The influence of subsidies and taxes on economic viability of family farms in Lithuania

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Abstract

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Family farms are eligible for various tax exemptions and subsidies in Lithuania. The goal of tax exemption and subsidies is to maintain family farm viability. Taxes and subsidies are the two closely interrelated fiscal policy instruments. Taxes and subsidies should not make double benefits for family farms, but should rather be applied to different areas. Unfortunately, the research by various researchers has shown that family farms receive double benefits thought tax exemption and subsidies.

The paper aims at assessing the impact of taxes and subsidies on the viability of family farms. To investigate the theoretical aspect of the economic viability of family farms, relation between subsidies and taxation, systemic analysis and synthesis of theoretical insights in the foreign and local scientific literature as well as the methods of induction and deduction have been applied. In this paper, the logistic regression model has been employed to estimate the influence of subsidies and taxation on economic viability of family farms.

As a source for raw data we used the Accounting Data network of farmer's database. The research results have shown that the family farms which are viable by virtue of the subsidies, would be viable after eliminations subsidies. In cases of tax exemption, elimination and addition of the same taxes as for other business will have no significant impact on the viability of the family farms in Lithuania. Therefore, it could be assumed that the tax exemptions are superfluous and the subsidy regime is not effective in Lithuania for family farms.

Keywords: economic viability; family farms; subsidies; tax

Introduction

Agriculture is a specific industry with distinctive competitive environment, susceptibility to seasonality, value of the European Union (EU) support, and entrepreneurship in this business sector. Agriculture is important for the national economy not only for its contribution to the total value added and creation of new jobs, but also for its social, ethno cultural, and environmental aspects (Lamb, 1994; Brain & Deac, 2010; Besusparienė, 2017).

One of the EU priorities mentioned in the common Rural Development Policy 2014-2020 (European Commission, 2009) is viable food production, which is intended to improve viability of the agricultural sector, thereby promoting sustainability of farms, progress and integrated growth in the rural areas. Support and taxes are the main factors of promotion of these processes. Following the post-2020 reduction or complete abandonment of the support to agriculture, taxes are to remain the key factor of viability of family farms (European Parliament, 2016). Nonetheless, no comprehensive research on the potential tax system for family farms which would promote economic viability, competitive ability, and sustainability of farms have been conducted. The empirical studies conducted have shown that the tax burden

on the small and medium-sized farms, including the social and health insurance contributions, is usually higher than the earnings, and the farms maintain their viability only by virtue of the support.

When dealing with economic viability of family farms, it is important to assess the impact of subsidies and taxes. Regarding the existing tax system in Lithuania, this system is considered by the authors to be differentiating small and large family farms. First of all, the family farms are categorised by different criteria of taxation in Lithuania (Miceikienė & Girdžiūtė, 2016). The situation is the same in other countries as well, because tax systems applicable to family farms are different compared to those applying to other business legal forms, which leads to inconsistency of social fairness and non-efficiency under the Pareto principle (Mukhtar & Nasim, 2016; Hajduga, 2014; Proskura, 2014; Leibus & Irmeja, 2014). The existing situation regarding taxation of family farms indicates that countries use different taxation criteria for family farms taxation, which has not been properly assessed for their use (Juškevičienė, 2012; Juškevičienė & Lakis, 2010; Veen et al., 2007). Second, these implications lead to the fragmentation of family farms (Slavickienė & Savickienė, 2012; Kazakevičius, 2009), thereby decreasing competitiveness in the global market of family farms, leading to lower viability of farms. Finally, the best way to halt the decrease in the farm viability is to provide subsidies to family farms. Subsidies are doubtlessly the main instrument able to guarantee higher profitability and viability of family farms (Meyer, 2011). Therefore, the granted subsidies may help ensure that a farm is capable of competing in the global market. On the other hand, the existing tax system in Lithuania provides a wide range of tax exemptions compared to other business legal forms. There is some doubt regarding the capability of tax exemptions in terms of ensuring viability of family farms. In general, subsidies and the existing tax system often provide dual exemptions for family farms (Slavickienė & Savickienė, 2012; National Audit Office of the Republic of Lithuania, 2013).

Therefore, our empirical research aims at assessing the influence of subsidies and taxes on economic viability of farms. The issues are to dispel the myth that taxes burden is high and reduces viability of farm. This is important in context of the new post-2020 agricultural policy, as, with the new system of subsidies in the EU agricultural sector, it is intended to reconsider the subsidies with the view towards their abandonment or reduction (European Parliament, 2016; European Union, 2016). This means that, after 2020, family farms have to be viable without subsidies and with taxes and, at the same time, the governments have to collect the maximum revenue from taxes.

Research problem: what kind of tax system should be applied to family farms in order to secure economic viability of farms without the expected subsidies and with the same taxes as for other business companies?

Research aim: to assess the influence of subsidies and taxes on economic viability of farms.

Research objectives:
• To analyse the concept of economic viability of family farms and identify the indicators of economic viability.
• To analyse the relationship between subsidies and taxation in context of family farms.
• To present the research results in view of the influence of subsidies and taxes on economic viability of family farms.

