loans and the time spent developing credit activities for the agricultural sector. Kohansal and Mansoori [63] focus on the factors that influence the repayment capacity of the borrowings contracted by farmers. These are high interest rate, farmer's experience and total costs considered for granting the requested amount. The main reasons for non-repayment are studied by Mehmood et al. [64] and they may by classified into two categories: bank related (high interest rate, obtaining less financing than the amount needed to develop the business, the distance from banking institutions) and borrower related (commodity prices, problems in the distribution chain or the value chain).

The specific indicators for debt are identified in a study conducted by Petrick and Kloss [65] regarding 9 EU countries: Denmark, France, Germany, Greece, Ireland, Italy, Poland, Spain and the UK over a 10-year period: 2000–2009. Considering the interest rates, Greece paid the highest interests with the highest fluctuations. This is because the indicator refers to an average of short, medium and long-term loans. Until 2009, there was a decrease of this indicator, except for Denmark and Portugal [65]. Regarding the level of indebtedness, the most indebted are the agricultural entities in Denmark because the leverage ratio is more than 50% and the leverage on property has doubled [65]. The explanation is given by the liberal financing system. Denmark stands out also by the fact that, until the crisis started, it had easy access to the credit market by offering real estate mortgages. Lending was heavily used in countries such as Germany and the UK, while in Greece, Ireland, Italy, Portugal and Spain the credit level was very low [65]. Regarding the net investment, Denmark had the main role, even if investments declined sharply in 2009 [65]. Also, in Ireland investment fell sharply, while in Greece and Italy the values were negative, which shows a sudden drop in capital [65]. In essence, in all the countries under review, there was a decline in agricultural financing, although in Portugal and Greece the exchange rates were above average. In Portugal those who obtained agricultural financing paid lower interest rates than those in other sectors, while in Greece the highest interest rates were registered in agriculture [65]. It is possible to say that the agricultural credit market is segmented, mainly by country, and not by the currency used or by the region to which they belong [66]. At EU level, before the crisis began, the largest borrowing per farm was in Denmark. The indebtedness of the agricultural entities is not correlated with country-specific risk premiums, which is highlighted in bond yields. Therefore, in countries where the public system had a precarious financial situation and where local interest rates were correlated with risk premiums, the agricultural sector was not directly exposed to the rapid rise in interest rates because it was less indebted [66]. The differences between member countries have allowed hedging operations to minimize the risk of loss in agriculture.

Table 1 synthetizes the main findings in the literature.

Table 1. Main findings in the scientific literature by chronological published year of the studies.

Main Findings	Reference
The USDA considers credits as a last resort solution for farmers and promotes the policy of helping farmers to pay the debt so they can concentrate on investment.	[28]
The smallholders could not afford credits, since they had few or no collaterals at all.	[19]
Large number of small farms would continue to survive in spite of the increasing concentration of land on larger units over the post-war period.	[24]
The controlling of the demographic effect pointed out that higher commodity prices, lower real interest rates, and lower land values are associated with greater entry of young people in the agricultural sector.	[25]
The allocation of land was made to the most efficient uses and users. Yet, in practice, land ownership rights are influenced by power relationships.	[27]
The results show that rural banks are more focused on agricultural loans than similar banks in the urban area, as location represents an important factor. Also, the larger the agricultural area of the potential borrower is, the lower the contracted loans are.	[61]
The study on 950 market-oriented small households in Guatemala revealed credit unions relax credit constraints for a significant portion of those rationed by banks, but not the poorest of the study households.	[30]

Table 1. *Cont.*

Main Findings	Reference
Specific conditions of agriculture, such as spatial dispersion or covariance of risk, exacerbate the difficulties faced by small farmers in engaging in collective action. In this case, family farmers had a very limited possibility to counteract the political influence of rural elites.	[23]
The study on 40,000 Australian farms reveals a differentiation between two centers of attraction, in terms of farm size. The correction for size-related attrition bias had little effect.	[26]
Farmers face stiff competition on a free market. This helps with developing a regional identity for the products and also allows farmers with better education and managerial skills to develop rapidly.	[20]
The presented model distinguishes two market regimes—a developed post-transition market economy and a transition economy. The most important result shows that there is a failure of collateral as a screening instrument in credit markets of transition economies.	[59]
The technological innovations determine a need for investment from the part of farmers. Implicitly, the agricultural crediting sector has developed and contributed to the development of intensive agriculture.	[18]
The research estimates production efficiency in the agricultural sector in China with a panel data set comprising 30 provinces between 1991 and 1997. The results show that if economic growth is fueled by investment, an exodus or a shortage of foreign capital will render growth unsustainable.	[51]
The results on two USA states suggest that the degree of risk, the scoring function and the probability of default are factors that significantly influence the credit decision.	[62]
The study indicates the way in which the granted agricultural aid managed to contribute to the agriculture development and it gives the examples of several "micro-projects".	[55]
If subsidies are granted at the end of the production season, they can no longer be used for the purchase of raw materials, but they can be used as a collateral guarantee to obtain a loan at the beginning of the next season.	[58]
The results on Indian households reveal that even though there are several gaps in institutional credit delivery system, credits are still playing a critical role in supporting agriculture production.	[37]
The factors that influence the loan repayment capacity of a farmer are: high interest rate, farmer's experience and total costs considered for granting the requested amount.	[58]
The agricultural sector should reduce social disparities and poverty quickly and efficiently.	[9]
The research shows that in countries where the public system had a precarious financial situation and where local interest rates were correlated with risk premium, the agricultural sector was not directly exposed to the rapid rise in interest rates because it was less indebted.	[66]
The study implies that there are differences between small and big farms when it comes to using the subsidies as guarantees for loans. Big farms use subsidies to increase long-term loans, while small farms use subsidies to obtain short-term loans. The subsidies produce a crowding out effect for short-term loans in the case of big farms and for long-term loans in the case of small farms. The effect remains significant even after controlling for the endogeneity.	[21]
The experiment proved that the fingerprinting method led to substantially higher repayment rates for borrowers with the highest ex-ante default risk but had no effect for the rest of the borrowers.	[31]
The reasons for non-repayments are revealed by the analysis, and they are: bank related factors (high interest rate, obtaining less financing than the amount needed to develop the business, the distance from banking institutions) and borrower related factors (commodity prices, problems in the distribution chain or the value chain).	[64]
The vouchering system used in Tanzania for supporting the farmers failed, since the vouchered amounts were too small to be used.	[40]

Table 1. *Cont.*

Main Findings	Reference
The specific indicators for debt are identified in an analysis on 9 EU countries: the interest rates, the level of indebtedness, and the net investment.	[65]
Direct payments are formed by coupled payments—financial support given for the production of minimum quantities from certain agricultural products and decoupled payments—financial support given for the total agricultural area or the number of animals.	[44]
The results of a 1326 household questionnaire in Zambia revealed that factors, such as education level of household head, size of household and number of daily meals served, significantly influence decision to access finance, while loan payback period, having a phone and personal savings influence the intensity of participation in the rural financial market.	[29]
By using both descriptive and inferential techniques as well as designing two multiple regression models, the authors reveal that Nigeria's commercial and merchant banks lagged behind in financing agriculture when compared to manufacturing.	[41]
The research results indicate that the ten analyzed EU countries registered agricultural improvements after the EU accession, especially in terms of production factors and their efficient use.	[60]
Agriculture is a main development priority as it should offer global food safety and security, along with environmental protection.	[3]
The study confirms that agricultural financing is a crucial domain for ensuring food security and poverty reduction.	[36]
A crediting system designed for the specificity of agriculture has contributed to the development of this sector and of the rural areas in the US.	[39]
The financial instruments offered by the EU for funding agriculture and rural development are treated as sustainable ways of developing people, resources and business in the rural areas.	[46]
The subsidies are considered a safety net by the farmers due to the guarantee they offer in obtaining a bank loan.	[56]
The research results reveal that decoupled payments reduce credit constraints.	[57]
Ensuring food security and poverty reduction are two main issues for the global authorities, but also for individual citizens who can take action by performing a sustainable agriculture.	[12]
The short supply chain has proven to be a tool in favor of sustainable productions and environmental, social and economic benefits.	[13]
The study reveals that small farms are less likely to receive a credit and are more exposed to loss.	[38]
The findings of the Auto-Regressive Distributed Lag approach showed that short and long run relationship exist between agricultural credit and economic growth in both short and long run in Nigeria. Economic growth is influenced by dynamic variables, such as credit to agricultural sector, real exchange rate, real interest rate, private domestic investment and inflation rate.	[42]
The study uses CAPRI—Common Agricultural Policy Regional Impact-modeling analysis for calculating greenhouse gas emissions for the major non-CO_2 sources in agriculture. The results point out to several issues such as: production effects, the importance of technological mitigation options and the need to consider emission leakage for an effective reduction of global agricultural GHG—Greenhouse Gas-emissions.	[47]
The results show that the focus on sustainability issues in the literature is a recent one and the analysis of climate change on wine production sustainability is primarily focused on the environmental aspects and not to the socio-economic ones.	[48]
The innovative factors of development in the wine industries are analyzed through an econometric model. The results show that policy implications could be useful to develop supportive actions to innovation.	[49]
The analysis shows that, even if the CAP—Common Agricultural Policy- has become more complex, there are still concerns regarding further CAP impact. The member states strategies of reaching the three main CAP objectives are poorly documented.	[52]

Table 1. *Cont.*

Main Findings	Reference
437 landowners were questioned, and their responses were analyzed in relation to changes in land use intensity and agricultural production in the 2001–2011 period. The importance of farm size and farmer type in understanding changes in land use intensity has been highlighted.	[53]
The study revealed that loans are offered only for three types of activities: operating activities for feed, seed, fertilizer, or fuel granted for short term period, installment activities for equipment or breeding livestock granted for medium financing needs and real estate loans offered for long term financing of land, buildings, and homes.	[35]
European farmers should be given subsidies for continuing to have large productions, but also to guide them towards a sustainable agriculture.	[2]
The study reveals that in Sub-Saharan countries the most used form for financing the agriculture is from another economic activity.	[43]
The EU agriculture reached its objectives of offering food security to the citizens and became a lead producer of agricultural products in the world. Now, it must face the challenge of becoming more sustainable.	[45]
Climate change and migration from the rural areas are issues that can be diminished by proper investments in agriculture.	[50]
The current EU consultations emphasize the importance of direct payments in achieving agricultural practices by creating benefits for the environment.	[54]

Considering these aspects, it can be seen that most studies relate either to financial institutions and their characteristics, to provide financing for the agricultural sector or to analyze certain aspects of indebtedness at the level of some member states at the EU level. What can be noticed is that there is no mix of endogenous and exogenous factors that could affect the debts of the agricultural entities. Thus, this research paper aims to emphasize the impact of several agricultural factors, on total debt, short-term debt and long-term debt in order better predict related risks for a sustainable agricultural business which, further, could contribute to sustainable development.

3. Methodology of Research

The data from the Farm Accounting Data Network (FADN) [67,68] database were analyzed for the agricultural holdings, which could be considered commercial, regardless their size. Even if the observations of Kelly et al. [69], regarding the impossibility of assessing the current sustainability of agriculture were noted, the main idea of the present study was not to see how sustainable the agriculture is, but to identify the factors that can influence the debt which small, medium and large farms have at the EU level, as these further determine the sustainability level of agriculture. In this respect, it was collected the data for all the 28th EU Member States for all the considered variables presented in Table 2 from 2008 to 2015. The period was chosen considering the study conducted by Ciaian et al. [21]. On one hand, the analysis is conducted on 1995–2007 period; on the other hand, during that period, the effect of the economic crisis on the Common Agricultural Policy and on the level of the loan can be highlighted. Another argument for the period choice is that the study by Ciaian et al. [21] did not use Romania and Bulgaria, as they joined the EU in 2007. In our research, both countries were included. On the other hand, Croatia, which joined the EU in 2013, was not included into the analysis as the available information for it was from 2013 or from 2014. Therefore, the available data were not comparable to other countries' information, as the Czech Republic had a maximum of three reporting periods.

The econometric approach was conducted using panel models. Unlike linear regression models, panel models attempt to quantify the effect considering both cross-sectional correlations and correlations that may occur throughout the period.

Panel models can be estimated with fixed effects or with random effects. Fixed effect estimation allows control of the heterogeneous component which was not included in the analysis and which remains constant over time or between cross-sectional elements. By using these effects, the impact of the variables not included in the analysis and the possibility of having biased coefficients (i.e., the average value of the estimator does not reach its true value, or otherwise the average sample distribution is not equal to the actual value of the parameter) is diminished.

The random effects are used in a situation where they offer better results compared to fixed-effects estimation. The difference between them is that in fixed panel models, the free term varies according to each observation (more precisely, a constant is added for each observation—cross-sectional variable—if fixed cross effects appear in section, respectively, a constant for each period of time—if fixed effects are used over time), while in the case of random effect models the fluctuation is observed in variance (besides the classic error term, it still could be found an additional error term). More precisely, if for fixed-effect models the variance is constant, in the case of random effects models it flutters, so it is not constant.

The panel model on which the analysis is conducted is presented in Equation (1)

$$\begin{aligned} Debt\ Variable_{it} = \ & \alpha_{it} + \beta_{it} \times coupled\_payments_{Var} + \gamma_{it} \times decoupled\_payments_{Var} \\ & + \rho_{it} \times other_{Var} + \varepsilon_{it} \end{aligned} \quad (1)$$

where *Debt Variable* is our dependent variable such as total debts, long term debts or short-term debts, i measures the cross-sectional effect, t measures the period effect, while ε reveals the error term. Regarding the independent variables, they could be grouped in variables that are related with coupled payments ($coupled\_payments_{var}$), in variables that are linked with decoupled payments ($decoupled\_payments_{Var}$) and in variables that are related with other elements, such as cost or ratios indicators ($other_{Var}$).

Considering the model presented in Equation (1), $\alpha_{it} = \alpha_i$ if the model is estimated with cross-sectional fixed effect, $\alpha_{it} = \alpha_t$ in case of period fixed effect or $\alpha_{it} = \alpha_{it}$ when both elements are considered. In random effect model, there is no additional constant, meaning $\alpha_{it} = \alpha$, while the error term is a sum between the error term ε and other error term σ. In other words, the variance is $\omega_{it} = \varepsilon_{it} + \sigma_{it}$. The additional variance term fluctuates, and its mean is zero. To choose between the two models: fixed effects models and random effects, the Hausman test was used. This has a null hypothesis that the random-effects model is a much better estimator than the model where fixed effects are used. The model was proposed by Hausman [70].

In order to conduct the analysis, 24 variables were used. From these variables, three were considered dependent variables (total debt, long-term debt and short-term debt). Each variable, if not expressed as a percentage or as a ratio between other variables, was scaled to the agricultural area used (measured in hectares). This measure was taken to exclude existing correlations from the available information. Also, using this mathematical trick, the heteroskedasticity level that data might have can be decreased. The three dependent variables are the total amount of loans, the total amount of long-term loans and the total amount of short-term loans.

The logarithmic value was used for creating variables with low correlation, and for providing an interpretation based on elasticity. Therefore, the economic interpretation of the results is supported by this process. The explanation is based on the fact that the interpretation is in percentages, so the measure unit would not have any influence.

Regarding the 21 independent variables, it should be noted that some were obtained by processing other variables from the FADN database [67]. Along with the dependent variables, these were reported to the utilized agricultural area and adjusted by logarithmic value. Information about the initial forms of the variables (both dependent and independent) together with other research where they were used is presented in Table 2.

Table 2. The variables included in the analysis.

Symbol	Name	Initial Measurment Unit	Meaning	Studies Where the Variables were Included
TD	Total debt	Euro	The total amount of debts recorded at the end of the year	[21]
LTD	Long term debt	Euro	The total amount of debts over a period of one year	[21]
STD	Short term debt	Euro	Total debt for a period of less than one year or outstanding cash payments	[21]
CP	Coupled payments	Euro	Total subsidies for minimum quantities of crops, livestock or animal products (milk, meat, etc.)	[21,44,67]
DP	Decoupled payments	Euro	Single farm payment and single area payment scheme. Additional help is included	[21,44,67]
TACP	The correlation between farm size and coupled payments ($TACP = TA \times CP$)	Euro	The product between the total assets of a farm (farm size) and coupled payments	[21,27]
TADP	The correlation between farm size and decoupled payments ($TADP = TA \times DP$)	Euro	The product between the total assets of a farm and decoupled payments	[21,27]
TATD	The correlation between farm size and total debt ($TATD = TA \times TD$)	Euro	The product between the total assets of a farm and total debt	[21]
AVFAWU	Net added value of the firm per agricultural work units	Euro	Net added value of the firm per agricultural work units	[21,24–26]
TA	Total assets	Euro	The value of the total assets of the farms analyzed	[24–26]
CW	Contract work	Euro	Costs related to work done by contractors and rental of the equipment	
EF	External factors	Euro	Remuneration for the factors: labor, land and capital, that are not owned by the owner (includes renting employees and interest)	
%IEF	Share of interest in external factors	%	Share of interest in external factors	
%REF	Share of rent in external factors	%	Share of rent in external factors	
%EEF	Share of employees in external factors	%	Share of employees in external factors	
SC	Specific costs	Euro	Specific costs with crop and livestock inputs	
SCC	Specific crop costs	Euro/ha	Specific costs for crops per hectare of cultivated areas	
SLC	Specific livestock costs	Euro/living unit	Specific costs for livestock per living unit	
%CQ	Share of production obtained in cultivated areas in total production	%	The ratio of crop production to total production per country. Total production includes crop production, livestock production and other types of production.	
%LQ	Share of livestock production in all production	%	The ratio of livestock production to total production per country. Total production includes crop production, livestock production and other types of production.	[21]
%CF	Share of cash flow in total held capital	%	The ratio between the cash flow and the total capital of the firm	
OW	Own work	%	The ratio of work done by a family to total work	[21]
LL	Leased land	%	The ratio between the rented land and the usable agricultural area	[21]

Note: The farm size is defined as total assets of a farm.

To conduct the analysis, two techniques were used: the first is the pool model- its aim is to highlight the overall impact on the dependent variables: long-term debt, short-term debt and total debts. The second model was chosen based on the sample's characteristics.

The first way of estimation, the pool model cannot emphasize the cross-sectional effect, the period effect or both. Moreover, it considers that the variance of the model is constant, thus, that no random effect exists. The estimation is similar with a simple OLS model and reveals the mean value of the sample (the overall tendency of the sample), but simple OLS no do not allow us to test for cross equation restrictions. The second way of estimation adjusts for arbitrary cross-sectional heteroskedasticity and corrects the existing autocorrelation.

According to Reed [71], the method of estimation depends both on the number of components considered in the analysis and on the number of existing periods. Considering the characteristics of the sample, in which there are 27 countries and 8 periods, and Reed's recommendations [71], the estimation method is the Period SUR effect within the generalized least square method. The technique was chosen because the number of periods (8) is less than half of the states included in the analysis (27). The Period SUR method for estimating the generalized least squares method corrects the heteroskedasticity and the contemporary (cross sectional) correlation of the errors associated with the analyzed period and it groups the elements cross-sectional, according to the countries included in the analysis. For the results to be robust, it is necessary to use a correlation matrix appropriate to the estimation method. In this case, the estimation of the correlation matrix was conducted by using the White Period. White Period method, considers cross-sectional data errors to be correlated within the series, based on cross-sectional grouping. The estimator is built to adapt to the arbitrary heteroskedasticity found in the cross-sectional series.

The peculiarity of the estimator used is related both with the Period Sur effect and with the White period correlation matrix. In case of generalized least squared method, the estimated coefficient matrix is consistent with the coefficient matrix under the assumptions that the mean of the error term is zero and the unconditional variance of errors is positive and non-singular. The importance is that when performing asymptotic interference of coefficient matrix by estimated coefficient matrix, we do not consider that the estimated unconditional variance of errors differs from the initial unconditional variance of errors (Wooldridge-pp. 148–160 [72]). Regarding the correlation matrix, it ensures robustness in the presence of any heteroskedasticity or serial correlation when T (time) is relative small to N (the number of cross-sectional data) (Wooldrige-pp. 246-276 [72]). The model that was estimated includes the effects during the period and does not include the influence of country or of geography. In order to observe these effects, it is mandatory to conduct another analysis in which the cross-sectional fixed effects are encountered or where dummy variables are used for quantifying the effects of region, geography and country. For this analysis, the method of estimation was not the cross-sectional fixed effect, rather the period fixed effect as it provides better results; the estimators present higher consistency and unbiased values. Further research aims to surprise the effect of region, geography and country.

The Eviews 7.0 econometric program was used for conducting the analysis, which was based on 10 research hypotheses, namely:

Hypothesis (H1). *The higher the subsidies under the Common Agricultural Policy are, the lower the total amount of debt (total, long-term, short-term) is. The increase of subsidies in agriculture leads to additional resources for farmers to finance the agricultural inputs required for crop and livestock production. In this way, the farmers reduce the loans contracted as the subsidies cover some of their costs [21,57–59].*

Hypothesis (H2). *The larger the size of the farm and the subsidies under the Common Agricultural Policy are—both coupled and decoupled type—the higher the total debt, the long-term debt and the short-term debt are. Although the subsidies increase under CAP, larger farms have the capacity to contract higher and more* *advantageous loans and to make significant investments because of their higher collateral guarantees than smaller farms [19–21,24,26,29].*

Hypothesis (H3). *The higher the value of the farm expressed in labor units is, the higher the debt value (total, long-term, short-term) is. The farms with higher values usually offer stability both for their employers and employees and can contract more advantageous loans [21,24–27]. In addition, the valuable the farm is on the market, better conditions of contracting it might have. The value can include, among the financial assets also the -brand, the characteristics of investors, the working conditions, etc.*

Hypothesis (H4). *The higher the specific costs are—for both crops and livestock—the higher the amount of debt (total, long-term, short-term) is. Additional costs must be financed by additional resources, which are procured in the easiest way from loans.*

Hypothesis (H5). *The higher the share of crop or livestock production in the total production is, the lower the total value of the debt (total, long-term, short-term) should be. In this case, the production is expressed in euro and its increase should determine additional revenues which might finance the agricultural activities of the farm. On one hand, the crops usually have an intensive character compared to other agricultural land categories, which gives extra value. So, the increase of the crop share in total outcome production generates higher outcomes and, further, decreasing debts. On the other hand, the livestock includes higher added values compared to vegetal production, as it partially incorporates the crop outcome, and it represents the first step of agriculture towards industry. In this context, the added values generate higher income, which could lower the debt level. In both cases, these additional revenues could be generated by ensuring agro-food security of a country or additional export activities. Their economic effect represents a positive externality. So, it should decrease the contracting value of loans. Higher production outcomes could generate higher stability on short or long term. While crop production could decrease the value of short term loans, as is more quickly converted to cash, the livestock production could affect the value of medium and long-term loans, as it takes longer to be converted into cash, but with higher added value. This assumption is because we do not have information if the entities included into the analysis are engaged in livestock, crop or both activities. In fact, they could have mixed farming systems which impact their economic dimension. According to [73], a possible indicator for long term sustainability is the level of debt as the mixed farming system needs a long-term view, as it could be less resilient to market fluctuation for one product. Regarding short term sustainability, it is quantified considering cash flow and short-term debt. This is because the entity is less sensitive to the global market due to the diversification that their products have (crops and livestock, etc.). The hypothesis is based on the fact that we computed the elasticity coefficient between crop production/crop subsidies/ share of crop in total production and total production, between livestock/ livestock subsidies share of livestock on total production and total production and we looked at the characteristics of them (how many are below or above 1, the analysis being conducted both at country and overall level.)*

Hypothesis (H6). *The higher the share of the cash flow in the total existing capital is, the lower the total amount of debts (total, long-term, short-term) is. This hypothesis is based on the fact that a higher cash flow would lead to more financial resources at farm level. So, the need of credit is lower, as the future debt. [21] demonstrated that the cash flow negatively influenced the short-term loan. This means that an increase in the cash flow, the short-term loans are decreasing. This finding supports our hypothesis.*

Hypothesis (H7). *The higher the costs of external factors are, the higher the debt value (total, long-term, short-term) is. In general, higher costs lead to lower profits, decreasing the farm's possibility of continuing the activities or making investments without higher credits and further higher debts.*

Hypothesis (H8). *The higher the ratio of the leased land to the total arable land is, the higher the debt value (total, long-term, short-term) is. Of course, the leased land implies paying regularly a certain amount of money or giving products instead to the owner, these leading to increased costs of a farm. So, considering the arguments of H7 hypothesis, the debts increase as well.*

Hypothesis (H9). *The higher the ratio between the work done by the family and the total work is, the higher the debt (total, long-term, short-term) is. Usually, own work, which means the work done by family members who own the farm, is considerably preponderant in small farms, which have little financial resources and use credits to finance the continuity of their agricultural activities, increasing in this way the debts [19].*

Hypothesis (H10). *The higher the assets of farmers or small and medium-sized enterprises are, the higher the debt value (total, long-term, short-term) is. Usually, the acquisition of assets requires contracting credits, which determine debt growth [19,20].*

In order to disseminate information, fixed effects models were estimated. It should be noted that the estimation with fixed period effects was chosen because the cross-sectional fixed estimation provided some unreliable (R-squared and R-squared adjusted) credit worthiness (their value exceeded 90%), situation caused by the impossibility of controlling the auto-correlation phenomenon. It could not be determined if the autocorrelation phenomenon is associated with cross-sectional links or bindings during the period. Thus, the effect of region, geography or country was not included into the analysis; rather the effect of time was extracted.

In what concerns the conducted models, the analysis is based on 9 models on which the independent variables were included separately so that they are less correlated. In fact, correlation creates biased coefficient, which affects the economic interpretation. The biased results consider that the coefficients do not reach the true value of the parameter, rather a false value is found out. This affects both the econometric and the economic analysis that is conducted. Because of this, it was conducted using variables that have a correlation coefficient smaller than 0.5. The highly correlated variables (the correlation coefficient is higher than 0.5) were included in different models. The correlation appears even though the variables are scaled to the utilized agricultural area. In this way, the results of the all independent variables could be measured without having problems regarding the biasness or the consistency of the coefficients. The models were selected considering both their economic and their econometric interpretation, the purpose being to have reliable and trustworthy coefficients and interpretation.

4. Results

In order to provide reliable results, the analysis was based first on presenting the descriptive statistics of the variables included in the models. In this regard, the minimum and the maximum values extracted from the FADN database were highlighted for each variable. It should be noted that the variables were analyzed in agricultural unit values where their own units of measurement or percentage values could not be used. By presenting the minimum and maximum values, it was intended to highlight certain characteristics of the sample included in the analysis. The results are presented in Table 3.

The highest rates of agricultural unit debt are found in the Netherlands, a specific issue for both long-term and short-term debt. Concerning the latter category, the short-term agricultural unit debts have the lowest value in Italy [65]. In terms of coupled payments, in 2009, 2010, 2011 and 2015, Romania is the country that received the smallest amounts for crops, livestock and agricultural development, while the countries with the largest aggregate subsidies per farm are Malta, Finland and Denmark. Decoupled payments are low in Latvia, while the highest value is found in Greece.

Further, the lowest unit farm value is allocated to Romanian entities, regardless of whether they are coupled subsidies or decoupled subsidies, even if they are large-scale entities. The same effect is also identified for the total subsidies granted to agricultural entities. Even when considering their size, Romania has the lowest values compared to the Netherlands, which has the highest values. The value of the company in agricultural units is the highest in Denmark and the lowest in Malta. In terms of labor units, both the lowest and the highest values are registered in Denmark.

Table 3. Analyzed variables—highlighting the minimum and maximum values for each year of analysis and mentioning the country where they were recorded.

	2008		2009		2010		2011		2012		2013		2014		2015	
Symbol	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Total debt	68.65 Greece	18,641.10 Netherlands	88.90 Greece	21,066.61 Netherlands	66.90 Greece	21,805.39 Netherlands	62.03 Greece	21,898.63 Netherlands	41.76 Greece	22,897.47 Netherlands	36.18 Greece	225,57.40 Netherlands	11.38 Greece	21,176.74 Netherlands	4.98 Greece	22,554.26 Netherlands
Long term debt	49.93 Greece	16,232.61 Netherlands	57.31 Greece	18,548.01 Netherlands	40.66 Greece	19,286.96 Netherlands	42.49 Greece	19,479.49 Netherlands	29.06 Greece	20,434.77 Netherlands	24.26 Greece	20,195 Netherlands	7.09 Greece	19,939.93 Netherlands	3.12 Greece	20,225.91 Netherlands
Short term debt	6.55 Italy	2408.49 Netherlands	5.60 Italy	2518.59 Netherlands	6.86 Italy	2518.43 Netherlands	0 Cyprus	2419.14 Netherlands	4.03 Italy	2462.69 Netherlands	4.64 Italy	2362.39 Netherlands	4.29 Greece	2236.81 Netherlands	1.60 Cyprus	2328.34 Netherlands
Coupled payments	15.64 Bulgaria	2596.67 Malta	30.06 Romania	810.27 Malta	17.72 Romania	885.71 Malta	27.74 Romania	687.32 Finland	15.51 Denmark	671.46 Finland	11.58 Denmark	655.20 Finland	−20.78 Netherlands	643.19 Finland	13.85 Romania	648.54 Malta
Decoupled payments	41.37 Latvia	687.51 Greece	48.84 Latvia	623.08 Greece	55.82 Latvia	614.77 Greece	65.35 Latvia	549.42 Malta	71.29 Latvia	674.63 Malta	77.81 Latvia	708.58 Malta	85.18 Latvia	752.51 Malta	76.20 Romania	413.95 Netherlands
Correlation between farm size and coupled payments	264.47 Bulgaria	85,690.36 Malta	279.55 Romania	71,032.57 Slovakia	163.03 Romania	51,098.99 Finland	252.48 Romania	52,442 Finland	306 Romania	54,925.52 Finland	398.55 Romania	53,923.54 Finland	−9073 Netherlands	55,957.93 Finland	130.23 Romania	59,979.94 Luxemburg
Correlation between farm size and decoupled payments	455.45 Romania	112,227.53 Netherlands	728.71 Romania	134,004 Netherlands	732.77 Romania	15,2547 Netherlands	911.78 Romania	153,983.9 Netherlands	1211.93 Romania	193,599.5 Netherlands	1354.23 Romania	188,917 Netherlands	1215.14 Romania	194302.3 Netherlands	716.29 Romania	178868.19 Netherlands
Correlation between farm size and total debt	788.68 Romania	145,228.5 Netherlands	1008.27 Romania	173,236.1 Netherlands	895.81 Romania	184,648.3 Netherlands	1164.26 Romania	188,422.7 Netherlands	1517.93 Romania	230,714.3 Netherlands	1752.79 Romania	201,352.7 Netherlands	1413.64 Romania	182,229.2 Netherlands	846.52 Romania	204,374.8 Netherlands
Net added value of the firm per agricultural work units	3482.73 Slovenia	50,017.13 Denmark	2453.44 Slovakia	43,539.48 Denmark	3888.01 Slovenia	74,306.98 Denmark	4952.86 Slovenia	85,307.26 Denmark	3822.59 Slovenia	98761.2 Denmark	3809.53 Slovenia	92,135.26 Denmark	3584.55 Slovenia	70,508.05 Denmark	2316.56 Malta	61,762.5 Denmark
Family farm income expressed in work units	−58572.9 Denmark	35,505.89 UK	−54,178.3 Denmark	31,735.48 UK	3452.04 Romania	41,534.38 UK	3524.18 Bulgaria	4292.37 UK	3575.2 Bulgaria	74,495.09 Denmark	3772.21 Slovenia	73,378.08 Denmark	2356.43 Sweden	43,795.41 Luxemburg	2215.65 Malta	44,471.3 Netherlands
Total assets	1450.06 Slovakia	65,918.9 Malta	1455.70 Slovakia	59,655.89 Malta	1529.42 Latvia	72,300 Malta	1689.90 Latvia	67,411.4 Malta	1739.2 Slovakia	72,864.7 Malta	1781.99 Slovakia	75,938.8 Malta	2067.96 Bulgaria	78,262.64 Malta	2184.96 Slovakia	70,442.7 Malta
Contract work	192 Lithuania	31,132 Slovakia	151 Lithuania	27,848 Slovakia	165 Lithuania	24,912 Slovakia	145 Lithuania	34,675 Slovakia	167 Lithuania	30,850 Slovakia	160 Lithuania	47,806 Slovakia	259 Lithuania	32,670 Slovakia	451 Malta	31,193 Slovakia
External factors	76.87 Lithuania	2137.7 Netherlands	75.17 Lithuania	2279.8 Netherlands	77.11 Lithuania	2331.7 Netherlands	70.37 Lithuania	2364.68 Netherlands	65.65 Lithuania	2312.93 Netherlands	73.09 Lithuania	2312.97 Netherlands	84.28 Lithuania	2207.86 Netherlands	87.17 Lithuania	2203.91 Netherlands
Share of interest in external factors	1.81% Italy	65.18% Denmark	1.63% Italy	57.71% Denmark	1.40% Italy	55.66% Denmark	1.31% Greece	51.62% Denmark	0.79% Greece	47.85% Denmark	0.83% Greece	42.50% Denmark	0% All	0% All	0% All	0% All
Share of rent in external factors	5.30% Estonia	41.96% France	6.70% Estonia	42.37% Ireland	7.69% Malta	44.59% Ireland	8.45% Malta	45.01% Ireland	8.00% Malta	50.56% Bulgaria	8.40% Malta	51.56% Bulgaria	11.66% Latvia	58.80% Bulgaria	10.88% Malta	55.46% Bulgaria
Share of employees in external factors	23.43% Austria	82.90% Slovakia	25.07% Austria	80.80% Slovakia	28.46% Austria	79.91% Malta	29.05% Austria	80.75% Slovakia	30.24% Belgium	81.07% Slovakia	30.82% Belgium	81.01% Slovakia	32.27% Ireland	79.97% Czech Republic	31.92% Ireland	80.35% Portugal
Specific costs	314.11 Lithuania	8438.20 Malta	287.02 Latvia	5888.51 Malta	279.41 Latvia	6740.29 Malta	312.69 Latvia	7219.01 Malta	345.68 Lithuania	8026.83 Malta	366.59 Lithuania	8276.11 Malta	361.45 Lithuania	7779.49 Malta	351.99 Lithuania	7968.24 Malta
Specific crop costs	119.17 Estonia	1548.58 Malta	108.06 Estonia	1604.91 Netherlands	104.18 Estonia	1705.26 Netherlands	138.45 Estonia	1792.59 Netherlands	149.66 Estonia	1782.73 Netherlands	163.82 Estonia	1827.7 Netherlands	166.69 Estonia	1921.25 Netherlands	165.15 Estonia	1945.7 Netherlands
Specific livestock costs	320.87 Ireland	1204.73 Cyprus	315.35 Ireland	1275.74 Cyprus	328.07 Ireland	950.32 Cyprus	340.81 Ireland	1096.81 Malta	308.4 Romania	1190.84 Finland	326.17 Romania	1207.98 Finland	326.48 Romania	1092.62 Finland	232.98 France	1474.48 Cyprus