Economic viability of family farms

Before starting to analyse economic viability of family farms, the definition of economic viability should be considered at first. According to Baker and Wood (2010), we have confused the concepts of viability and vitality. The researchers admit that viability refers to the capacity to sustain profitability and encourage investment, but when we talk of vitality, we think of the level of activity in business, its 'busyness' or 'buzz'. According to Ravenscroft (2000), these two measures are interrelated, with the relative level of 'busyness' (vitality) seen as a significant component in new investment decisions (viability) and concurrently, the continued development of new facilities (viability) generating an enhanced attraction for customers (vitality).

Further, viability is the most important when family farms are considered. Viability, in its strictest business definition, is the ability of a business to cover its costs of production as well as to provide a rate of return for the capital invested. The viability of farming, therefore, can be viewed as a measure of the ability of the farm business to survive (Hennessy et al., 2008). Agriculture doubtlessly has been associated with the production of basic food. Nonetheless, primarily, agriculture plays a crucial role in the life of an economy. Second, it is the backbone of the economic system (Kusis et al., 2014). Therefore, economic viability reflects the economic situation of farm and possibilities of investment. In view of the above reasons, the increasing rate of economic viability of the farm is important for economic growth on the macro level.

The main question is the assessment of economic viability. Adelaja et al. (2005), Savickienė and Miceikienė (2018) note that modelling viability is essentially modelling the farm's financial structure. Viability models help identify the determinants of viability and measure their effects on viability. When referring to viability, the authors of the paper refer to farm's possibilities of investment as well. According to Adelaja et al. (2005), viability could be defined as the ability

of a farm to meet its financial obligations. Financial obligations of a farm should be to operate profitably and invest in the development of the farm, as any other business.

Another perspective towards the importance of economic viability of family farms involves consideration of the farmers' older age. Kusis et al. (2014) have identified, on the basis of the Young Farmers Statistics that almost half of all agricultural workers are 55 years old or older. At the EU-27 level, there is approximately one farmer of less than 35 years old for each nine farmers of more than 55 years old. With reference to Tropea (2014. cited Wang, 2015), the objection against these arguments could be that the issues relating to farming economic viability, retirement succession planning, access to markets, land and credit all influence young people's decision on whether or not to enter farming. According to Mohamed and Gouda (2018), economic viability of family farms may be deferent of local economic situation or place.

Therefore, it is important to determine which factors have influence on economic viability of farms and which indicator shows economic viability of farms. According to Miceikienė & Girdžiūtė (2016), Savickienė et al. (2017), viability is largely determined by two external factors: subsidies which help maintain economic viability of farms and taxes which are the major negative factor of economic viability of farms. Savickienė & Slavickienė (2013) admit that certain family farms claim that taxes affect the changes in the viability of their operations. Income and profit of the farms doubtlessly is the main factor of economic viability. According to the European Parliament (2015), profit from agriculture is only part of the income structure for many family farms, therefore, the issues of economic viability of family farms is very important. Key (2018) admits that the economic viability status of family farms may depend on the government decisions. If policies raise the productivity of small farms, this may increase the economic viability and halt consolidation of farms. The summary of different factors which influence the economic viability of farms has been presented in Figure 1.

As suggested by Figure1 the main factors which influence the economic viability of family farms are the amount of subsidies received, the existing tax burden, earnings of family farm, and other factors. The other factors may include the farmer's age, education, entrepreneurial characteristics, experience. The earnings may depend on the market situation as well as on other factors mentioned above. Mohamed and Gouda (2018) have put forward the same idea suggesting that the calculation of economic viability index included criteria such as tenure of family farms, factor of support, education, health, water, and infrastructure. It should be admitted that this economic viability index is important for developing countries with low education, health and infrastructure level.

According to O'Donoghue et al. (2016), the economic viability rates of family farm differ substantially from country to country. The researchers have also suggested the importance to discuss about new viability classification into economically viable, sustainable, and vulnerable farms.

Several main questions are related to assessment of economic viability of farms. *First*, which indicators could be used for calculation of economic viability? *Second*, what is the viability threshold for identification of viability, i.e. whether the farm is viable or non-viable? *Finally*, how the influence of subsidy and taxes on the viability of family farms could be assessed?
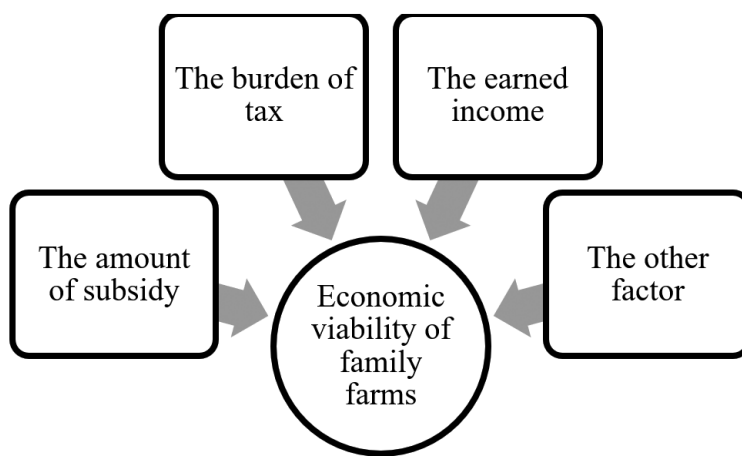