Table 3. *Cont.*

	2008		2009		2010		2011		2012		2013		2014		2015	
Symbol	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Share of crop production	18.50% Ireland	70.90% Italy	20.05% Ireland	70.51% Italy	21.62% Ireland	70.66% Italy	19.88% Ireland	69.82% Bulgaria	18.76% Ireland	72.33% Bulgaria	18.91% Ireland	71.40% Bulgaria	17.71% Ireland	73.08% Bulgaria	17.50% Ireland	71.79% Bulgaria
Share of livestock production	26.62% Italy	79.38% Ireland	27.16% Italy	77.59% Ireland	26.55% Italy	76.41% Ireland	24.38% Slovakia	78.21% Ireland	22.67% Slovakia	79.76% Ireland	23.80% Slovakia	79.45% Ireland	23.85% Bulgaria	80.89% Ireland	25.97% Bulgaria	81.19% Ireland
Share of cash flow	−2% Slovakia	18% Greece	−4% Slovakia	17% Greece	−3% Slovakia	17% Greece	−1% Slovakia	14% Romania	0% Slovakia	14% Romania	−1% Slovakia	14% Romania	−7% Slovakia	16% Romania	−6% Hungary	35% Cyprus
Own work	7.03% Slovakia	94.69% Ireland	8.56% Slovakia	96.36% Slovenia	9.32% Slovakia	96.59% Slovenia	5.86% Slovakia	95.94% Slovenia	9.24% Slovakia	95.77% Slovenia	7.11% Slovakia	94.92% Slovenia	5.55% Slovakia	96.24% Slovenia	5.86% Slovakia	96.88% Malta
Leased land	18.01% Ireland	96.29% Slovakia	17.59% Ireland	96.13% Slovakia	17.89% Ireland	95.49% Slovakia	18.21% Ireland	95.23% Slovakia	18.85% Ireland	94.82% Slovakia	18.56% Ireland	94.29% Slovakia	5.55% Slovakia	96.24% Slovenia	5.86% Slovakia	96.88% Malta

Note 1: Below each value, it is recorded the assigned country. Red and green are the maximum values in the analysis. Blue are the values for Romania. Note 2: The independent variables (Correlation between farm size and coupled payments, Correlation between farm size and decoupled payments, Correlation between farm size and total debt) related with "correlation" refers to the product between the first term and the second one in order to observe the cumulative effects. Minimum and maximum values were chosen because we are interested on the influencing factors on debt (short, medium and long), rather than the confidence intervals that are found at 99.7%, 95.4% and 68.3%, using mean and standard deviation.

The assets' value per arable agricultural unit is the smallest in Slovakia and the highest in Malta. Unlike this, the value of the labor contract is the highest in Slovakia, while the fixed costs and the labor contract have the lowest values in Lithuania. From total labor contract costs, the lowest share of interest costs is found in Italy and Greece, the lowest share for rents is found in Estonia and Malta, and the lowest share of staff salaries is found in Austria at the beginning of the analyzed period. The maximum values are as follows: in Denmark for the interest rates, in Ireland and Bulgaria for the share of rents from total costs and in Slovakia for the share of wages from total costs.

In terms of specific costs, the highest values are in Malta, while the lowest are in Lithuania. Regarding crop-specific costs, the maximum values are recorded in the Netherlands, while those for livestock are found in Cyprus. In this category, Romania is distinguished by the fact that, between 2012 and 2014, it held the lowest values for the specific costs of livestock. The costs incurred at farm level can be covered from production. An analysis on the results indicates that the largest share of crop production in total production is found in Italy and Bulgaria, while the largest share of livestock production in total production is identified in Ireland.

Another element that was included into the analysis is the share of cash flow in the total existing capital at farm or agricultural entity level. The results indicate that negative values are found in Slovakia. Also, it can be concluded that Romania obtained the highest values of the cash flow share in total capital between 2011 and 2014. The last two elements can be interpreted simultaneously. In Slovakia, most of the land is leased, not owned by the farmers and the work is mainly carried out by third parties, while the situation is opposite in Ireland. The share of the leased land is low, and the work is mostly done by landowners.

In order to conduct an unbiased analysis, the first step was to establish the correlation matrix between the variables included in the models. For reliable results, the variables strongly correlated with each other cannot be used within a model. In this research, any value higher than 0.5 or smaller than -0.5 was considered strongly correlated. The use of highly correlated variables generates biased coefficients; therefore, the results can be found under the sign of uncertainty. The correlation matrix is presented in Table 4.

As the information presented in the correlation matrix is dense, Table 5 synthesizes it.

The econometric models were estimated based on the information presented in Tables 4 and 5. It is worth mentioning that the value of the farm measured in agricultural units was used in the models, because it offered higher yields.

Table 6 highlights the total debt pool estimates without any adjustments in the developed models.

Table 6 suggests that concurrent payments (subsidies for crops, for livestock and for development) have a negative impact on total debt. Therefore, an increase in coupled subsidies leads to a decrease in total debts, or in other terms, an increase with 1% in coupled subsidies, decreases the total amount of debt with a value between 0.18% and 1.14%. The same effect is also found for payments made at different moment in time as the link is also negative. Thus, an increase in decoupled payments leads to a decrease in total debts. It can be observed the influence of coupled payments is higher than the influence of decoupled payments as a change in decoupled payments impacts negatively the total amount of debt with no more than 0.7%.

Table 4. The correlation matrix.

Element	TD	LTD	STD	CP	DP	TACP	TADP	TATD	AVAWU	FFIWU	TA	CW	EF	%IEF	%REF	%EEF	SC	%CQ	%LQ	%CF	OW	LL	SCC	SLC
TD	1																							
LTD	0.985 ***	1																						
STD	0.681 ***	0.580 ***	1																					
CP	0.043	0.085	−0.12 *	1																				
DP	0.326 ***	0.377 ***	−0.005	0.301 ***	1																			
TACP	0.591 ***	0.601 ***	0.306 ***	0.635 ***	0.459 ***	1																		
TADP	0.700 ***	0.702 ***	0.392 ***	0.050	0.678 ***	0.742 ***	1																	
TATD	0.633 ***	0.600 ***	0.512 ***	−0.007	0.245 ***	0.729 ***	0.838 ***	1																
AVAWU	0.601 ***	0.602 ***	0.353 ***	−0.120 *	0.450 ***	0.557 ***	0.838 ***	0.799 ***	1															
FFIWU	0.43 ***	0.425 ***	0.230 ***	−0.049	0.432 ***	0.540 ***	0.762 ***	0.721 ***	0.899 ***	1														
TA	0.417 ***	0.498 ***	−0.011	0.308 ***	0.816 ***	0.373 ***	0.506 ***	0.061	0.312 ***	0.283 ***	1													
CW	0.644 ***	0.619 ***	0.504 ***	−0.103	0.246 ***	0.621 ***	0.801 ***	0.905 ***	0.801 ***	0.675 ***	0.083	1												
EF	0.644 ***	0.648 ***	0.333 ***	0.010	0.612 ***	0.492 ***	0.749 ***	0.442 ***	0.565 ***	0.443 ***	0.600 ***	0.470 ***	1											
%IEF	0.537 ***	0.548 ***	0.313 ***	0.085	0.124 *	0.299 ***	0.291 ***	0.294 ***	0.357 ***	0.260 ***	0.204 ***	0.339 ***	0.199 ***	1										
%REF	−0.134 *	−0.111	−0.19 ***	0.040	0.249 ***	−0.058	0.021	−0.044	0.110	0.036	0.007	0.075	−0.152 **	−0.030	1									
%EEF	−0.434 ***	−0.46 ***	−0.173 **	−0.041	−0.321 ***	−0.215 ***	−0.325 ***	−0.272 ***	−0.416 ***	−0.242 ***	−0.229 ***	−0.40 ***	−0.098	−0.530 ***	−0.732 ***	1								
SC	0.599 ***	0.636 ***	0.194 ***	0.282 ***	0.732 ***	0.476 ***	0.592 ***	0.171 **	0.296 ***	0.245 ***	0.852 ***	0.178 **	0.808 ***	0.198 **	−0.186 ***	−0.096	1							
%CQ	−0.573 ***	−0.610 ***	−0.276 ***	−0.223 ***	−0.270 ***	−0.442 ***	−0.399 ***	−0.386 ***	−0.397 ***	−0.326 ***	−0.428 ***	−0.432 ***	−0.135 *	−0.480 ***	−0.126 *	0.562 ***	−0.319 ***	1						
%LQ	0.455 ***	0.511 ***	0.132 *	0.175 **	0.301 ***	0.254 ***	0.261 ***	0.255 **	0.341 ***	0.301 ***	0.489 ***	0.187 ***	0.114 *	0.436 ***	0.164 **	−0.504 ***	0.365 ***	−0.905 ***	1					
%CF	−0.408 ***	−0.389 ***	−0.283 ***	−0.018	−0.056	−0.342 ***	−0.344 ***	−0.438 ***	−0.134 *	−0.048	−0.107	−0.403 ***	−0.172 **	−0.018 ***	0.124 *	0.132 *	−0.147 **	0.385 ***	−0.223 ***	1				
OW	−0.193 ***	−0.104 **	−0.386 ***	0.400 ***	0.240 ***	−0.120 *	−0.301 ***	−0.519 ***	−0.243 ***	−0.23 ***	0.402 ***	−0.466 ***	−0.312 ***	0.057	0.376 ***	−0.324 ***	0.116 *	−0.242 ***	0.390 ***	0.306 ***	1			
LL	0.095	0.034	0.193 ***	−0.024	−0.0219	0.147 **	0.154 **	0.142 **	−0.073	−0.089	−0.237 ***	0.108	0.362 ***	−0.172 **	0.007	0.168 **	0.149 **	0.301 ***	−0.304 ***	−0.076	−0.489 ***	1		
SCC	0.517 ***	0.536 ***	0.196 ***	0.206 ***	0.711 ***	0.394 ***	0.556 ***	0.120 *	0.296 ***	0.265 ***	0.745 ***	0.131 *	0.847 ***	0.099	−0.157 **	−0.016	0.937 ***	−0.068	0.133 *	−0.034	0.052	0.231 ***	1	
SLC	0.379 ***	0.361 ***	0.197 ***	0.228 ***	0.209 ***	0.383 ***	0.313 ***	0.265 ***	0.083	0.031	0.197 ***	0.146 **	0.465 ***	0.043	−0.445 **	0.229 ***	0.495 ***	−0.061	−0.041	−0.330 ***	−0.347 ***	0.254 ***	0.421 ***	1

Note: ***, **, * denotes the significance level at 1%, 5% and 10%. Red values highlight strong correlations. Green values provide evidence on medium correlation, higher than 0.4 and smaller than 0.5, that was considered into the analysis. The authors accepted that there is a significant degree of tolerance regarding these values and that they could not generate biased coefficients.

Table 5. Identifying the correlations between independent variables.

Element	The Correlation with the Other Variables
Coupled payments	Correlation between farm size and total debt, contract work
Decoupled payments	Correlation between farm size and decoupled payments, total assets, external factors, specific costs, specific crop costs
Correlation between farm size and coupled payments	Coupled payments, correlation between farm size and decoupled payments, correlation between farm size and total debt, net added value of the firm per agricultural work units, family farm income expressed in work units, contract work
Correlation between farm size and decoupled payments	Decoupled payments, correlation between farm size and coupled payments, correlation between farm size and total debt, net added value of the firm per agricultural work units, family farm income expressed in work units, total assets, contract work, external factors, specific costs, specific crop costs
Correlation between farm size and total debt	Correlation between farm size and coupled payments, correlation between farm size and decoupled payments, net added value of the firm per agricultural work units, family farm income expressed in work units, contract work, own work
Net added value of the firm per agricultural work units	Correlation between farm size and coupled payments, correlation between farm size and decoupled payments, correlation between farm size and total debt, family farm income expressed in work units, contract work, external factors,
Family farm income expressed in work units	Correlation between farm size and coupled payments, correlation between farm size and decoupled payments, correlation between farm size and total debt, net added value of the firm per agricultural work units, contract work,
Total assets	Decoupled payments, correlation between farm size and decoupled payments, external factors, specific costs, specific crop costs
Contract work	Coupled payments, correlation between farm size and coupled payments, correlation between farm size and decoupled payments, correlation between farm size and total debt, net added value of the firm per agricultural work units, family farm income expressed in work units
External factors	Decoupled payments, correlation between farm size and decoupled payments, net added value of the firm per agricultural work units, total assets, specific costs, specific crop costs
Share of interest in external factors	Share of employees in external factors
Share of rent in external factors	Share of employees in external factors
Share of employees in external factors	Share of interest in external factors, share of rent in external factors, share of crop production, share of livestock production
Specific costs	Decoupled payments, correlation between farm size and decoupled payments, total assets, external factors, specific crop costs
Share of crop production	Share of employees in external factors
Share of livestock production	Share of employees in external factors
-Share of cash flow	Does not have strong correlations
Own work	Correlation between farm size and total debt
Leased land	Does not have strong correlations
Specific crop costs	Decoupled payments, correlation between farm size and decoupled payments, total assets, external factors, specific costs
Specific livestock costs	Does not have strong correlations

Note: The independent variables (Correlation between farm size and coupled payments, Correlation between farm size and decoupled payments, Correlation between farm size and total debt) related with "correlation" refers to the product between the first term and the second one in order to observe the cumulative effects.

Table 6. Impact of independent variables on total debt.

Dependent Variable—TOTAL DEBT (Pool Estimation)									
Element	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
C	−3.042 *	0.698	0.898	0.667	−8.695 ***	5.70 ***	−1.30 *	−0.611	−3.72 ***
Coupled payments	−1.14 ***	−0.342 ***	−0.071				−0.186 ***		
Decoupled payments	−0.065			−0.714 ***					
Correlation between farm size (total assets) and coupled payments	0.832 ***				−0.097	0.035			
Correlation between farm size and decoupled payments		0.455 ***						0.37 ***	
Correlation between farm size and total debt			0.276 ***				0.278 ***		0.216 ***
Net added value of the firm per agricultural work units			−0.211	0.304 ***					
Total assets		0.057							
Contract work				0.147 **	0.645 ***				
External factors			0.999 ***			0.865 ***			0.327 ***
Share of interest in external factors	0.029 ***	0.031 ***				0.026 ***		0.04 ***	
Share of rent in external factors	−0.01	−0.016 ***				−0.007		−0.0004	
Share of employees in external factors			−0.021 ***	−0.03 ***			−0.024 ***		−0.03 ***
Specific costs				1.342 ***			1.00 ***		
Share of crop production	−0.038 ***	−0.06 ***				−0.063 ***			
Share of livestock production	−0.018 ***	−0.033 ***				−0.031 ***			
Share of cash flow	−0.01	−0.011	−0.051 ***	−0.039 ***	−0.053 ***	−0.026 **	−0.035 ***	−0.061 ***	−0.041 ***
Own work	0.031 ***	0.017 ***	0.011 *	−0.014 ***	0.016 ***	0.001		4.24×10^{-6}	
Leased land	0.012 ***	0.0148 ***	−0.007 *	−0.007 **	−0.003	0.003	−0.002	−0.001	−0.007 ***
Specific crop costs					0.842 ***			0.66 ***	0.613 ***
Specific livestock costs	1.21 ***	0.810 ***			0.881 ***				0.687 ***
Rsqd ad	74.57%	71.97%	67.48%	78.85%	63.21%	72.99%	72.55%	67.10%	71.35%
F stat	58.05 ***	50.73 ***	56.26 ***	101.21 ***	53.53 ***	65.28 ***	94.85 ***	63.36 ***	77.15 ***
Dw	0.25	0.23	0.13	0.36	0.12	0.17	0.13	0.25	0.13

Source: own processing with Eviews. Note ***, **, * denotes the significance level at 1%, 5% and 10%. Note: The independent variables (Correlation between farm size and coupled payments, Correlation between farm size and decoupled payments, Correlation between farm size and total debt) related with "correlation" refers to the product between the first term and the second one in order to observe the cumulative effects.