Fig. 1. Factors influencing the economic viability of farms
Source: formed authors

Table 1. Indicators of Viability Threshold

Indicator	Formula	Viability Threshold
Return on investment (%)	[(net income – value of unpaid labour) / (total assets – total liabilities)] x100	More than 5%
Expense to income ratio (%)	(total farm operating expense and depreciation / total farm cash receipts) x 100	Less than 80%
Debt to net income ratio (%)	(total farm debt / total net income) x 100	Less than 600%
Direct payments to producers and dependency ratio (%)	Dependency ratio = (total direct payments by government / total net farm income) x 100	Less than 20%

Source: J. Scott, 2001. p. 5

In case of the present research, the index suggested by Mohamed and Gouda (2018) would not be used. Instead, the research uses the viability indicators and the viability threshold proposed by Scott (2015) (Table 1).

As suggested by Table 1 there are four main indicators for assessment of economic viability and these indicators of economic viability depend on different factors. With Figure 1 and indicators in Table 1 combined, the result is presented in Figure 2.

The presented Figure 2 has led to the conclusion that all the above indicators of economic viability of farms depend on the subsidies (also known as direct payments) and on the earnings of family farms. Therefore, the influence of subsidies on economic viability of farms should be assessed in context of new post-2020 agricultural policy. According to the European Parliament (2016), one of the main questions is direct payments after 2020. Subsidies by the European Parliament (2016) should be targeted on specific objectives with orientation towards clear results, and decoupled direct payments should be gradually phased out over a pre-announced

transitional period. The future challenges for new subsidies system in the EU agricultural sector implies the need to evaluate the subsidies with the view towards potential abandonment or reduction thereof, with minimal effects of economic viability of farms.

Another impact on the economic viability of farm comes (Figure 2) from the tax burden. As suggested by Figure 2 only two indicators of economic viability of farms depend on the tax burden. Therefore, it is more important to assess the influence of taxes on economic viability of farms and the relation between economic viability, subsidies and tax expenses of farm.

Relation between subsidies and taxation

Taxes and subsidies are two external factors which have an opposite influence on economic viability of farms. Opinions among the researchers who deal with the relation between these external factors are very different. Certain researchers' claim that the farmer taxation should be viewed individually from the common national tax policy, and the
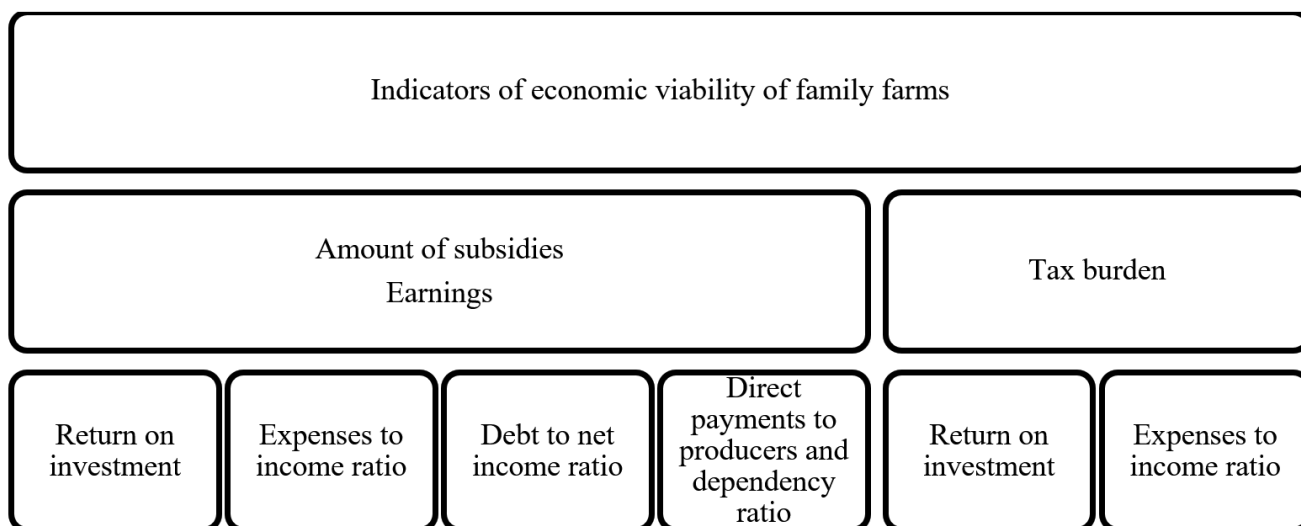
Fig. 2. Factors influencing the indicators of economic viability of farms
Source: formed authors following J. Scott, 2001

farmers should be provided with preferential taxation conditions in view of the specific activity, with the benefits being referred to as the support to agriculture (Swinnen, 2018; Cahill, 2006; Hill & Blandford, 2007; Slavickienė & Savickienė, 2012). Other researchers claim that benefits in farmer taxation oppose the tax fairness principle and should not be applied, or should be applied to everyone else, while subsidies distort the economic business logic (Zhong et al., 2011).

According to Bird (1983.citedSoliwoda & Pawlowska-Tyszko, 2014), agriculture is commonly regarded as the sector that is very difficult to tax. Moreover, the system of agricultural taxation depends on the priorities of public policy of each country.

Some political decisions of taxation are influenced by external factors in the country. Agriculture has been associated with the production of basic food. Agriculture plays a crucial role in the life of an economy. It is the backbone of the economic system. Agriculture not only provides food and raw materials, but also employment opportunities to a very large proportion of population (Kusis et al., 2014). According to the European Commission (2009), we are expected to fulfil these functions of agriculture: to have safe and high quality food in a competitive market, to maintain valuable cultural landscapes across Europe through sustainable land management and to help rural areas remain attractive and viable. At the same time, agriculture is undergoing fundamental changes which require farmers to adapt to new conditions and seize new opportunities. Particular challenges will result from the need to adapt to climate change. These functions of agriculture doubtlessly can be controlled using different tax instruments and subsidies. Choosing the right financial instruments is a complicated process for a government. Therefore, it is important to remember the essence of taxes and subsidies.

Pigou (1947. cited Zodrow & Mieszkowski, 1984) was the first to claim that the supply of public services is lower in situations where distortionary taxes are used relative to first-best optimum where lump sum finance is used. By Ross (2015) the economist Pigou argued that negative externalities should be taxed and positive ones subsidised. One of Ross's (2015) proposed methods of resolving transaction costs for external economies is government activity, either through direct regulation or emission fees. Pigou supported the concept of taxing the negative externality until the firm embodied the full real cost of production. For pollution, this takes the form of emissions taxes. This concept is sometimes called the Pigouvian tax.

It is important to discuss an issue which arises in connection to externalities – the possibility of using corrective taxes or subsidies to remove inefficiencies arising from private behaviour. Such an approach, if appropriate, is attractive because it minimises the need for bureaucratic intervention into the resource allocation process, thus avoiding some of the potential wastes (Oakland, 1987). The specificity of agriculture is that creating a wide range of benefits can have a negative impact on the environment. Vaznonis & Startienė (2009) have identified them as agricultural external effects. Researchers Pretty and Ward (2001) confirm that regulations and economic incentives are commonly used to encourage change in behaviour, and, at the same time, include establishment of strictly protected areas, regulations for erosion control or adoption of conservation farming, economic incentives for habitat protection, and pesticide taxes. There is considerable evidence showing that though these may change behaviour, there may be little or no positive effect on the attitudes. Unfortunately, farmers commonly revert to old practices when the incentives end or regulations are no longer enforced. The proposal to introduce taxes has been based on the fact that private production costs are lower than the social cost of production (Vaznonis & Startienė, 2009). However, Vaznonis & Startienė (2009) emphasise the fact that even without the use of pesticides and fertilisers, taxation is quite complicated, and it is still important to assess the benefits of environmental taxes. Exemption of environmental taxes provides a reasonable return.

As it can be noticed, taxes and subsidies are closely interrelated. In Lithuania, as in other countries of the EU, various subsidies are provided to agriculture. Subsidies are implemented by the European Commission (2009) in important areas, such as valuable landscape maintenance, production of bio-fuels. Some of these areas can be developed through promotion of organic farming. Organic farming is one of the ways to reduce environmental issues. However, social responsibility of farmers is important in addressing environmental issues. Jasinskas & Simanavičienė (2009) claim that a socially responsible family farm is a family farm which develops organic farming. As an objection to this claim, it could be noted that there are non-socially responsible farmers who would set up organic farms to receive subsidies and no longer engage in organic farming once the period of subsidies has ended. Different tax exemption and subsidies should encourage the long-term existence of organic farms, even after tax exemption and subsidies expire. The Common Agricultural Policy of the European Union (A reformed..., 2016) is increasingly becoming oriented towards organic farming, which provides both environmental and socio-economic benefits and is in line with sustainable development components, as well as socially responsible business in the outer layer. According to Čiegis (2009), another problem related to organic farming is that a lot of the organic products

(milk, beef, poultry) are sold without organic certification marks. Therefore, such exempt products are uncompetitive in the market. These reasons lead to a socially distorted farm competition on the market. Therefore, it is important to find a balance between taxes and subsidies on this issue.

On one hand, farmers are supported through subsidies, on the other hand they are charged with different taxes, at the same time providing them with tax exemptions. There appears to be a confrontation between subsidies and taxation, because privileges are granted twice as subsidies and tax exemptions. In 2013 the National Audit Office of the Republic of Lithuania carried out a national audit on agricultural tax exemption. The national audit revealed that until that moment, agricultural sector had exceptional tax treatment, which was favourable compared to normal circumstances, and was called a tax exemption. Lithuania and other countries of the EU countries use tax privileges as one of the tax policies. Lower tax rates or exemption for income, for example, compensatory and direct payments, exclusion of the tax system, comprise the preferential conditions for economic activity of agricultural entities (The National Audit Office of the Republic of Lithuania, 2013). Farmer taxation has not been analysed comprehensively in Lithuania, but researchers in other countries have shown deeper inquiry into this subject (Miceikienė & Girdžiūtė, 2016). The problem of agricultural taxation, tax structure, measurement of taxable basis (income, capital), and determining optimal (or sub-optimal) tax rate for farmers seem to be viewed more seriously in the developed countries (Soliwoda & Pawlowska-Tyszko, 2014).