Another negative impact is observed when the share of rents and of employees in the total costs of external factors increases. That means that higher the share of rents or of employees in total costs of external factors is, the lower the value of total debt is. The fluctuations are between 0.02% and 0.03%. The explanation can be given by the fact that if the entity has already difficulties in paying long-term obligations, financial institutions are skeptical in providing additional financing support. In this case, the farm tries to assert on their crops, livestock or to resize its costs. Essentially, it can be noticed that when the share of crops in total production increases, respectively, when the share of livestock in total production increases, the value of total debts decreases. In other words, the analysis reveals that the share of crops in total production affects more significantly total debts, rather than the share of livestock in total production. As a fact, an increase with 1% in the share of crops in total production decreases total debt with a value between 0.03% and 0.063%, while an increase with 1% in the share of livestock decreases total debt with a value found between 0.018% and 0.033%. It is obvious that the production output generated capital which increase the possibility of repaying the loans. The greater positive impact on debt in the case of the crop share might be explained by the fact that the crop culture represents an important support for the livestock production.

The results on the cash flow value (the difference between cash inflows and outflows) suggest that the higher the share of the cash flow in the total capital is, the lower the amount of the total debts is. Therefore, an increase in the share of cash flow in the total existing capital determines a decrease in total loans. Regarding the economic interpretation, it could be revealed that an increase with 1% in the share of cash flow into total capital leads to a decrease between 0.01% and 0.06% on total debts.

Based on the models conducted, the elements which encourage contracting of loans were also identified. In this respect, the results highlight that either coupled or decoupled subsidies influence the process of borrowing, but only for large entities (farms) Their impact is between 0.37% and 0.45% increase in total debts in case of decoupled payments for large firms and around 0.83% increase in total debts in case of coupled payments for large entities. Increasing farm value or increasing the value of small and medium-sized businesses in the agricultural environment encourages total debt growth because the entity becomes more credible in front of banking entities. The financial institutions can, therefore, grant financing as the agricultural units' aim is to extend and develop their agricultural business.

An increase into labor costs or into fixed costs determines an increase in total debts as the entity needs additional resources to cover them. The effect is identical for the specific cost components. Thus, the increase in crop costs or the increase in livestock costs leads to an increase in total debts, because of additional need for financing for remaining at the same level as competing entities. The results reveal that an increase with 1% in specific crop costs leads to an increase with between 0.6% and 0.84% of total debts, while an increase with 1% of specific livestock costs leads to an increase between 0.68% and 1.21% of total debts. In could be observed that specific livestock costs impact higher the amount of total debts as their financing should be ensured on long term.

In terms of asset value, it seems to have a positive influence on the total debt, but the value of the coefficient is not statistically significant.

Regarding the labor and leased land indicator, contrary results related to the value of the total debts were obtained, with significant values statistically different from zero. As a fact, a conclusion on their influence on the total debts cannot be drawn.

Similar to the undertaken analysis, using the same models, an analysis of the long-term debts was conducted Table 7 shows the obtained results.

Table 7. Impact of independent variables on long-term debt.

Dependent Variable—LONG TERM DEBT (Pool Estimation)									
Element	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
C	−6.108 ***	−1.694 ***	−0.875	−1.307	−11.50 ***	3.936 ***	−2.318 ***	−2.354 ***	−4.50 ***
Coupled payments	−1.269 ***	−0.36 ***	−0.071				−0.156 **		
Decoupled payments	−0.035			−0.742 ***					
Correlation between farm size and coupled payments	0.94 ***				−0.100	0.052			
Correlation between farm size and decoupled payments		0.487 ***						0.44 ***	
Correlation between farm size and total debt			0.296 ***				0.269 ***		0.193 ***
Net added value of the firm per agricultural work units			−0.225	0.355 ***					
Total assets		0.15							
Contract work				0.163 **	0.71 ***				
External factors			1.173 ***			1.017 ***			0.413 **
Share of interest in external factors	0.031 ***	0.034 ***				0.027 ***		0.043 ***	
Share of rent in external factors	−0.011 *	−0.017 ***				−0.008		−0.006 ***	
Share of employees in external factors			−0.022 ***	−0.031 ***			−0.028 ***		−0.035 ***
Specific costs				1.491 ***			1.17 ***		
Share of crop production	−0.035 ***	−0.06 ***				−0.063 ***			
Share of livestock production	−0.0135	−0.031 **				−0.027 ***			
Share of cash flow	−0.0146	−0.014	−0.06 ***	−0.046 ***	−0.06 ***	−0.033 **	−0.037 ***	−0.068 ***	−0.045 ***
Own work	0.041 ***	0.023 ***	0.018 ***	−0.009	0.024 ***	0.008 **		0.007	
Leased land	0.011 ***	0.013 ***	−0.011 ***		−0.006	0.0004	−0.007 **	−0.003	
Specific crop costs					0.950 ***			0.718 ***	0.706 ***
Specific livestock costs	1.39 ***	0.904 ***			1.029 ***				0.742 ***
Rsqd ad	75.97%	73.77%	70.19%	80.21%	65.16%	75.59%	74.73%	69.92%	73.11%
F stat	62.50 ***	55.47 ***	63.70 ***	109.97 ***	58.17 ***	74.66 ***	106 ***	68.74 ***	84.13 ***
Dw	0.26	0.24	0.14	0.37	0.13	0.19	0.13	0.26	0.13

Source: own processing with Eviews. Note ***, **, * denotes the significance level at 1%, 5% and 10%. Note: The independent variables (Correlation between farm size and coupled payments, Correlation between farm size and decoupled payments, Correlation between farm size and total debt) related with "correlation" refers to the product between the first term and the second one in order to observe the cumulative effects.

Table 7 presents the influence of independent variables on long-term debt. The first effect noticed is that the granting of coupled subsidies diminishes the value of long-term loans. In other words, an increase with 1% in coupled subsidies decreases long term debt with a value between 0.15% and 1.26%. In comparison with the effect on total debt, the effect on long term debt is higher. The same correlation is also identified for decoupled subsidies, in the sense that an increase in the amount of decoupled subsidies determines a decrease of long-term debts. In a quantified manner, an increase with 1% of decoupled payments affects long term debt with 0.74%, by decreasing its value.

Considering the firm size, the effect is similar to that identified on total debt. In this regard, larger the firms for which coupled subsidies are given are, the higher the amount of long-term debt is. When a change, such an increase, with 1% occurs then the value of long term debt is decreasing with 0.94%. Also, larger companies that have higher debt register higher long-term debt with 0.27%. Regarding the firm value, it seems that higher values determine higher long-term debt, fact which that can be justified by a greater confidence level of the creditors on the possibility of the farmer or of the small and medium-sized firms from agricultural sector to repay their maturity obligations.

Similar with the results found in Table 6, asset growth can positively influence the value of long-term debt, but the value of the coefficient is not significantly different from zero.

Other findings that are similar to the ones found in the case of total debts are those related with the increase of external costs, the increase of specific costs, the increase of labor costs, and the increase of crop-specific costs and of livestock costs. In this regard, an upside change of these factors determines an increase on the long-term debt. Besides the fact that the economic explanation of this phenomenon is found in the need of entities of obtaining additional resources in terms of cost coverage and market survival, the significance of the value of the coefficients can also be statistically significant since the significant degree of rejecting the null hypothesis is less than 10%.

Regarding the labor costs, there is a significant different influence between an increase of the interest rate, respectively an increase of the salaries and the rents within them. While an increase in the interest rate determines an increase in the total loans (or their value) between 0.02% and 0.043%, an increase in the share of employees has a negative effect. The decrease is between 0.0006% and 0.03%. Thus, an increase in the interest rate has a stronger effect at general level than an increase of the salary weight or the rent expenses. On the other hand, if both increases occur simultaneously, then the effect on total debts is almost insignificant.

Considering the production, the higher the share of crop production or livestock production is, the lower the amount of long-term debt is. The justification lies in the fact that the improvement of either animal or vegetal production determines additional resources, with which the entity can either self-finance its activities or use it to cover its debts. The fluctuations on long term debt are higher in the case of the increase of the share of crop production rather than the increase of the share of livestock production. Using quantified data, we can observe that the decrease is between 0.03% and 0.06%, for crop production and between 0.027% and 0.031% for livestock production.

When the cash flow variable is analyzed, we can observe that it covers similar values on total debts such as the increase of the share of crop production. As a fact, the higher the share of cash flow on total capital is, the lower the total amount of long-term loans is. In other words, an increase with 1% of the share of the cash flow on total capital impacts negatively the value of long term debts with values between 0.03% and 0.068%.

The results found for family's own work are somehow contradictory. The results show that the higher the ratio between the work done by the family and total work is, the higher the amount of the long-term debt is. The argument might be that the entity prefers to minimize labor costs (through self-employment) and to contract long-term loans for ensuring the financing activity of other needs.

Regarding the relationship between total debt and leased land it could be mentioned that the coefficient associated with leased land is not statistically significant.

The results for short-term debts are shown in Table 8.

Table 8. Impact of independent variables on short-term debt.

Dependent Variable—SHORT TERM DEBT (Pool Estimation)									
Element	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
C	10.37 ***	11.86 ***	4.184 **	4.423 ***	−0.139	11.05 ***	0.143	3.16 ***	−1.11
Coupled payments	−0.648 ***	−0.30 ***	−0.192				−0.283 ***		
Decoupled payments	−0.173			−0.697 ***					
Correlation between farm size and coupled payments	0.381 ***				−0.130	−0.091			
Correlation between farm size and decoupled payments		0.252 **						0.142	0.298 ***
Correlation between farm size and total debt			0.3229				0.306 ***		
Net added value of the firm per agricultural work units			−0.354	0.004					
Total assets		−0.156 ***							
Contract work				0.231 *	0.475 ***				
External factors			0.392 **			0.287 **			0.084
Share of interest in external factors	0.021 ***	0.0224 ***						0.03 ***	
Share of rent in external factors	−0.018 **	−0.025 ***				0.022 ***		−0.004	
Share of employees in external factors			−0.016 **	−0.020 ***		−0.011	−0.008 **		−0.009
Specific costs				0.753 ***			0.31 **		
Share of crop production	−0.072 ***	−0.08 ***				−0.081 ***			
Share of livestock production	−0.052 ***	−0.056 ***				−0.052 ***			
Share of cash flow	0.009	0.005	−0.009	−0.008	−0.028	0.011	−0.021	−0.029	
Own work	0.001	0.006 ***	−0.007	−0.024 ***	−0.008	−0.017 ***		−0.02 ***	
Leased land	0.016 ***	0.0169	−0.001	−0.003	0.001	0.011 **	0.006	0.001	
Specific crop costs					0.416 **			0.292	0.237
Specific livestock costs	0.022	−0.094			0.116				0.079
Rsqd ad	35.47%	34.66%	28.97%	35.32%	27.75%	33.10%	29.42%	28.55%	27.24%
F stat	11.69 ***	11.27 ***	11.86 ***	15.67 ***	12.74 ***	12.76 ***	15.80 ***	13.22 ***	12.45 ***
Dw	0.25	0.26	0.23	0.29	0.22	0.24	0.23	0.25	0.21

Source: own processing with Eviews. Note ***, **, * denotes the significance level at 1%, 5% and 10%. Note: The independent variables (Correlation between farm size and coupled payments, Correlation between farm size and decoupled payments, Correlation between farm size and total debt) related with "correlation" refers to the product between the first term and the second one in order to observe the cumulative effects.

In Table 8, the impact of independent variables on short-term debt can be observed. If in some cases the effect is similar to the one identified in the case of total debts or in the case of long-term debts, in other situations the effect is opposite.

Based on the influence of coupled and decoupled subsidies, it can be seen that the effect is similar to the one identified for long-term debt and total debt. Therefore, an increase with 1% in coupled subsidies or decoupled subsidies generates a decrease of short term debt with almost 0.6%. The results found in Table 8 reveal an approximately equal influence of coupled and decoupled subsidies on short term debt. Moreover, if we consider the impact on long and short term, we can observe that the influence is smaller than the one detected for both analysis. The conclusion could be that there is a more significant impact on long debt than on short debt of coupled and decoupled subsidies. Another influence is related with the size of the company when coupled or decoupled subsidies are granted. The results provide evidence that short-term debt increases as the size of the entity increases when coupled or decoupled subsidies are offered. The signs are similar with the one found on long term debt or total debt, but the impact is smaller in comparison with both cases. That means that the size of the company is more important in contracting long term loans, rather than short term loans.

The value of the company measured in agricultural units does not influence the short-term debt ratio as the value of the coefficients is not significantly different from zero.

It is worth presenting the influence that total assets have on short-term debt. If in the case of long-term debt and total debt, the effect was particularly an increase, although the value of the coefficients did not differ significantly from zero; in this situation, the influence on short-term debts had a counterbalancing effect. Therefore, the higher the assets of agricultural entities are, the lower the short-term debt is. Mainly, an increase in assets can be assigned both to an increase of fixed assets and an increase of current assets. For example, if the entity obtains a particular output, its use may be relatively rapid. Therefore, crop production or livestock production can be quickly converted into liquidity. They can be used as a guarantee for long-term borrowing or can be used to extinguish short-term debts which eligibility is in the next period.

The increase in costs of external factors, specific costs, crop-specific costs and labor costs positively influences short-term debt. In other words, an increase with 1% of the labor costs increase short term debt with a value between 0.23% and 0.47%, an increase in external factors impact positively the short-term debt with a value between 0.28% and 0.39%. The most significant increase of short term debts is due to the increase of specific costs, that being between 0.31% and 0.75%. Considering the structure of specific costs, it can be observed that an increase of specific crop costs affects positively the short-term debt, with a value of 0.41%, while the increase of specific livestock costs even though it impacts positively the short-term debt, its coefficient is not statistically significant from zero. Concerning the impact of external components, an increase in the share of interest rate increases the value of the short-term loans, while an increase in the share of employees decreases the value of short-term debts with 0.02–0.03%. However, for the increase in the share of rents in external factors, it was not possible to identify a certain effect. The reason is that although statistically significant coefficients have been obtained, their influence is contrary, which does not allow economic interpretation.

Negative influence on short term debt is identified when there is an increase in the share of crop production or of livestock production in total production between 0.052% and 0.081%, while the influence of the proportion of cash flow in total capital is not statistically significant.

Regarding the family's own work and rented land, the effects are ambiguous on short-term debts, given that the obtained coefficients have different signs even though they are significantly different from zero in each situation.

If we must make a comparison between factors that affect short term debt and long-term debt, we would synthetize the following information: both coupled and decoupled payments impact the value on short term debt and long-term debt negatively, but the impact is stronger for long term debt in the case of granting coupled payments. Moreover, when short term debt is analyzed the effect of coupled and decoupled payments on it seems almost identical. Regarding the size of the farm entities, it was observed that larger entities that had access to coupled and decoupled payments have higher debts (both on short term and on long term). The results provide evidence that the impact is more significant in the case of long term debt rather than in the case of short term debt. Moreover, the results reveal that the effect of debt on larger entities is stronger for the short-term period.

Net added value of the firm per agricultural unit affects long term debt meaning that an increase of it determines an increase on long term debt, while no effect is found for short term debt. In other words, the explanation comes as additional net added value could be used by entities in order to access additional resources as their collateral guarantees were improved (more credibility is conferred to entities that have higher net added value).

Regarding the influence of total assets, they impact negatively short-term debt, but have no influence on long term debt.

When costs plan is considered at firm level, the results reveal that contract work, external factors, share of interests in external factors, specific costs affect both short term and long-term debt. Among them, external factors and specific costs have higher impact on dependent variables. The results provide evidence that external factors and specific costs affect long term debt more significantly, rather than short term debt. This suggests that the agricultural units look at obtaining profitability on long run and not on short run. In a more suggestive way, if the increase with 1% in external factors leads to an increase with 0.28–0.39% of short term debt, similar increase, generates an increase of 0.41–1.1% on long term debt. Similar evidence is found for specific costs. An increase with 1% of specific costs generates an increase of 0.31–0.71% on short term debts and an increase between 1.17% and 1.49% on long term debt. When specific crop costs and specific livestock costs are encountered, it could be observed that they strongly affect long term debt, the increase being between 0.71% and 1.39%. The results emphasize that specific livestock costs have a stronger influence on long term debts, while they are insignificant of short term debts.

The increase of share of crop production and of share of livestock production decreased the value of both long-term debt and short-term debt, stronger influence being found on short term debt.

Considering own work, influence is statistically significant in both cases, but only in the case of long term debt it is positive correlated. Positive correlation is also found for leased land, but only in the case of short term debt.

The results are synthesized in Table 9 for a more simplistic view and for better understanding of this subject.

Table 9. Synthesis on the impact of analyzed factors on debts.