In general, subsidies and taxes system often provides dual tax exemptions for family farms. In particular, isolated areas related to environmental issues are present in the existing system. Therefore, this paper aims at assessing the influence of subsidies and taxes on economic viability of farms, additionally including such taxes as property and environmental taxes. Consequently, it is important to conduct an empirical research on this issue for further study of farmer taxation field.

Material and Methods

This part of the paper deals with the methods and data employed in the empirical research. The findings of theoretical studies have shown that different factors may have influence on economic viability of farms. The two main factors are subsidies and taxes. Various tests may be used to determine this influence. To investigate the economic viability of farms, in this research, subsidies and taxes are analysed under the logistic regression model. According to King and Ryan (2002), logistic regression is one of the most frequently used statistical methods to examine factor impact on limited dependent variable.

Logistic regression is a mathematical modelling technique appropriate for describing the relationship between one or more independent variables and a dependent variable where the outcome is discrete in nature (Hosmer & Lemeshow, 1989, cited Hildreth & Dewitt, 2016). For the present empirical research, two modelling techniques have been used: binary logistic regression (BLR) and linear probability (LPM). According to Milosavljevic et al. (2015), the goal of the BLR analysis is to find the model that is best adapted to the data but is still an acceptable model that describes the relationship between the dependent variable and a set of independent ones describing it. The dependent variable is usually marked Y and independent one X. The BLR model includes main independent variables X (intensity of the subsidies, size of farm, farm activities), and dependent variables Y (economic viability status changes). According to Pohlman & Leitner (2003), if a dependent variable is a binary

Table 2. Independent variable factors

Variable factor	Description
Farm activity	Farm activity is given value "1" or "0": if farm activity is crop production – "1", if no "0"; if farm activity is animal husbandry "1", if no – "0". Control variable is mixed activity of a farm.
Farm size	According to the Orders by the Minister of Agriculture (2010), farms are classified by economic size. Following Vitunskienė (2014. p. 284), farm grouping by economic size has been used: micro (>8 ths. Eur), small (8 ths. Eur – 25 ths. Eur), medium (25 ths. Eur - 100 ths. Eur), large (<100 ths. Eur). Farm size is given value "1" or "0": if farm size is micro – "1", if no – "0"; if farm size is small "1", if no – "0"; if farm size is medium – "1", if no – "0". Control variable is large size of farm.
Intensity of subsidies	Subsidy size and total output ratio.
Intensity of subsidies and farm size multiplication	Multiplications of intensity of the subsidies and farm size coded as"1" and "0" have been used as independent variables.
Intensity of taxes	Taxes size and total output ratio.
Intensity of taxes and farm size multiplication	Multiplication of intensity of the taxes and farm size coded as"1" and "0" has been used as independent variables.

Table 3. Additional tax calculation methodology

Tax	Calculation methodology
Environmental pollution tax from mobile sources	Accounting Data Network 2013 of farmers has been used, and statistical calculation of the average of fuel consumption among farms by farm size has been performed. Then, the conditional environmental tax has been calculated.
Real estate tax	Accounting Data Network 2013 of farmers has been used, and statistical calculation of the value of production buildings at the farm in the balance sheet has been performed. Then, the conditional real estate tax has been calculated.
Income tax	Standard rate income tax, without tax exemption, has been calculated.

outcome, an analyst can choose among discriminant analysis and LPM, logistic or probit regression. LPM and logistic regression are the most common models used with binary outcomes. Therefore, BLR and LPM have been used for the present research.

For the empirical research, data on 97 farms covering 2009-2013 year period, which have been obtained from the Accounting Data Network of Farmers, have been used. The number of farms was 116.447 on 1 January 2014 in Lithuania (SE Agri-Information, 2014). The determination of sample size was performed according to Israel (1992): for a population of more than 100,000. 100 sample sizes provides for precision of 10%. The present empirical research has involved 97 farms, will give 10 percent margin of error. Using panel data from 97 farms of different size (micro, small, medium, large) this paper provides an econometric evaluation of the impact of subsidies and taxes on economic viability of family farms.

To assess the influence interrelation between subsidies and economic viability of farms, and the interrelation between taxes and economic viability of farms, different independent variables factors have been used. As suggested by Table 2 some independent variables factors (such as size and activity of farm) are coded into a binary form. Intensity of the subsidies has been calculated as subsidy size and total output ratio.