Variables	Influence on the Total Debt	Influence on the Short-Term Debt	Influence on the Long-Term Debt
Coupled payments	−(0.05–0.09)	Inconclusive and statistically insignificant	−(0.09–0.60)
Decoupled payments	Inconclusive	Inconclusive and statistically insignificant	−(0.3)
Correlation between farm size (total assets) and coupled payments	Inconclusive	Inconclusive and statistically insignificant	Inconclusive
Correlation between farm size and decoupled payments	+(0.05–0.08)	Negative, but statistically insignificant	+(0.06–0.11)
Correlation between farm size and total debt	+(0.10)	+(0.16–0.19)	+(0.096)

Table 9. *Cont.*

Variables	Influence on the Total Debt	Influence on the Short-Term Debt	Influence on the Long-Term Debt
Net added value of the firm per agricultural work units	+(0.16)	Negative, but statistically insignificant	+(0.17)
Total assets	+(0.53)	Negative, but statistically insignificant	+(0.60)
Contract work	+(0.15–0.38)	Inconclusive and statistically insignificant	+(0.17—0.41)
External factors	+(1.03–0.95)	Negative, but statistically insignificant	+(1.03–1.18)
Share of interest in external factors	+(0.03–0.05)	Positive, but statistically insignificant	+(0.03–0.05)
Share of rent in external factors	Inconclusive and statistically insignificant	−(0.01)	Inconclusive and statistically insignificant
Share of employees in external factors	−(0.01–0.02)	+(0.009–0.019)	−(0.01–0.02)
Specific costs	+(0.98–1.11)	Negative, but statistically insignificant	+(1.15–1.27)
Share of crop production	−(0.02–0.03)	Positive, but statistically insignificant	−(0.02–0.03)
Share of livestock production	−(0.01)	Positive, but statistically insignificant	−(0.01)
Share of cash flow	−(0.1)	+(0.01)	−(0.01–0.03)
Own work	−(0.01)	Inconclusive	Inconclusive
Leased land	Inconclusive	+(0.01)	Inconclusive
Specific crop costs	+(0.70–0.89)	Positive, but statistically insignificant	+(0.25–1.006)
Specific livestock costs	+(0.41–0.65)	−(0.57–0.60)	+(0.36–0.89)

Note: The independent variables (Correlation between farm size and coupled payments, Correlation between farm size and decoupled payments, Correlation between farm size and total debt) related with "correlation" refers to the product between the first term and the second one in order to observe the cumulative effects.

5. Robustness Analysis

Generated patterns are related to the presence of autocorrelation, which could create biased models. The problem is that the autocorrelation cannot be identified if is related to cross-sectional correlation or to correlation between periods. To check for robustness of analyzed models, they were retested using periodic effects, the Period SUR method within the generalized least squares method, and the White Period within correlation matrix. The results for total debts can be found in Table 10.

Table 10 presents the impact of independent variables on total debt under a robustness analysis. Considering the coupled subsidies, the effect is like the one found in Table 6. Thus, an increase in coupled subsidies determines a decrease on total debt. Even though the sign and the significance are the same, the change is also important. As it can be seen from Table 10, when an increase of 1% in coupled subsidies occurred, total debts decrease with a value between 0.03% and 0.095%. The effect is smaller than the one detected in Table 6 due to the adjustments that were made.

Table 10. Impact of independent variables on total debt—robustness analysis.

Dependent Variable—TOTAL DEBT (Fixed Effects Estimation on the Analyzed Time Period. Period SUR Method. Correlation Matrix White Period)									
Element	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
C	1.379	2.606 **	2.272 **	0.852	−2.567 *	3.652 ***	0.413	0.803 *	0.141
Coupled payments	−0.053 ***	−0.09 ***	−0.03 *				−0.095 ***		
Decoupled payments	0.062 **			−0.27 ***					
Correlation between farm size (total assets) and coupled payments	0.358 ***				−0.010	−0.026 ***			
Correlation between farm size and decoupled payments		0.058 **						0.087 *	
Correlation between farm size and total debt			0.012				0.102 ***		0.032
Net added value of the firm per agricultural work units			0.021	0.164 ***					
Total assets		0.530 ***							
Contract work				0.155 **	0.386 ***				
External factors			1.038 ***			0.951 ***			0.928 ***
Share of interest in external factors	0.039 ***	0.044 ***				0.039 ***		0.055 ***	
Share of rent in external factors	−0.008	−0.0008				0.002		0.0005	
Share of employees in external factors			−0.020 ***	−0.027 ***			−0.019 ***		−0.023 ***
Specific costs				1.111 ***			0.983 ***		
Share of crop production	−0.021 *	−0.02 ***				−0.037 ***			
Share of livestock production	0.001	−0.011				−0.014 **			
Share of cash flow	0.004	−0.002	−0.015 ***	−0.012 **	−0.01 ***	−0.010 **	−0.019 ***	−0.018 ***	−0.012 ***
Own work	0.005	−0.01 ***	−0.001	−0.014 ***	0.001	−0.003		−0.009 **	
Leased land	0.007	0.012 ***	−0.004	−0.007 *	−0.008	0.002	−0.0008	−0.001	−0.005
Specific crop costs					0.701 ***			0.898 ***	0.199
Specific livestock costs	0.656 ***	0.117			0.419 ***				0.229
Rsqd ad	61.21%	64.26%	55.58%	67.55%	34.16%	79.07%	52.98%	71.57%	56.76%
F stat	19.85 ***	22.48 ***	18.93 ***	30.84 ***	8.96 ***	51.78 ***	19.63 ***	39.67 ***	21.16 ***
Dw	1.61	1.61	1.57	1.80	1.70	1.67	1.74	1.76	1.56

Source: own processing with Eviews. Note ***, **, * denotes the significance level at 1%, 5% and 10%. Red values are associated with models where there is no relevance of period fixed effects, and green values are associated with models with fixed effects relevance, with a probability of rejecting redundant period fixed effect up to 17.95%. Note: The independent variables (Correlation between farm size and coupled payments, Correlation between farm size and decoupled payments, Correlation between farm size and total debt) related with "correlation" refers to the product between the first term and the second one in order to observe the cumulative effects.

Contrary, the influence of decoupled payments is doubtful, as no economic interpretation can be done (the associated coefficients are both positive and negative and statistically significant from zero). The product between coupled subsidies and firm size even though it is statistically significant, it doesn't have an economic interpretation as the sighs of the associated coefficients are positive and negative. On the other hand, a positive correlation is found between decoupled payments granted for larger firms and their total debts. In this regard, considering firm size, an increase in decoupled payments leads to an increase in total debts with a value between 0.058% and 0.087%. The explanation may be because the entities have several development/research areas, for which they need additional sources of financing. Regarding the effect of total debt and firm size, it seems that larger entities have higher debts.

Another positive effect is given by the increase in farm net added value (measured in agricultural working units). The results emphasize that higher the value of the firm is, higher total amount of debt is. The results are similar with the results found in Table 6, the difference being the magnitude of the effect. In this case, an increase of farm net added value per agricultural unit generates an increase with 0.16% of total debts, while the results found in Table 6 reveal that the impact is around 0.30% The positive correlation is based on the fact that, with the increase on farm net added value, the entity may contract long-term and medium-term loans of higher value as it can provide additional collateral elements. What should be noted is that, by analyzing the robustness of the results obtained, not only the increase in the net added value per agricultural working unit affects the increase on total debts, but also the increase of the total assets (their effect is being similar, in terms of sign and interpretation, but different in terms of the magnitude of the effect—the effect on total debts in 0.53%).

The need for additional resources also occurs when labor costs, costs of external factors, specific costs, including their components crop-specific costs or livestock specific costs are analyzed. Regarding contract work variable, it can be seen that the effect on total debts is smaller than the one found in Table 6 (the influence on total debts in between 0.15% and 0.38% compared with initial values, where the influence was between 0.14% and 0.64%). When the cost of external factors is encountered, we can observe that if higher in the case of robustness analysis. In a quantified manner, an increase with 1% in the cost of external factors generates on increase with almost 1% of total debts. The influence is also around 1% in the case of specific costs, the difference between initial analysis and the robustness one being in finding smaller values for the second analysis. If the components of specific costs are analyzed, we can observe that the impact of specific crop costs is approximately the same in both analysis (a change affects total loans with a value between 0.61% and 0.89%), while the impact of specific livestock costs is smaller in the robustness analysis, being almost half of the initial values (0.41–0.65%). From an economic perspective, the increase of these costs generates an additional need for resources, for maintaining entity's market exposure and for ensuring minimal development.

As regards the components of external factors, it can be observed that an increase of share of the interest rate determines an increase on total debts with a value between 0.039% and 0.055%); while an increase of the share of wages causes a decrease on total debts with a value around 0.02% (the remuneration of the employees generates obligations over a short period of time). The signs and the magnitude of the coefficients are similar with the one found in Table 6.

On the other hand, when the share of crop production or livestock production is considered, then an increase with 1% of them influences negatively the value of total debts. In other words, the fluctuation is between 0.014% and 0.037%, being approximately half of the initial values. The same effect is observed in the case of the share of cash flow in total equity. The change that occurs on total debt is around 0.02%. In both situations, at entity's level, there is an increase in own resources due to which on one hand, some of the debts can be reimbursed. On the other hand, there are additional own sources of financing. The same impact is also encountered when measuring the effect of own labor. An increase with 1% in own labor leads to a decrease with 0.01% in total debts. Moreover, in this situation, the economic relevance could be presented rather than the initial analysis where no interpretation could be done.

In Table 11, the results based on the robustness analysis conducted on long term debts are presented.

Table 11. Impact of independent variables on long-term debt—robustness analysis.

Dependent Variable—LONG TERM DEBT (Fixed Effects Estimation on the Analyzed Time Period. Period SUR Method. Correlation Matrix White Period).									
Element	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
C	−0.895	1.165	1.145	−0.552	−4.543 ***	2.899 ***	−0.081 ***	−0.581	−1.46
Coupled payments	−0.605 ***	−0.114 ***	−0.034				−0.095 ***		
Decoupled payments	0.064			−0.306 ***					
Correlation between farm size and coupled payments	0.412 ***				−0.002	−0.031 *			
Correlation between farm size and decoupled payments		0.060 *						0.111 *	
Correlation between farm size and total debt			0.016				0.096 *		0.030
Net added value of the firm per agricultural work units			−0.002	0.177 ***					
Total assets		0.602 ***							
Contract work				0.172 **	0.411 ***				
External factors			1.180 ***			1.057 ***			1.030 ***
Share of interest in external factors	0.040 ***	0.044 ***				0.036 ***		0.059 ***	
Share of rent in external factors	−0.0106	−0.002				0.001		−0.002	
Share of employees in external factors			−0.022 ***	−0.027 ***			−0.019 ***		−0.026 ***
Specific costs				1.271 ***			1.151 ***		
Share of crop production	−0.02 **	−0.029 ***				−0.038 ***			
Share of livestock production	0.004	−0.013				−0.017 ***			
Share of cash flow	−0.004	−0.010 *	−0.026 ***	−0.021 ***	−0.019 ***	−0.014 **	−0.024 ***	−0.030 ***	−0.021 ***
Own work	0.014 *	−0.008 **	0.001	−0.01	0.005	0.001		−0.003	
Leased land	0.006	0.01 *	−0.007		−0.012 *	−0.0005	−0.003	−0.002	−0.009 **
Specific crop costs					0.847 ***			1.006 ***	0.25 **
Specific livestock costs	0.891 ***	0.203			0.489 ***				0.36 **
Rsqd ad	59.27%	59.73%	59.30%	72.86%	35.95%	72.02%	55.83%	75.35%	64.28%
F stat	18.38 ***	18.71 ***	21.88 ***	39.49 ***	9.61 ***	35.59 ***	21.90 ***	43.81 ***	28.64 ***
Dw	1.71	1.71	1.57	1.77	1.67	1.58	1.74	1.75	1.62

Source: own processing with Eviews. Note ***, **, * denotes the significance level at 1%, 5% and 10%. Red values are associated with models where there is no relevance of period fixed effects. Note: The independent variables (Correlation between farm size and coupled payments, Correlation between farm size and decoupled payments, Correlation between farm size and total debt) related with "correlation" refers to the product between the first term and the second one in order to observe the cumulative effects.

Table 11 highlights the influence of independent variables on long-term debt based on robustness analysis.

The results are similar in terms of sign, with the one found in Table 7, in the case of coupled payments. Thus, an increase in coupled subsidies generates a decrease of long term debt. In a quantified manner, an increase with 1% of coupled payments influences negatively long-term debts with 0.09% and 0.60%. In terms of magnitude the values of the coefficients are half than the one found in initial analysis. Decoupled payments have also a negative influence on long term debt. Thus, an increase with 1% on decoupled payments leads to a decrease of long term debts with 0.3%. In comparison with the results found on total debts, the influence is statistically significant different from zero and is similar in terms of correlation with the one presented in Table 7. Regarding the farm size, it can be observed that a significant influence is found in the case of decoupled payments. The results emphasize that larger companies that received decoupled subsidies have higher long-term debts, while the impact of coupled payments is irrelevant in this situation as the coefficients, even though are statistically significant from zero, do have opposite signs.

When the impact of net farm value added variable is considered, then an increase in long term debts is detected. The explanation is that higher the value of the entity measured in agricultural units is, higher long terms are as its ability to contribute with own resources, together with additional collateral guarantee increases. This feature facilitates additional long-term debt. Similar effect is provided in the case of total assets, but the increase of long term debts is higher (0.6%). From an accounting perspective, the phenomenon can be explained by the need to balance assets accounts with equity and debt accounts.

The increase in total debts may also be affected by an increase in internal factors, such as the labor contract costs, by an increase in external factors costs or by an increase of specific costs, both with its components. In a quantified manner, the largest impact is found in the increase of specific costs as the increase with 1 % of it determines an increase in long term debt with between 1.15–1.27%. Similar results in terms of magnitude are found when the increase of external factors costs is encountered, the change in long term debt being around 1.1%. The change in labor cost affects long term debt with a value between 0.17% and 0.41%. Regarding the components of specific costs, both the increase of specific crop costs and the increase of livestock costs impact long term debt, higher influence being found for the increase of specific crop costs.

Concerning the external factor costs' components, there is a negative influence of the increase of the employees' weight within the external factors, a positive influence of the increase of the share of interest rate in external factors and an insignificant influence of the increase of the share of rent in the total expenditures associated with the external factors on long term debts. In comparison with the results presented in Table 7, the change in long term debts is similar. The changes that were observed reveal that long term debt vary with a value between 0.019% and 0.059%.

Regarding the factors that negatively affect the amount of long term debts, identical factors were found as is presented in Tables 7 and 10. In this regard, it can be noted a decrease of long term debt when an increase in the share of cash flow to total capital, an increase in crop production, as well as an increase in the production of livestock occurs. In a quantified manner, the fluctuations are between 0.01% and 0.038%, being a little bit higher in comparison with initial results or the results found in Table 10.

Considering the families' own labor indicator and the leased land indicator, no interpretation can be provided, given that in some models the correlation is negative, while in other models the correlation is positive, in both cases the coefficients being statistically significant different from zero. Therefore, these indicators may also consider other farm features, such as resource management skills, managerial capabilities or risks.

In order to complete the robustness analysis, the results were also retested for short-term debts. These are presented in Table 12.

Table 12. Impact of independent variables on short-term debt—robustness analysis.

Dependent Variable—SHORT TERM DEBT (Fixed Effects Estimation on the Analyzed Time Period. Period SUR Method. Correlation Matrix White Period)									
Element	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
C	6.237 ***	5.169 **	3.038 ***	2.218	0.316	3.224 *	−0.815	2.86 **	1.135
Coupled payments	−0.117 *	−0.075 ***	−0.044 *				−0.095 ***		
Decoupled payments	−0.017			−0.131 *					
Correlation between farm size and coupled payments	0.033				−0.026	−0.031 *			
Correlation between farm size and decoupled payments		0.007						−0.007	
Correlation between farm size and total debt			0.022 **				0.096 *		0.0038 *
Net added value of the firm per agricultural work units			−0.099	−0.069					
Total assets		0.156							
Contract work				0.216 *	0.254 **				
External factors			0.594 ***			0.520 **			0.473 **
Share of interest in external factors	0.023 **	0.022 **				0.017 *		0.022 ***	
Share of rent in external factors	−0.008	−0.007				−0.003		−0.004	
Share of employees in external factors			−0.005	−0.011 **			−0.019 ***		−0.005
Specific costs				0.544 ***			1.151 ***		
Share of crop production	−0.020 *	−0.02 *				−0.019 **			
Share of livestock production	−0.002	−0.002				−0.0009			
Share of cash flow	0.009 *	0.009 *	−0.001	−0.002	−0.006	0.009 *	−0.024 ***	0.005	−0.009
Own work	−0.01	−0.013	−0.006	−0.012	−0.009	−0.01		−0.013 *	
Leased land	0.016 *	0.017 **	0.004	0.005	0.004	0.012	−0.003	0.007	0.007
Specific crop costs					0.341 *			0.446 **	0.046
Specific livestock costs	−0.011	−0.058			0.214				0.059
Rsqd ad	10.01%	10.49%	11.34%	11.20%	15.15%	16.52%	55.83%	7.00%	7.04%
F stat	2.32 ***	2.40 ***	2.83 ***	2.80 ***	3.74 ***	3.66 ***	21.90 ***	2.15 **	2.16 **
Dw	1.95	1.97	1.92	1.79	1.95	2.01	1.74	2.01	1.92

Source: own processing with Eviews. Note ***, **, * denotes the significance level at 1%, 5% and 10%. Red values are associated with models where there is no relevance to fixed effects, and green values are associated with fixed-effect models with a probability of rejecting redundant fixed effect up to 12.56%. Note: The independent variables (Correlation between farm size and coupled payments, Correlation between farm size and decoupled payments, Correlation between farm size and total debt) related with "correlation" refers to the product between the first term and the second one in order to observe the cumulative effects.

In the case of short-term debts, by conducting the robustness analysis, r, presented in Table 12, only 3 out of the 9 models were accepted as relevant considering the period fixed effect in comparison with the results found for total amount of debts or for the amount of long-term debt. In this case, it can be noticed that these models have no period fixed effects, so less influence of time can be mentioned regarding the short-term debt.

Considering these aspects, only those models where the fixed effects are different from each other on the period on which the analysis was conducted are considered for the interpretation of the results.

As a result of the robustness analysis, it is noted that larger the coupled subsidies are, lower the amount of short-term debt is. The increase with 1% of coupled payments decreases short term debts with 0.07–0.1%. In the short run, the influence of coupled subsidies is less important than the one found in the case of long term debt or total debt. We could reveal that coupled subsidies are more important for long term activity rather for short term activity.

Another element that has an influence on short term debt is the increase in the share of interest to total external factors. Its increase impacts positively short-term debt, but the impact is less intense than the one found in Tables 10 and 11, for both long term debts and total debts. It can also be seen that an increase in the share of employees or the increase in the share of interest costs to external factors does not affect the value of short-term debt if the period fixed effect is considered. The explanation is based on the fact that these costs are carefully monitored, their fluctuations being closely to zero from one period to another.

Regarding the production variables, it appears that the increase of share of crop production in total production leads to a decrease in short-term debt. The explanation is given by the fact that agricultural production is faster than the production of livestock, since its benefits can be easily quantified than the one found in the case of livestock. An increase with 1% of independent variables determines a decrease of short-term debts with a value around 0.02%, the decrease being almost similar with the one presented in Tables 10 and 11. Also, for livestock, the benefits of production would lead to a decrease in short-term debt, but the value of the coefficient is not statistically significant if we consider period fixed effect. Otherwise, if no period effect is used, then the influence of the increase of livestock production affects negatively short-term debt. It should be beard in mind that the benefits from livestock are emphasize in a longer period as the livestock must reach the required parameters by the producers either to be processed in slaughter houses, or in the process of breeding.

Consistent with this result, it can be argued that an increase in crop-specific costs (sowing costs, fertilization, protection of agricultural production, etc.) leads to an increase in short-term debt with 0.44%, while an increase in the cost of livestock (feed, feed for grazing livestock and farm animals etc.) do not have an impact on short-term debt.

Considering the cash-flow to total capital ratio increase, it seems that the effects are opposed to those identified for total debts, respectively, for long-term debts. The results provide evidence that an increase in the ration of cash flow to company's total capital determines an increase in short-term debt. On the other hand, the increase is very small, being of 0.009%. In other words, we could say that cash flow resources are used for paying long term debts and for ensuring the activity on the short run.

Other variables that have an impact on short-term debt are the variables of own labor and leased land. As a fact, an increase in families' own labor leads to a decrease in short-term debt, while an increase in the rented land scaled to the total used agricultural area leads to an increase in short-term debt. Based on these results, we could admit that leased land costs affect short term debts by increasing their value, in comparison with long term debts where a decreasing trend is observed.

If we consider the models where period fixed effects are not relevant, decoupled subsidies have a negative impact on the value of short-term debts. An increase with 1% in decoupled payments decreases short term debt with 0.13%. The effect is smaller than the one detected in the case of long term debt, where the decrease was 0.3% (see Table 10). In fact, as decoupled payments are higher, the short-term debts are smaller. Regarding the influence of farm size, it can be observed that larger companies that receive coupled payments have smaller short-term debt, while the influence of farm size on decoupled payments is not statistically significant different from zero. Other negative effects are identified in the situation where the share of employees in the total external factors is encountered, as its increase lowers the short-term debt.

In addition, in Table 12, there are also variables that increase the value of short-term debts, even though the period fixed effects are not relevant. Based on the results, these variables are labor contracts, specific costs and specific crop costs external factors cost, and an increase in the share of interest in total external factors. The most significant influence is found for specific costs as an increase with 1% of them increases short term debt with a value between 0.54% and 1.15%, the effect being almost similar in terms of magnitude with the effect found in Tables 10 and 11, for total debt and long-term debt. Regarding the components of specific costs, the results reveal that only specific crop costs affect short term debt in terms of increasing its value with approximately 0.4%. The results are different from the one related with long term debt and total debt where both the specific crop costs and the livestock costs affects the dependent variable. The influence of increasing external factor costs generates an increase of 0.47–0.49% for short term debt, the increase being half of the increase found for long term debt and total debt. The results would indicate that an increase in these items would generate a rise in short-term debt.

A variable that has an interesting behavior is the share of cash flow in total capital. If the models where there is no redundant effect for period (the period fixed effects are relevant) are considered, then one may observe that any increase of independent indicator generates an increase in short term debt. It seems that cash flow resources are used for long run activity, rather for short term, as the effect found in Tables 10–12 emphasizes. On the other hand, if we consider all models on which the analysis was conducted then the influence of cash flow variable is not statistically significant different from zero.

Considering the model's creditworthiness, it seems that the R-adjusted values are lower. It can be concluded, that agricultural unit farms focus on long term activity, rather on short term obligations. On the other hand, the autocorrelation phenomenon that occurs between errors is reduced, so the results found by conducting the robustness analysis are unbiased.

Moreover, the obtained results suggest the influence of specific variables on long-term debt. However, as these results are due to the characteristics of the agricultural domain, it is interesting to enquire whether the entities in the field rely more on short-term debts or whether they ensure financing through long-term debts. Based on this, to bear out the results obtained in Table 12, where the dependent variable is the amount of short-term debts, an additional analysis was conducted in which besides the initial variables, the one lag long-term debt variable w was added. The reason was to check whether the company focuses on short-term debt or whether short-term debt is in fact long-term debt that reached maturity time in the analyzed period. The results are presented in Table 13.

Table 13 identifies the factors that influence short-term debt. A significant importance is conferred by long-term debts that were analyzed with one lag. The significance of the associated coefficients is significantly different from zero, therefore long-term debt from previous periods (the results are considered for one lag, but the effect was tested also with 2 or 3 lags) influences short-term debt. In other words, an increase with 1% of long term debt lagged with one period creates additional short-term debts, the increase being around 0.6%. Hence, the analyzed entities from agricultural field are entities that rely on long-term financing, and short-term debts are due to the maturity of long-term ones. In fact, the entity does not focus on contracting short-term debts, rather on having long-term debts because they can ensure sustainable development and market survival.

Table 13. Impact of independent variables on short-term debt—robustness analysis by including long-term debt by one lag.

Dependent Variable—SHORT TERM DEBT (Fixed Effects Estimation on the Analyzed Time Period. Period SUR method. Correlation Matrix White Period)									
Element	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
C	6.893 ***	7.265 **	1.776	3.017	4.833 **	2.898 **	−0.519	2.685 **	−0.462
Coupled payments	0.120	0.025	−0.014				−0.048		
Decoupled payments	−0.171			0.015					
Correlation between farm size and coupled payments	−0.045				0.0068	−0.006			
Correlation between farm size and decoupled payments		−0.010						−0.013	
Correlation between farm size and total debt			0.116				0.168 ***		0.198 **
Net added value of the firm per agricultural work units			−0.100	−0.178					
Total assets		−0.174							
Contract work				0.132	−0.024				
External factors			−0.175			−0.193			−0.229
Share of interest in external factors	0.008	0.008				0.007		0.008	
Share of rent in external factors	−0.008	−0.015 *				−0.003		−0.008	
Share of employees in external factors			0.008	0.009 *			0.018 *		0.019 **
Specific costs				−0.219			−0.329		
Share of crop production	0.002	0.001				0.008			
Share of livestock production	0.004	0.004				0.006			
Share of cash flow	0.014	0.013 *	0.017 *	0.015 *	0.010	0.018 *	0.009	0.013 *	0.007
Own work	−0.023 ***	−0.017 *	−0.014	−0.013 *	−0.025 ***	−0.022 ***		−0.019 **	0.010 **
Leased land	0.005	0.004	0.004	0.004	0.003	0.005	0.010 **	0.004	
Specific crop costs					0.096			0.092	0.090
Specific livestock costs	−0.607 *	−0.57 *			−0.378				−0.348
Long term debt(-1)	0.594 ***	0.606 ***	0.60 ***	0.618 ***	0.57 ***	0.584 ***	0.623 ***	0.428 ***	0.631 ***
Rsqd ad	30.66%	32.67%	35.53%	34.51%	32.59%	32.52%	37.77%	28.80%	34.85%
F stat	5.618 ***	6.07 ***	7.90 ***	7.60 ***	7.49 ***	6.66 ***	9.77 ***	6.43 ***	8.18 ***
Dw	1.95	1.91	1.97	1.97	1.95	2.01	1.95	1.98	1.97

Source: own processing with Eviews. Note ***, **, * denotes the significance level at 1%, 5% and 10%. Red values are associated with models where there is no relevance of fixed effects, and green values are associated with patterns in which there is relevance of fixed effects with a probability of rejecting redundant fixed effect of maximum 11.44%. Note: The independent variables (Correlation between farm size and coupled payments, Correlation between farm size and decoupled payments, Correlation between farm size and total debt) related with "correlation" refers to the product between the first term and the second one in order to observe the cumulative effects.

Based on the results found in Table 13, only some variables' coefficients are statistically significant from zero. It seems that an increase in the share of rents in total external factors leads to a decrease of short-term debts with 0.015%. In the case when the fixed effects are not relevant (there is redundant fixed effect), the increase in the share of wages/employees in total external factors leads to an increase of short-term debts when long term debts come to maturity. Other influences are found when the share of cash flow to total capital is considered. Its' increase determines an increase in short-term debt. The explanation can be given by the fact that the company focuses on long-term financing, so the main purpose is not to pay its short-term debt. The results are in accordance with the one found in Tables 10–12. Consequently, the increase of the cash flow ratio to total capital is used, together with other resources, for medium and long-term financing activities, rather for financing short term debts, which generates the increase of the short-term debts.

As far as the families' own labor, the higher its share in the total labor is, the lower the amount of short-term debt is, which is economically reliable. The results are in accordance with the results found in Tables 10 and 12 and suggest that own labor is more important in the short run than in the long run, as it could create additional resources that are used for other activities.

An interesting correlation is identified between the cost of livestock and short-term debt when long term debt comes to maturity. The results indicate that with an increase in specific livestock costs with 1%, short-term debt decreases with 0.6%. The justification lies in the need to finance these activities on long term and may be related to the positive correlation identified between the increase in the cash flow and the increase in the short-term debt.

In the case of the models where redundant fixed effects are significant, it seems that an increase in the share of rented land in the total arable area leads to an increase in short-term debt.

Also, Table 13 shows that even if the value of the coefficients is not significantly different from zero, the size of the firm and the grants of subsidies determine smaller short-term debts. The results confirm that the entities focus on obtaining long-term financing. In line with these results, there is the increase of specific costs. The results lead to the opinion that they are related with an increase in long-term debt, rather with an increase in short-term debt. Mainly, crop production is financed on the short term, while long-term financing is allocated to livestock.

Because the period fixed effects are not relevant for models in which the dependent variable is the amount of short-term debts, it can be concluded that there is no influence of the period on the short-term debts. Agricultural entities therefore focus on long-term financing rather than on short-term financing, which is why collateral guarantees are crucial for expanding and for developing the business.

6. Discussion

As rural development policies are targeting more than 90% of EU territory and more than 50% of EU population [74], their importance in achieving sustainable development of agriculture is obvious in the context of global population growth and of limited resources. This research focused on assessing the influencing factors of debt in agriculture for discussing the road to sustainability.

It can be argued that both coupled and decoupled subsidies negatively influence the value of short-term debt, long-term debt and total debts. Therefore, the larger the subsidies, either in the form of coupled payments (crop, livestock/livestock and agricultural development) or in the form of decoupled payments (payments granted for exploitation and area payments under the payment scheme, the additional financing scheme being included) are, the smaller the amount of total debts, short-term debt and long-term debt is. The explanation is that the entity receives additional sources of financing; consequently, it does not have to resort to loans. The results are consistent with the first hypothesis (H1) and are similar to those identified by Ciaian et al. [21], Swinnen [58], Janda [59] and O'Toole and Hennessy [57]. In another study was shown that the direct payments granted to farmers represent an important factor for increasing the land area and the land changes [75], which further could generate higher debt according to the second research hypothesis. Further, one of the options of future post 2020 CAP is to reduce until elimination the direct payments, which will lead to compliance reduction with greening objectives [76] or to increases in total debts due to decreases of coupled payments, as it was demonstrated in this research through hypothesis 1. The CAP post 2020 will further use the coupled and decoupled payments as they face high risks on income, but with a more emphasis on environmental practices [2]. The EU aims to link the decoupled payments with the environmental performance, making the small farmers more vulnerable [2]. In these conditions, the debt level of small farmers could increase, generating unsustainable development due to social and economic problems for this category. However, future post CAP aims to provide solutions for this matter, such as redistributed payment [2]. In addition, it seems like direct payments improve water, soil and air quality, contributing to the climate change mitigation [77]. So, even though the debts increase based on payments growth, the impact on agriculture is environmental positive.

Considering the size of the agricultural entity, it can be observed that the granting of subsidies through the Common Agricultural Policy to larger firms leads to an increase of the long-term, short-term and total debts, if the average effect across EU entities is considered. On the other hand, considering the results found by conducting the robustness analysis, the effect of subsidies granted by larger entities is uncertain both on long term debt and total debt. If the models where the period fixed effect are assessed, then the larger firms that have access to coupled payments have smaller short-term debt. Regarding decoupled subsidies, it can be noticed that larger the agricultural unit is, the higher the total debt and the long-term debt are. On the other hand, no effect is found on short term debt as the estimated coefficient is not statistically different from zero. Taking these into account, the results are similar to those obtained by Ciaian et al. [21] (for the overall estimation and for emphasizing the effect on total debts and long-term debt by using the robustness analysis). Thus, the second hypothesis (H2) is true.

The third hypothesis (H3) that was tested relates to the link between the value of the agricultural unit and the quantum of existing debts. The results show that this hypothesis is true. The explanation is based on the fact that, with an increase in the value of the entity, it can cover the collateral requested by the financial institutions, so it can use external resources in the form of loans. The same idea is supported by Sebatta et al. [29] and Chavas [20], which shows that the higher the households/agricultural entities are, the faster the access to finance is. A similar effect is also observed when the value of total assets is analyzed. The more assets agricultural firms have, the easier the access to finance is. The consequence is an increase in the value of the long-term debt and of total debts, so H10 is true. However, it should be noted that the effect is not reliable on short-term debt as the coefficient found in Table 12 is not statistically significant from zero.

In terms of specific costs, both with its components: crop-specific costs and livestock specific costs and external factors costs, a direct correlation can be identified between their increase and the increase in total debt and long-term debt (the exception being when the correlation between livestock-specific costs and short-term debt is considered). In this regard, H4 and H7 assumptions are true. In other words, the related interpretation is similar with the elasticity indicator. The results emphasize that the impact of both the external factors and specific costs is stronger on total debt and on long term debt. The results indicate that an increase of 1% in the cost of external factors or in specific costs affects the amount of debts (long-term debt and total debt) with an increase around 1%. The results have a smaller impact on short term debts, as the period fixed effect is redundant. In fact, the increase of development costs leads to additional sources of financing. The results suggest that while costs increase, the need for financing can also increase, which can lead to bankruptcy of the agricultural unit. The results obtained support the results found by Kohansal and Mansoori [63] and by Mahmood et al. [64].

Regarding the external factors, it was found that the higher the share of the interest rate is, the higher the amount of debts is. The impact is stronger for long term period rather than for short term period, where its effect is almost wiped out by the increase of the share of employees in external costs. In fact, the results suggest that the higher the share of wages in total external factors is, the lower the amount of debt (short term debt, long term debt and total debt) is. The explanation could be that the entity is increasing its internal expenditures, therefore, it can no longer use external resources for own financing. Overall, we found the same effect regarding the share of rents in external factors as in the case of employees' costs, in terms of influence, even though the coefficients are not statistically significant from zero. In the case of interest rates, the results are somehow similar to the ideas supported by Petrick and Kloss [65] and by Kohansal and Mansoori [63]. On the other hand, the results are opposed with the results found by Agriculture, Forestry and Fishery, Republic of South Africa [78] as they concluded that the farm debt continues to increase even though the repo rate and the prime rate were reduced. The explanation that authors offered is related to the fact that farm debt is affected by demand driven factors, that rising inflation affects expenditures and generates an increase on production costs and that an increase in agriculture in the form of cash flow income is due to the increase use of farm credit for financing farming investment.

Because rising costs of external factors and specific costs lead to increased debt, we wondered what happens if internal resources increase. It can be seen that an increase in the share of crop production in total output leads to a decrease in borrowed resources. The results present larger magnitude on long term debt rather than short term debt. These results are reliable both for general analysis and the robustness analysis which were conducted. Similar results are also found in the case of the increase in livestock production in the total production, the exemption being found in the case of short-term debt. Therefore, H5 hypothesis is true.

The increase of internal resources, quantified by the share of cash flow to total capital that the farm has, also generates a decrease in borrowed amounts. The effect is biased only in the case of short-term debts, where a positive influence is detected when long term debts come to maturity. The increase of the share of cash-flow to total capital leads to a decrease on total debt or on long term debt, the effect being the same. Therefore, H6 is supported by the obtained results.