In the first part of the empirical research, dependent variables factor is economic viability status changes, involving comparison of economic viability indicators with vs. without subsidies. Three indicators of viability (Return on Investment, Expense to Income Ratio, Debt to Net Income Ratio) by Scott (2001), see Table 1 have been chosen. One of the indicators (Direct Payments to Producers and Dependency Ratio) was rejected, because of its ineligibility for empirical research. Farm is considered viable; if all three indicator of viability comply with the viability threshold, see Table 1. The three indicators have been calculated for the case with subsidies and without subsidies. Then, the economic viability status of farm with subsidies vs. without subsidies has been compared. Finally, the economic viability status changes have been coded into the binary form: if farm without subsidies becomes unviable, it is given value "1", if other – "0".

In the second part of the empirical research, dependent variable factor is economic viability status changes, involving comparison of economic viability indicators with vs. without additional extra. In both cases, the received subsidies have not been included in this empirical research. Only one indicator of viability (Expense to Income Ratio) by Scott (2001), see Table 1 has been chosen. The other indicators have been rejected because of their ineligibility for empirical research. Additional taxes are added to the expenses of farm, see Table 3.

Taxes mentioned in Table 3 have influence on economic viability status of the farm. The same methods as in the first part of the empirical research have been used. The both parts of the empirical research involve comparison of the interrelation between subsidies and economic viability of farms, and interrelation between taxes and economic viability of farms under three different models using BLR and LPM (see Table 4). For all three models, dependent variable Y is economic viability status changes. Another independent variable used for all three models is farm activities (crop production, animal husbandry, mixed). As suggested by Table4 core independent variable X is different for all three models.

The logistic regression analysis has been performed using software GRETL under the BLR and LPM. According to Schuppert (2009), if several independent variables and one categorical dependent variable are present, the BRL regression model for empirical estimations is designed as follows:

$$P(Y_{it}) = \frac{e^{b_0 + b_k X_{itk} + \varepsilon_{it}}}{1 + e^{b_0 + b_k X_{itk}}}, \tag{1}$$

where $P(Y_{it})$ is probability of Y occurring, subscript i denotes the i-th observation in the sample. Here ε indicates the natural logarithm base, e indicates the error. Interception b_0 at y-axis and b_k is regression coefficient of X_{itk}, where X predictor is variable.

The LPM regression according Moutinho & Hutcheson (2011) model for empirical estimations is designed as follows:

$$Y_{it} = \alpha + \beta_k X_{itk} + \varepsilon_{it}. \qquad (2)$$

Subscript i denote the i-th observation in the sample. Here, α indicates the value of Y_{it} when all values of the explanatory variables are zero. Regression coefficient β_k describes the change in Y_{it} that is associated with unit change in X_{itk}.

Here (Table 4) logit models scale to categorical dependent variables with more than two outcomes. Model examines how two-dimensional variable Y (in this the probability that the family farm will stay viable or not) depends on one or more independent variables (eg: X_1, X_2, ...,X_n) -family farm intensity of subsidies, farm size, intensity of taxes and farm activities type.

The categorical variable is not included directly in the regression model, but by replacing it with a two-digit variable that acquires the values: "0" - denotes the maintaining the viability, "1" denotes the becoming a non-viable.β1,…, β11, as usual, mark the regression coefficients, giving information how strongly and in which direction independent variables affect the odds ratio of the dependent variable.

Results and Discussion

Table 5 provides the results of the estimation of different versions of model presented in Table 4. The results of the influence of subsidies on economic viability of farm are presented in Table 5. As suggested by Table5 the majority of the variables have the expected signs and those with unexpected signs are mostly insignificant. For several variables, the estimated coefficients differ for farms of animal husbandry activity vs. farms of crop activity in terms of sign and significance.

According to Peng et al. (2002), the value of the regression coefficient determines the direction of the relationship between X and the logit of Y. When this relationship is great-er than zero, larger (or smaller) X values are associated with larger (or smaller) logit of Y. Conversely, if regression coefficient is less than zero, larger (or smaller) X values are associated with smaller (or larger) logits of Y.

As suggested by Table 5 the BLR results in all three model show that economic viability status changes have the greatest influence on a farm of animal husbandry activity and crop production activity compared to a farm of mixed activity. These results suggest that crop production activity farms have a higher chance to be viable without subsidies, because the effect of subsidies on economic viability of these farms is not as great as the effect on mixed activity farms. The previous study done by Argilés (2001) showed different result that crop production activity farm increased the probability of failure and higher values of output to economic size gave higher probability of farm viability in Spain case (1989-1991). Differences between our research results and Argil's (2001) research may leads differences between countries, changes in farming peculiarities due per year. Also Argilés(2001) concentrated more detail on accounting information using for farm viability status calculation.

To evaluate the model data (Table 5), it is important to assess data reliability. The reliability shows the percent correctly predicted. Wooldridge (2009, cited Hauser & Booth, 2011) admits the importance of the percent correctly predicted, as this percent is a useful goodness-of-fit measure, although it can be very misleading. The percent correctly predicted in all three models calculated by BRL (Table 5) is quite high. All three models correctly predicted are better than the blind conjecture.