Considering the results of the leased land and the families' own labor, the results are vague. The only reliable results are related to the impact of leased land on short-term debt, which is a positive one (the need for financing) and the impact of self-employment on short-term debt and on total debt that is negative (the use of own resources leads to a decrease in the need for additional resources). These results are similar to the effects presented by Ciaian et al. [21]. Therefore, even if only partially, H8 and H9 are true.

Finally, it is observed that short-term debts respond differently to long-term debt and to total debts. In this regard, an additional analysis was conducted in order to identify whether short-term debts are in fact medium to long-term debts. The obtained results suggest that short-term debts are mainly formed from medium and long-term debt that reached maturity. These results are in line with what was discovered by Sebatta et al. [29] who concluded that agricultural entities are developing their activity based on medium and long-term resources, rather than short-term resources. The results indicate that the long-term borrowing trend is also maintained at EU level, not only in poorer countries.

The importance of this research in the sustainable development of the agricultural entities, specifically, and of the agricultural sector, in general, is given by the comprehension regarding several determinant factors of debts. By understanding them, sustainable development can be favored, as well as reaching the objectives of post 2020 CAP, which aims to increase the environmental practices of farms by considering the particularities of each member state [2]. This study might help the decision makers to better understand the analyzed risks, generating a more focused risk management in agriculture, as the new post 2020 CAP wishes to be taken into consideration [2]. According to Alarcon [79] firms that have short run obligations increase their efforts in clearing their payments, which leads to an improvement of efficiency. In fact, by understanding the factors that affect short term obligation, the relationship between financing institutions and agricultural units is more stable, and thus, can be a way of boosting efficiency. Other results are found by Mugera and Nyambane [80] who reveal that technical efficiency is positively related with short term debt, while production efficiency has no impact on long term debt. Regarding research studies conducted in the literature, United Nations Development Programme (2012) [81] emphasized several cases in which loan contracting positively impacts the sustainable agriculture (in Peru loans were granted for purchasing, processing, and exporting goods for no more than 9 months, and the increase in revenues of the entities that contracted loans was six time higher; in Tanzania a long term lending relationship between bank and smallholders farms created guaranteed income from premium-priced organic cotton; in Kenya, framer's insurance was enabled and the program is looking to cover harvest and livestock loss with the purpose of ensuring financial sustainability). Moreover, the research conducted by United Nations Development Programme [81] and [82] also emphasized the importance of granting subsidies in ensuring sustainable development (in Philippines, government's' aid in the form of startup capital for increasing grower's capital fund improved productivity and the access to financing for urban dwellers by creating long term financial sustainability; in Tunisia, the support offered to organic agricultural for local-foreign partnership increased foreign direct investment with 250% in four years; in China government's support for organic production together with training and strict regulation lead to access into new markets and decreased in environmental degradation). It can be observed that the aid conferred either by government or banks generate an increase in farm performance. Moreover, the report developed by Lerman [83] revealed that among the major reasons for accumulation of farm debt is the lack of profitability in several countries such as Tajikstan, Belarus, Kazakhstan, Moldova, Russia, and Ukraine (known as CIS Countries) and Israel, government interventions by imposing several finance constraints, lack of transparency in accounting related with debt, interest rates and inflation.

The effect found in the European Union, that arises from Common Agricultural Policy is also important. Rizov et al. (2013) [84] found different results for coupled and decoupled subsidies in an analysis conducted on EU 15. On one hand, coupled subsidies have a small positive or a large negative impact on productivity rather than the decoupled subsidies. This effect is explained by the fact that coupled payments are linked to farm factors and production decisions, thus, the loose of efficiency, mainly allocative efficiency, is higher. On the other hand, the investment induces productivity gain by contracting loans and by ensuring higher risks is smaller for coupled subsidies than for decoupled payments (Ciaian and Swinnem [85]). Their results [84] emphasize the fact that subsidies had a negative impact on farm productivity before the decoupling reform (decoupled payments). After the reform was implemented, the effect of subsidies turned positive in 10 out of 15 countries, a negative influence being found only in Greece and UK. Moreover, the results turned positive for both the northern counties and the southern countries, as before, northern countries have higher returns to scale. In addition, it could be noticed that the research was conducted on developed countries. Our results reveal the impact of subsidies, both coupled and decoupled, on farm debt, pointing out a negative influence on short-term debt and long-term debt. The effect is a little bit smaller for short-term debt in case of coupled subsidies rather than the one found for decoupled subsidies, while for long term obligations the effect of decoupled payments is between its minimum and maximum value of coupled subsidies. Regarding the size of the entities, our results show that decoupled payments granted for larger firms increase the value of long term debt and of total debt, while a decrease of short term debt for larger entities that granted coupled subsidies is detected. In another research, Zhu and Lansink [86] found that an increase in subsidies in total revenues negatively impacts the technical efficiency in Germany, Netherlands and Sweden. They also revealed that degree of specialization (farm size) positively marked on technical efficiency in Germany, while the degree of subsidies dependence negatively influenced on technical efficiency in Netherlands and Sweden.

On the reasoning that financial stimulus influences the sustainable development of farms due to an ease of funds' access [2], the analysis conducted in this paper demonstrated the impact of several factors on agricultural debt to guide the adaptation of future CAP measures for climate change mitigation and adaptation, as well as the implementation of sustainable agricultural practices after 2020. In this context, future research could determine the link between the debt level and sustainable development indicators, such as agricultural emissions.

7. Conclusions

The financing of the agricultural sector is subject to the influence of both the internal and the external factors. Long term sustainability of these entities is rather difficult, as they require solid collateral for maintaining market exposure and for ensuring their development. Under these circumstances, the entity relies on borrowing loans as additional sources of financing, either to secure its livestock financing or to secure the financing for growing and harvesting crops. This study addresses agriculture financing, considering the influence of internal and external factors, such as the subsidy policy that exists at the level of the European Union. The analysis was conducted using panel data over an eight years period: 2008–2015. The purpose was to highlight the effects on agricultural debts (long term debt and short-term debt) at the level of the European Union (27 Member States, without Croatia because it was excluded from the analysis due to the lack of information), by correlating the results with the scientific literature and by emphasizing their importance for sustainable development.

The research aimed to assess the impact of specific factors on the agricultural debt level in the European Union during 2008–2015 as these should be consider in future common agriculture policies as well as in achieving sustainable agriculture.

The increases of debt do not necessarily mean a bad situation, if the funds are used in order to develop the farms, especially if the increasing requirements of environmental protection in agriculture are considered. Higher debts could also mean higher performance as well as a better and sustainable farm development. As it was emphasized in Table 9, the coupled payments negatively impacted the total and long-term debts, while the decoupled payments negatively impacted the short-term debts. In this case, the results were found consistent with other literature findings and the first research hypothesis was validated. Finally, by receiving additional funding for the agricultural entities, the debts are decreasing and, more important, these financial sources could generate environmental improvements on long term.

The product between farm size and decoupled payments positively impacted the total, long-term and short-term debts during 2008–2015, the larger the agricultural unit is, the higher the total debt and the long-term debt are. Thus, some results were found consistent with other literature findings and the second research hypothesis was validated. These findings could also influence the environmental dimension of the agricultural entities in both ways: bigger farms could invest in more environmental-friendly technologies and processes, but also, they could harm the environment even more, depending on the production structure and the used resources as well as they could generate more waste.

The net added value of the firm per agricultural work units, the total assets, and the contracted work positively impacted the total and long-term debts between 2008 and 2015, which means higher debts due to higher value of the farm expressed in labor units, higher value of assets, and higher contracted work. The results were found consistent with other literature findings and the third, as well as the 10th research hypotheses were validated. Hence, the access to finance is fastest in the case of farms with higher value expressed in labor units and with higher value of assets due to the better stability for employers and employees. The effect represents more advantageous loans. Also, the costs attributed to contracted work generate higher debts, as it was expected. This last variable was not found in other models in the analyzed literature and, in this case, the findings are considered new.

The external factors and, with a much lower influence, the share of interest in external factors positively impacted the total and long-term debts between 2008 and 2015, which means higher debts due to higher payments for the remuneration of external labor, land and capital factors and due to higher interest rate within them. The specific costs generated similar impact on debt as the costs of external factors. In addition, the share of rent in external factors negatively impacted only the short-term debt during the analyzed time frame. Also, the share of employees in external factors negatively impacted the total and long-term debts during 2008–2015 and it positively impacted the short-term debt. The results were found consistent with the fourth and the seventh research hypotheses and these cost variables were not found in other models in the analyzed literature and, so, the findings are new. The results suggest that the higher the share of wages in total external factors is, the lower the amount of debt is. The explanation could be that the entity is increasing its internal expenditures, therefore, it can no longer use external resources for its own financing. Consequently, increased costs imply higher financial requirements which could be covered, among others, by increasing the debt. As the post 2020 CAP desires focus mainly on solving environmental agriculture problems, future studies could analyze the impact of environmental -related costs and the impact of the financial costs on debts as well as on the possibility of payment of that debt. This could show if the increased debt could help improving the sustainability of agricultural businesses and in what conditions.

The increase of internal resources, quantified by the share of cash flow to total capital that the farm has, generates a decrease in borrowed amounts on long-term and in the total values, meaning that the sixth hypothesis was validated. The results were found consistent with the literature. Also, the own work in a farm negatively influenced only the total agricultural debts during 2008–2015, not being validated the ninth hypothesis, because the higher the own work value is, the lower the total debts are. This could be explained by the fact that, usually, the small farms use preponderantly their own work and they do not have good opportunities of financing. This situation generates unsustainable development of agriculture. Further, the leased land positively influenced only the short-term debt by 0.01% at an increase of 1% of leased land, validating partially the eighth hypothesis. The share of crop/livestock production in total production negatively impacted the total and long-term debt, as the increase of these shares leads also to decrease of borrowed resources due to higher revenues. As the higher production could mean higher pollution, then the higher debts could generate better sustainability in agriculture. The results were found consistent with the fifth research hypothesis. Of course, future studies could focus on determining the impact of various type of agricultural production on debts and further on pollution.

The obtained findings suggest that short-term debts were mainly formed from medium and long-term debt that reached maturity. This means that the long-term borrowing trend was maintained at EU level, not only in poorer countries, as farms are developing their activity based on medium and long-term resources, rather than short-term resources. The research is characterized by the failure of excluding the autocorrelation of errors among period, as well as by the failure to use the cross-sectional effects. The explanation is given by the fact that by including geography—country variable, a high value of the R-adjusted was found. Moreover, biased results were obtained in this case. However, the research is conducted using the period fixed effects, on adjusted models that correct the autocorrelation and the heteroskedasticity between the cross-sectional data. We believe that the analysis is useful to both theoreticians and practitioners because it highlights some factors that affect total debts, long-term debts and short-term debts for entities operating in the agricultural field while considering the future CAP requirements and the road to sustainability in the discussion. The results can be used to provide better performance management of agricultural entities while considering the future sustainable policies in the field. Research could be improved by using a larger set of data, so the results could be estimated on country level. In addition, some countries, such as those in Eastern Europe or Central Europe, could also be analyzed to see if there are any differences between them.

This research could support the policy improvements by understanding the main factors and their impact on farm-level debts, as well as, the impact of coupled and decoupled payments made through CAP on farm level, in the context in which some EU policy makers advocates for the reduction of direct payments while the literature review suggests the need of implementation of the agricultural policies which favors the sustainable practices in the farms. In addition, understanding the influencing factors of debts is relevant as developing the sustainability of farms implies investing in environmental-friendly and health-friendly technologies, as well as investing in innovation, that both need financial resources. Further, these could be obtained, mainly, through loans.

Future agricultural policy should be differentiated by farm size, since the direct payments, especially the decoupled subsidies, have a such an important role in the survival of small and medium farms, serving as collaterals for short-term loans, while for large farms, coupled subsidies (meaning those which recompense high productions for several agricultural products) are important factors in lowering the need for borrowing. While the post 2020 CAP [2] considers steep diminishing of the coupled payments as an environmental measure, the authors consider that a policy of correlation between production performance and environmental constraints would lead the large sized farms to sustainability at an accelerated pace. For the small and medium sized farms, the authors consider that the process of turning them to a more sustainable agricultural activity should be easier, since they rely more on decoupled subsidies, so gradual environmental constraints may be introduced.

In addition, we consider that providing grants for mixt farming systems could create several benefits. Firstly, even though specialization comes with higher profits, it also implies higher variability of income over years. Through mixed farming systems this variability of income could be reduced. Secondly, farmers could achieve higher labor productivity because they have the possibility of combining tasks over the years [73]. Thirdly, by providing grants for these farms, long term development of agricultural activities could be ensured because higher resource use efficiency can be created, and the costs of inputs could be considered as being local.

The role of government in developing agricultural finance is important as they decide to intervene mainly during agricultural or political crises, especially when they want to improve the condition of agricultural firms or want to increase farmers' coordination [87]. Their activities should be in line or should be followed by banks' activity. In fact, the government could provide assistance to agricultural loans, there could be a ceiling for which the credit is guaranteed by the state. This strategy could reduce market imperfection and monopoly power [88], encouraging the development of agricultural sector through the development of bank services. Moreover, Agricultural development banks (that are government owned) could be established in order to finance agricultural activities as they could have an important role in reducing rural poverty and in ensuring agricultural sustainability. These banks should have an appropriate regulatory and legal framework with prudential norms, effective internal control and external supervision [89], an example being Bank for Agriculture and Agricultural Cooperatives in Thailand or Bank Rakyat Indonesia.

Moreover, the policy makers should consider the necessity of more elaborated analyses when considering the reduction of the CAP budget after 2020, as this research demonstrated that both coupled and decoupled payments negatively influence the debt level. The increase of coupled payments generates decreases of total debt, while the increase of decoupled payments indicates the reduction of long-term debt. Further, the proposals for post-2020 CAP could be improved and better substantiated by creating indicators and indices which evaluate the agricultural financing status. These could be introduced into an agricultural sustainability index that could represent a support for both the decision makers and farmers to improve the agricultural sector.

Future Research

The issue of capital structure has not been considered in this study and this limitation will be further investigated in future studies on this subject. Moreover, further research might focus on testing if the findings of this study are similar with those when capital structure is being considered. In addition, this study does not consider the distinction between variables which might affect the demand and the supply for loans. However, this limitation will be further investigated in other studies. In addition, future studies should take into consideration elasticity coefficients for some variables when analyzing the debt influencing factors. Finally, future research might include variables which evaluate the impact of environmental and human capital indicators on debts, as well as vice versa.

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References

1. Ruete, M. Financing for Agriculture: How to boost opportunities in developing countries. In *Investment in Agriculture, Policy Brief Volume 3*; International Institute for Sustainable Development: Winnipeg, MB, Canada, 2015.
2. European Commission. COM (2017) 713-Final. 2017. Available online: https://ec.europa.eu/agriculture/sites/agriculture/files/future-of-cap/future_of_food_and_farming_communication_en.pdf (accessed on 12 July 2018).
3. United Nations. Millennium Development Goals. 2015. Available online: http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf (accessed on 12 July 2018).
4. Worldometers. Population. 2018. Available online: http://www.worldometers.info/world-population/ (accessed on 12 July 2018).
5. G20 Agrifinance Report. In *Scaling Up Access to Finance for Agricultural SMEs Policy Review and Recommendations*; International Finance Corporation: Washington, DC, USA, 2011.
6. Badulescu, D.; Giurgiu, A.; Istudor, N.; Badulescu, A. Rural tourism development and financing in Romania: A supply-side analysis. *Agric. Econ. Zemed. Ekon.* **2015**, *61*, 72–80. [CrossRef]
7. Drăgoi, M.C.; Iamandi, I.E.; Munteanu, S.M.; Ciobanu, R.; Lădaru, R.G. Incentives for Developing Resilient Agritourism Entrepreneurship in Rural Communities in Romania in a European Context. *Sustainability* **2017**, *9*, 2205. [CrossRef]
8. Doran, A.; McFayden, N.; Vogel, R.C. The Missing Middle in Agricultural Finance: Relieving the capital constraint on smallholder groups and other agricultural SMEs. *Oxfam Policy Pract. Agric. Food Land* **2009**, *9*, 65–118.
9. Christiaensen, L.; Demery, L.; Kuhl, J. The (evolving) role of agriculture in poverty reduction—An empirical perspective. *J. Dev. Econ.* **2011**, *96*, 239–254. [CrossRef]
10. Beciu, S.; Arghiroiu, G.A.; Lădaru, G.R. Recent evolutions of livestock at regional level in Romania. *Sci. Pap. Ser. Manag. Econ. Eng. Agric. Rural Dev.* **2016**, *16*, 49–54.
11. Vasile, A.J.; Popescu, C.; Ion, R.A.; Dobre, I. From conventional to organic in Romanian agriculture—Impact assessment of a land use changing paradigm. *Land Use Policy* **2015**, *46*, 258–266. [CrossRef]
12. Longo, P. Food justice and sustainability: A new revolution. *Agric. Agric. Sci. Procedia* **2016**, *8*, 31–36. [CrossRef]
13. De Fazio, M. Agriculture and sustainability of the welfare: The role of the short supply chain. *Agric. Agric. Sci. Procedia* **2016**, *8*, 461–466. [CrossRef]
14. Zolfani, S.H.; Zavadskas, E.K. Sustainable development of rural areas' building structures based on local climate. *Procedia Eng.* **2013**, *57*, 1295–1301. [CrossRef]
15. Aghion, P.; Dechezleprêtre, A.; Hemous, D.; Martin, R.; Van Reenen, J. Carbon taxes, path dependency, and directed technical change: Evidence from the auto industry. *J. Political Econ.* **2016**, *124*, 1–51. [CrossRef]
16. Aldieri, L.; Vinci, C.P. The role of technology spillovers in the process of water pollution abatement for large international firms. *Sustainability* **2017**, *9*, 868. [CrossRef]
17. IFAD. *Rural Finance Policy*; International Fund for Agriculture Development: Rome, Italy, 2009.
18. Monke, J. Farm Credit System. 2005. Available online: https://digital.library.unt.edu/ark:/67531/metacrs9114/m1/1/high_res_d/RS21278_2005Nov23.pdf (accessed on 12 July 2018).
19. Musser, W.N.; White, F.C.; McKissick, J.C. An analysis of optimal farm capital structure. *J. Agric. Appl. Econ.* **1977**, *9*, 163–168. [CrossRef]
20. Chavas, J.P. Structural change in agricultural production: Economics, technology and policy. *Handb. Agric. Econ.* **2001**, *1*, 263–285. [CrossRef]
21. Ciaian, P.; Pokrivcak, J.; Szegenyova, K. Do agricultural subsidies crowd out or stimulate rural credit market institutions? The case of EU Common Agricultural Policy. *Eur. Integr. Online Pap.* **2012**, *16*, 15.
22. Comes, C.-A.; Bunduchi, E.; Vasile, V.; Stefan, D. The Impact of Foreign Direct Investments and Remittances on Economic Growth: A Case Study in Central and Eastern Europe. *Sustainability* **2018**, *10*, 238. [CrossRef]
23. Binswanger, H.P.; Deininger, K. Explaining agricultural and agrarian policies in developing countries. *J. Econ. Lit.* **1997**, *35*, 1958–2005.