According to Joreskog (1999), R^2 is usually interpreted as the relative amount of variance of dependent variable Y (economic viability status changes) explained or accounted for by explanatory variables Xn. According to Ivanitskaya & Tregub (2013), the higher the R^2 the better is a model. As

Table 4. Model for logistic regression analysis

First part of the research (influence of subsidies)				Second part of the research (influence of extra taxes)			
Model No.	Dependent variable Y	Core independent variable X	Other independent variable X	Model No.	Dependent variable Y	Core independent variable X	Other independent variable X
1	Economic viability status changes	Intensity of subsidies	Farm activities	1	Economic viability status changes	Intensity of taxes	Farm activities
2		Intensity of subsidies Intensity of subsidies²		2		Intensity of taxes Intensity of taxes²	
3		Intensity of subsidies Intensity of subsidies x Farm size		3		Intensity of taxes Intensity of taxes x Farm size	

Table 5. Logistic regression analysis results of subsidies influence for economic viability

Model	1		2		3	
	BLR	LPM	BLR	LPM	BLR	LPM
Intensity of subsidies	0.0057*** (0.0020)	0.0005*** (0.0001)	0.0088*** (0.0027)	0.0014*** (0.0003)	0.0250* (0.0149)	0.0045*** (0.0012)
Intensity of subsidies²			-3.1078×10^{-6}** (1.2773×10^{-6})	-4.5486×10^{-7}*** (1.4814×10^{-7})		
Intensity of subsidies x micro farm					−0.0211 (0.0152)	−0.0037*** (0.0013)
Intensity of subsidies x small farm					−0.0199 (0.0150)	−0.0041*** (0.0012)
Intensity of subsidies x medium farm					−0.0159 (0.0156)	−0.0035*** (0.0013)
Farm of animal husbandry	3.9743*** (1.3697)	−0.6538 (0.4305)	3.9446*** (1.37377)	−0.5864 (0.4264)	4.1071*** (1.3828)	−0.3398 (0.4362)
Farm of crop production	1.3051 (1.3520)	−0.2918 (0.3750)	1.3050 (1.35554)	−0.2811 (0.3709)	1.2993 (1.35920)	−0.2734 (0.3704)
N (sample)	483	483	483	483	483	483
R-squared		0.4707		0.4835		0.4879
R² (McFadden)	0.3373		0.3436		0.3438	
Correctly predicted (%)	85.1		84.7		85.3	

All estimations include the constant, time and unit dummies. Standard Error presented in brackets.
* indicates significance at the 10 percent level
** indicates significance at the 5 percent level
*** indicates significance at the 1 percent level

suggested by Table 5 in the given model 3 under LPM, R² is 0.4879. Which provides 48.79% probability that the forecast built using this model will be true. That is, all X explain Y at 48.79%.

According to Ivanitskaya & Tregub (2013), that Standard Error represents a standard error of estimation, which is used during the stage of model testing. Standard error of the model is presented in brackets in Table 5.

Estimates in levels (model 1) show clear signs that subsidies have low effect on economic viability status of family farms. This is shown by the intensity of the subsidies coefficient: if intensity of the subsidies increases by 1% point, this leads to viability increase 1 times more. As suggested by Table 5 for farms of animal husbandry activity, subsidies are more important compared to farms of mixed activity. The results show that more likely is to become viable for 53 times more for farm of animal husbandry compared to mixed activity farms. The estimate of model 2 supports the similar results as provided by model 1. Model 3 provides the difference of influence of subsidies on economic viability by size of family farm. In general, subsidies have greater effect on viability of large size farms. The research results have actually shown that if farm is viable with subsidies, this farm will be viable without subsidies too. The results in Table 5 show that there are more issues with unviable farms, because

subsidies do not guarantee farm viability. It is challenging for the government to find decisions regarding the mode of use of financial instruments to make sure that mixed activity farms became viable and capable of competing on the global market. Appropriate financial instruments could ensure not only survival of conventional farms, such as animal husbandry or crop production, but also unconventional farms (mixed activities), which is important not only in terms of economic, but also social and environmental aspects.

Unfortunately, previous research on economic viability of family farm did not pay attention what is effect of subsidies to economic viability status. The majority of previous research focus on new methods to evaluate economic viability status (Savickiene et al., 2015), on comparing economic viability status of family farms between different countries (Savickiene et al., 2015), different regions (Oberholtzer et al., 2010; Brown et al., 2012; Hennessy & Moran, 2014) and different farm activity effect to economic viability of family farms (O'Brien & Hennessy, 2007; Hennessy & Moran, 2014).

In this paper, it has already been mentioned that there is a close relation between subsidization and taxation. Therefore, following the investigation of influence of subsidies on economic viability of farms, it is important to look at the influence of taxes on economic viability of farms. Family

farms often complain that taxes are high and farms are unviable because of the high taxes. Therefore, the purpose of our research also includes evaluation of the influence of taxes on economic viability and dispelling the myth that farms are unviable because of the high taxes. Empirical research results of the influence of taxes on economic viability of farms are presented in Table 6. As suggested by Table 6the majority of the variables have unexpected signs, meaning that variables are mostly insignificant.

Estimates in levels (model 1) show that the increase of intensity of taxes by 1% point is less likely, that taxes would increase 1 times more. As suggested by Table 6 the estimate of model 2 supports the different results as model 1. If intensity of taxes increase by 1% point is more likely that taxes would increase 1 times more. Model 3 provides the difference in influence of taxes on economic viability by farm size. It may be noticed that medium size farms have expected signs. This is a clear sign that taxes have greater influence on economic viability on mixed activity farm vs. animal activity farm. The results show that the likelihood of becoming more viable is 1.18 times greater for a farm of animal husbandry compared to a mixed activity farm. Previous research made by Binkiene et al. (2015) disclose that after improvement of tax system (of personal income and social taxes recalculation) would unsure economic viability

of micro, small and medium family farms in Lithuania case. This research showed that viable family farm number would increase to 8 percent. Unfortunately, Binkiene et al. (2015) did not take into account environmental and property taxes. This leads that the results are different from ours research results. In the context of climate changes, we believe that it is important to include environmental taxes in tax system of family farms. It is therefore necessary to assess the impact of new taxes on viability of family farms.

The results of evaluation of the influence of taxes on economic viability of family farms has shown similar results as in case of the subsidies, with the situation being more complicated for mixed activity farm. Therefore, it can be assumed that mixed farms are much more sensitive than animal husbandry or crop production farm. The results of research suggest that compliance of farm tax with VAT payer status or farm size is not enough good for their use, because taxes may have a different effect depending on the farm activity. Our research results disclose that new taxes would not have high impact for changes of economic viability status of family farm. These results are different compare with previous research and this leads different taxes. Unfortunately, subsidies impact to economic status is high for majority of farms. Therefore, the decreasing of subsidies after 2020 remains a new challenge of family farm in Lithuania.

Table 6. Logistic regression analysis results of the influence of taxes on economic viability

Model	1		2		3	
	BLR	LPM	BLR	LPM	BLR	LPM
Intensity of taxes	-0.0009 (0.0013)	$-8.2489.10^5$ $(6.7501.10^5)$	0.0001 (0.0025)	$3.5504.10^5$ (0.0001)	0.0010 (0.0038)	0.0006 (0.0004)
Intensity of taxes²			$-1.1619.10^6$ $(2.669.10^6)$	$-1.3232.10^7$ $(1.067.10^7)$		
Intensity of taxesž micro farm					-0.0022 (0.0042)	-0.0009** (0.0004)
Intensity of taxesž small farm					-0.0019 (0.0037)	-0.0008* (0.004)
Intensity of taxesž medium farm					-0.0017 (0.0039)	-0.0008* (0.0004)
Farm of animal husbandry	0.1020 (0,9184)	0.0089 (0.0395)	0.0652 (0,9224)	0.0048 (0.0396)	0.1659 (0.9332)	-0.0190 (0.2987)
Farm of crop production	0.0073 (0.7161)	0.0009 (0.0305)	0.0013 (0.7163)	$7.775.10^5$ (0.0305)	-0.0338 (0.7257)	-0.0780 (0.2574)
N (sample)	484	484	449	484	449	484
R-squared		0.2861		0.2885		0.2964
R² (McFadden)						
Correctly predicted (%)	92.8		92.8		92.8	

All estimation included constant, time and unit dummies. Standard Error presented in brackets.
* indicates significance at the 10 percent level.
** indicates significance at the 5 percent level.

Conclusion

Agriculture is important not just as production of basic food, but as important role in the life of an economy. In the economic perspective, it is important to have viable farms in the country. Viability of a farmer farm is the ability to cover its costs as well as provide the capital invested. The main factors, which have influence on economic viability of farmers 'farms, are the amount of subsidies, tax burden, and earnings. There are four main indicators to assess economic viability: Return on Investment, Expense to Income Ratio, Debt to Net Income Ratio, Direct Payments to Producers, and Dependency Ratio. All these indicators of economic viability of farms depend on the subsidies and farm earnings. Taxes have influence on only two indicators (Return on Investment, Expense to Income Ratio) of economic viability.

Relation between subsidies and taxation was noticed by Pigou about 70 years ago and shows that negative externalities should be taxed, while positive ones – subsidised. The specificity of agriculture has positive and, at the same time, negative effect on the environment. One of the goals behind subsidies is to promote positive farming practices, while negative externalities should be taxed. Most of tax exemption cases promote positive farming practices as well. Therefore, subsidies and tax breaks seem to be performing the same function. Unfortunately, the double promotion measures do not bring a double benefit.

The empirical research results have demonstrated that family farms which are viable while receiving subsidies, would still be viable if the subsidies are eliminated. Therefore, these family farms will be able to stay viable even if they are provided with less subsidies after the new cpost-2020 common agricultural policy is in place. Unfortunately, there are still a significant proportion of family farms, which receive subsidies, but are non-viable. Lithuania does not have effective subsidy and tax exemption systems. The criteria to be applied should be reviewed and subsidies should not be granted to all family farms. Instead, they should be provided to non-viable family farms only. This, in turn, would require preventive measures for avoidance of manipulation when a farm is artificially rendered non-viable.

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