24. Allanson, P. Farm size structure in England and Wales 1939–1989. *J. Agric. Econ.* **1992**, *43*, 137–148. [CrossRef]
25. Gale, H.F. Why did the number of young farm entrants decline? *Am. J. Agric. Econ.* **1993**, *75*, 138–146. [CrossRef]
26. Weiss, C.R. Size, growth, and survival in the upper Austrian farm sector. *Small Bus. Econ.* **1998**, *10*, 305–312. [CrossRef]
27. Binswanger, H.P.; Deininger, K.; Feder, G. Agricultural land relations in the developing world. *Am. J. Agric. Econ.* **1993**, *75*, 1242–1248. [CrossRef]
28. United States Department of Agriculture. *Farmers in a Changing World: Yearbook of Agriculture 1940*; United States Government Printing Office: Washington, DC, USA, 1940.
29. Sebatta, C.; Wamulume, M.; Mwansakilwa, C. Determinants of smallholder farmers' access to agricultural finance in Zambia. *J. Agric. Sci.* **2014**, *6*, 63. [CrossRef]
30. Barham, B.L.; Boucher, S.; Carter, M.R. Credit constraints, credit unions, and small-scale producers in Guatemala. *World Dev.* **1996**, *24*, 793–806. [CrossRef]
31. Giné, X.; Goldberg, J.; Yang, D. Credit market consequences of improved personal identification: Field experimental evidence from Malawi. *Am. Econ. Rev.* **2012**, *102*, 2923–2954. [CrossRef]
32. Karlan, D.; Osei, R.; Osei-Akoto, I.; Udry, C. Agricultural decisions after relaxing credit and risk constraints. *Q. J. Econ.* **2014**, *129*, 597–652. [CrossRef]
33. Mobarak, A.M.; Rosenzweig, M.R. *Selling Formal Insurance to the Informally Insured*; Yale Economics Department Working Paper No. 97, Yale University Economic Growth Center Discussion Paper No. 1007; Economic Growth Center, Yale University: New Haven, CT, USA, 2012. [CrossRef]
34. Giné, X.; Jakiela, P.; Karlan, D.; Morduch, J. Microfinance games. *Am. Econ. J. Appl. Econ.* **2010**, *2*, 60–95. [CrossRef]
35. Monke, J. Farm Credit System. Congressional Research Service, 7-5700. 17 May 2016. Available online: https://fas.org/sgp/crs/misc/RS21278.pdf (accessed on 12 July 2018).
36. GPFI, Global Partnership for Financial Inclusion. New Trends in Agricultural Finance. 2015. Available online: https://www.gpfi.org/sites/default/files/documents/02-New%20Trend%20Agricultural%20Finance%20Report-Final-LowRes.pdf (accessed on 12 July 2018).
37. Das, A.; Senapati, M.; John, J. Impact of agricultural credit on agriculture production: An empirical analysis in India. *Reserve Bank India Occas. Pap.* **2009**, *30*, 75–107.
38. Henning, J.I.F.; Jordaan, H. Determinants of Financial Sustainability for Farm Credit Applications—A Delphi Study. *Sustainability* **2016**, *8*, 77. [CrossRef]
39. Hartarska, V.; Nadolnyak, D.; Shen, X. Agricultural credit and economic growth in rural areas. *Agric. Finance Rev.* **2015**, *75*, 302–312. [CrossRef]
40. Selejio, O.; Hepelwa, A.S.; Mduma, J.K. *The Voucher System and the Agricultural Production in Tanzania, Is the Model Adopted Effective*; University of Dar es salaam: Dar es Salaam, Tanzania, 2013.
41. Toby, A.J.; Peterside, D.B. Analysis of the role of banks in financing the agriculture and manufacturing sectors in Nigeria. *Int. J. Res. Bus. Manag.* **2014**, *2*, 9–22.
42. Ayeomoni, O.; Aladejana, S.A. Agricultural Credit and Economic Growth Nexus. Evidence from Nigeria. *Int. J. Acad. Res. Acc. Finance Manag. Sci.* **2016**, *6*, 146–158. [CrossRef]
43. Adjognon, S.G.; Liverpool-Tasie, L.S.O.; Reardon, T.A. Agricultural input credit in Sub-Saharan Africa: Telling myth from facts. *Food Policy* **2017**, *67*, 93–105. [CrossRef] [PubMed]
44. UE Regulation 1307/2013. Available online: http://www.renascc.eu/documente/Reg%201307%20RO_1120ro.pdf (accessed on 12 July 2018).
45. European Union. CAP Post 2020 Fact Sheet. 2017. Available online: http://europa.eu/rapid/press-release_MEMO-17-4842_en.htm (accessed on 12 July 2018).
46. European Commission. The European Agricultural Fund for Rural Development. Financial instruments. Available online: https://www.fi-compass.eu/sites/default/files/publications/EAFRD_The_european_agricultural_fund_for_rural_development_EN.pdf (accessed on 12 July 2018).
47. Pérez Domínguez, I.; Fellmann, T.; Weiss, F.; Witzke, P.; Barreiro-Hurlé, J.; Himics, M.; Jansson, T.; Salputra, G.; Leip, A. An economic assessment of GHG mitigation policy options for EU agriculture (EcAMPA 2). *JRC Sci. Policy Rep.* **2016**. [CrossRef]
48. Sacchelli, S.; Fabbrizzi, S.; Menghini, S. Climate change, wine and sustainability: A quantitative discourse analysis of the international scientific literature. *Agric. Agric. Sci. Procedia* **2016**, *8*, 167–175. [CrossRef]

49. Stasi, A.; Muscio, A.; Nardone, G.; Seccia, A. New technologies and sustainability in the Italian wine industry. *Agric. Agric. Sci. Procedia* **2016**, *8*, 290–297. [CrossRef]
50. FAO. Migration, Agriculture and Climate Change. 2017. Available online: http://www.fao.org/3/I8297EN/i8297en.pdf (accessed on 12 July 2018).
51. Hu, B.; McAleer, M. Estimation of Chinese agricultural production efficiencies with panel data. *Math. Comput. Simul.* **2005**, *68*, 474–483. [CrossRef]
52. Ecorys. *Mapping and Analysis of the Implementation of the CAP*; EU Publications: Luxembourg, 2016; ISBN 978-92-79-54680-8. [CrossRef]
53. Van der Sluis, T.; Pedroli, B.; Kristensen, S.B.; Cosor, G.L.; Pavlis, E. Changing land use intensity in Europe–Recent processes in selected case studies. *Land Use Policy* **2016**, *57*, 777–785. [CrossRef]
54. Ecorys & European Commission—DG for Agriculture and Rural Development. Modernizing & Simplifying the Common Agricultural Policy. Summary of the Results of the Public Consultation, Brussels. 7 July 2017. Available online: https://ec.europa.eu/agriculture/sites/agriculture/files/consultations/cap-modernising/summary-public-consul.pdf (accessed on 12 July 2018).
55. European Commission. Agriculture and Rural Development. Available online: http://www.un.org/esa/agenda21/natlinfo/countr/ec/agriculture.pdf (accessed on 12 July 2018).
56. World Bank. Ending Poverty and Hunger by 2030. 2015. Available online: http://documents.worldbank.org/curated/en/700061468334490682/pdf/95768-REVISED-WP-PUBLIC-Box391467B-Ending-Poverty-and-Hunger-by-2030-FINAL.pdf (accessed on 12 July 2018).
57. O'Toole, C.; Hennessy, T. Do decoupled payments affect investment financing constraints? Evidence from Irish agriculture. *Food Policy* **2015**, *56*, 67–75. [CrossRef]
58. Swinnen, J.F. (Ed.) *The Perfect Storm: The Political Economy of the Fischler Reforms of the Common Agricultural Policy*; CEPS: Brussels, Belgium, 2008.
59. Janda, K. Credit guarantees in a credit market with adverse selection. *Prague Econ. Pap.* **2003**, *2003*. [CrossRef]
60. Koloszko-Chomentowska, Z. Selected Effects of Financing of Agricultural Holdings in New Member States of the European Union. *e-Finanse* **2014**, *10*, 65. [CrossRef]
61. Betubiza, E.N.; Leatham, D.J. Factors affecting commercial bank lending to agriculture. *J. Agric. Appl. Econ.* **1995**, *27*, 112–126. [CrossRef]
62. Wilson, C.A.; Featherstone, A.M.; Kastens, T.L.; Jones, J.D. *Determining What's Really Important to Lenders: Factors Affecting the Agricultural Loan Decision-Making Process*; Staff Paper # 06-07; Department of Agricultural Economics, Purdue University: West Lafayette, IN, USA, 2006.
63. Kohansal, M.R.; Mansoori, H. Factors affecting on loan repayment performance of farmers in Khorasan-Razavi Province of Iran. In Proceedings of the Conference on International Research on Food Security, Natural Resource Management and Rural Development, University of Hamburg, Germany, 6–8 October 2009; pp. 1–4.
64. Mehmood, Y.; Ahmad, M.; Anjum, M.B. Factors Affecting Delay in Repayments of Agricultural Credit; A Case Study of District Kasur of Punjab Province. *World Appl. Sci. J.* **2012**, *17*, 447–451.
65. Petrick, M.; Kloss, M. Exposure of EU farmers to the financial crisis. *Choices Mag. Food Farm Resour. Issues* **2013**, *28*, 1–6.
66. Pietola, K.; Myyrä, S.; Heikkilä, A.M. *The Penetration of Financial Instability in Agricultural Credit and Leveraging*; Centre for European Policy Studies (CEPS): Brussels, Belgium, 2011.
67. The Farm Accountancy Data Network (FADN). European Commission. Available online: http://ec.europa.eu/agriculture/rica/ (accessed on 12 July 2018).
68. FADN, European Commission. Available online: http://ec.europa.eu/agriculture/rica/concept_en.cfm (accessed on 12 July 2018).
69. Kelly, E.; Latruffe, L.; Desjeux, Y.; Ryan, M.; Uthes, S.; Diazabakana, A.; Emma, D.; Finn, J. Sustainability indicators for improved assessment of the effects of agricultural policy across the EU: Is FADN the answer? *Ecol. Indic.* **2018**, *89*, 903–911. [CrossRef]
70. Hausman, J.A. Specification tests in econometrics. *Econom. J. Econom. Soc.* **1978**, *46*, 1251–1271. [CrossRef]
71. Reed, B. WEEK #3 ASSIGNMENT. Second Semester 2009. University of Canterbury. ECON 324. Available online: http://www.econ.canterbury.ac.nz/personal_pages/bob_reed/Courses/ECON_324/Week3/Assignment_Week3.pdf (accessed on 12 July 2018).
72. Wooldridge, J.M. *Econometric Analysis of Cross Section and Panel Data*; The Mit Press: London, UK, 2002.

73. EIP-AGRI Focus Group (The European Innovation Partnership 'Agricultural Productivity and Sustainability' Focus Group). Mixed Farming Systems: Livestock/Cash Crops. Final Report. May 2017. Available online: https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/fg16_mixed_farming_final-report_2017_en.pdf (accessed on 12 July 2018).
74. Dinu, M. Financing of rural development policy in the European Union during 2007–2013. *Metal. Int.* **2013**, *18*, 56–58.
75. Reis, J.; Rodrigues, A. Agricultural land-use change and its drivers in Terceira Island, Portugal (2008–2013). *Reg. Sci. Policy Pract.* **2017**, *9*, 285–300. [CrossRef]
76. Hart, K.; Baldock, D.; Buckwell, A. *Learning the Lessons of the Greening of the CAP, a Report for the UK Land Use Policy Group in Collaboration with the European Nature Conservation Agencies Network*; Institute for European Environmental Policy: London, UK, 2016; Available online: http://cap2020.ieep.eu/2016/4/20/learning-the-lessons-from-cap-greening-2 (accessed on 12 July 2018).
77. Volkov, A.; Melnikienė, R. CAP direct payments system's linkage with environmental sustainability indicators. *Public Policy Adm.* **2017**, *16*, 231–244.
78. Agriculture, Forestry and Fisheries—Republic of South Africa. Increasing Farm Debt Amid Decreasing Interest Rates: An Explanation. Economic Research Division. Available online: http://www.nda.agric.za/docs/Economic_analysis/IncreasingFarmDebt.pdf (accessed on 12 July 2018).
79. Alarcon, S. Debt financing and efficiency in agricultural firms (Endeudamiento y eficiencia en las empresas agrarias). *Span. J. Finance Account.* **2008**, *37*, 211–230.
80. Mugera, A.; Nyambane, G.G. Impact of Debt Structure on Production Efficiency and Financial Performance of Broadacre Farms in Western Australia. *Aust. J. Agric. Resour. Econ.* **2015**, *59*, 208–224. [CrossRef]
81. United Nations Development Programme. International Guidebook of Environmental Finance Tool: A Sectoral Approach. Protected Areas, Sustainable Forests, Suitanable Agriculture and Pro-Poor Energy. Chapter 5: Sustainable Agriculture. 2012, pp. 1–45. Available online: http://www.undp.org/content/undp/en/home/librarypage/environment-energy/environmental_finance/international-guidebook-of-environmental-finance-tools-.html (accessed on 12 July 2018).
82. Aydogdu, M.H.; Yenigün, K. Farmers' Risk Perception towards Climate Change: A Case of the GAP-Şanlıurfa Region, Turkey. *Sustaynability* **2016**, *8*, 806. [CrossRef]
83. Lerman, Z. *Farm Debt in Transition: The Problem and Possible Solutions*; Policy Studies on Rural Transition No. 2008-2; FAO Regional Office for Europe and Central Asia: Rome, Italy, 2008; pp. 1–32.
84. Rizov, M.; Pokrivcak, J.; Ciaian, P. *CAP Subsidies and the Productivity of EU Farms*; Working Paper 37; Factor Markets Coordination; Centre for European Policy Studies (CEPS): Brussels, Belgium, 2013.
85. Ciaian, P.; Swinnen, J.F.M. Credit Market Imperfections and the Distribution of Policy Rents. *Am. J. Agric. Econ.* **2009**, *91*, 1124–1139.
86. Zhu, X.; Lansink, A.O. Impact of CAP Subsidies on Technical Efficiency of Crop Farms in Germany, the Netherlands and Sweden. *J. Agric. Econ.* **2010**, *61*, 545–564.
87. The Initiative for Smallholder Finance. The Role of Government in Developing Agricultural Finance: A Look at the History of Germany, the US, and South Korea. 2014. Available online: https://static1.squarespace.com/static/565cca2ae4b02fbb0a550169/t/5684215b2399a3371e6847c5/1451499867253/The-Role-of-Government-in-Developing-Agricultural-Finance-ISF-Briefing-4.pdf (accessed on 12 July 2018).
88. Munteanu, A.; Brezeanu, P. Government Effectiveness and Value Creation: The Case of Emerging European Listed Banks. *Transylv. Rev. Adm. Sci.* **2014**, *42*, 140–155.
89. Seibel, H.D. Agricultural Development Banks Close Them or Reform Them? 2000, pp. 45–48. Available online: https://www.imf.org/external/pubs/ft/fandd/2000/06/pdf/seibel.pdf (accessed on 12 July 2018).