Agris on-line Papers in Economics and Informatics

Volume XIV Number 2, 2022

Do Subsidies Decrease the Farm Income Inequality in Hungary?

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Abstract

The paper investigates the impact of different sources of income on farm household income inequality in Hungary using Farm Accountancy Data Network dataset for the period 2007-2015. The decomposition of the Gini coefficients by income sources is applied to focus on the impact of the policy shift from market to government support on farm household income inequality. Off-farm income are rather stable with a slight increase impact on farm household income inequality. Pillar 1 for direct income support subsidies have remained more important than Pillar 2 for rural development subsidies for farm income due to the importance of direct payments or single area payments for crop production. A slight increase in the importance of subsidies from Pillar 2 can be linked to a policy shift towards targeting farms in less favoured areas, and a greater role of agri-environmental and other rural development payments. The most striking finding is regarding instabilities, declining pattern, and for a large majority of farms negative market income. Subsidies from Pillar 1 reduced, while market income increased farm household income inequality.

Keywords

Income inequality, off-farm income, Gini decomposition.

JEL code: Q12; Q18; D31; H23

Fertö, I., Bojnec, Š. and Podruzsik, S. (2022) "Do Subsidies Decrease the Farm Income Inequality in Hungary?", *AGRIS on-line Papers in Economics and Informatics*, Vol. 14, No. 2, pp. 49-56. ISSN 1804-1930. DOI 10.7160/aol.2022.140204.

Introduction

Reduction in income inequalities for farmers is one of the policy challenges. The available public financial resources, and the restructuring of budgetary expenditure patterns generate additional issues for farm income inequality to be resolved. Outside the European Union (EU), attempts have been made to address the situation by amending the regulatory and institutional frameworks, and strengthening market orientations, meanwhile, the goal is to eliminate income inequality between farmers (Mirsha et al., 2009). The impact of the policy measures applied may vary depending on whether the payments are decoupled from production (Espinosa et al., 2021), on the share of market income and direct payments within the total farm income (Nitta, 2020) as well as the size of farms and their market positions (Moreddu, 2011). The effect of market income remains significant while its share in total farm income decreases (Allanson, 2005; Bojnec & Fertő, 2019a). In addition to subsidies, the role of social factors such as education can eliminate or increase farm income inequalities (Gardner, 1969). Due to agricultural policy regulations, the concentration of direct payments on a smaller number of larger farms is observed in several countries. Small number of larger farms can receive most of the direct payments while a large number of small farms share the remaining part of subsidies (Witzke and Noleppa, 2007; Beluhova-Uzunova et al., 2017, 2020). Regional differences in economic and agri-environmental conditions and the regional needs can also influence the effects of reducing income inequality by direct payments (El Benni and Finger, 2013; Tantari et al., 2019). The level and distribution of farm incomes and their potential inequality have been topics of the highest political and economic importance (e.g., Aristei and Perugini, 2010; Fragoso et al., 2011).

Earlier literature has developed and empirically applied the concept and the context of the decomposition of the Gini Coefficient to the structure and evolution of farm income and agricultural household income (Keeney, 2000;

Mishra et al., 2009; El Benni and Finger, 2013; Severini and Tantari, 2013a, 2013b, 2015). These papers focus on the impact of Common Agricultural Policy (CAP) reform on farm income and farm household income inequality. While there may be heterogeneity in results across EU member states and their regions, most studies report that subsidies have reduced income concentration and thus also farm household income inequality. Keeney (2000) finds that direct payment policies have reduced farm income concentration in Ireland – particularly, the compensatory allowances awarded to farmers in areas faced with natural production handicaps – which are at the greatest risk of having low farm income. Allanson (2006) and Allanson et al. (2017) for Scotland, Allanson and Rocchi (2008) in a comparative study of Scotland and Tuscany (Italy), El Benni et al. (2012) and El Benni and Finger (2013) for Switzerland and Severeni and Tantari (2013a, 2013b, 2015) and Cilierti and Frascarelli (2018) for Italy have reported that agricultural support, especially direct payments (within the EU's CAP Pillar 1) have reduced income concentration and thus reduced farm income inequality within the agricultural sector. Hanson (2021) carried out a panel-level assessment for the redistributive impact of the 2013 CAP reform. The negative impact of direct payments has been shown for the largest beneficiaries while the redistributive effect on small farms is significant. Bojnec and Fertő (2019b) find that subsidies from Pillars 1 and 2 reduce farm income inequality in Slovenia especially for less-favoured area (LFA) farms. In short, empirical evidence suggests that farm subsidies may reduce the farm income inequalities in investigated European countries.

This paper contributes to the analysis of the impact of CAP reform on farm household income inequality. While the effects of agricultural policy on farm income inequality is well documented for the Western European countries and for other developed countries there have been limited similar studies for Central and Eastern European countries (except Bojnec and Fertő 2019b for Slovenia). Hungary with a dual farm structure is an interesting example to investigate the farm income inequality issues.

The remainder of this paper is structured as follows. In Sections 2 and 3, the methods and data used are presented. Section 4 presents and explains our results on the effects of CAP reforms on the income distribution of farm households. Section 5 discusses the results and derives policy implications focusing on the effects of subsidies from Pillars 1 and 2 on farm household income inequality. Finally, Section 6 summarises main findings and concludes with study limitations and directions for research in future.

Material and methods

The chosen method is based on the approaches employed in earlier literature (Keeney, 2000; Mishra et al., 2009; El Benni et al., 2012; El Benni and Finger, 2013; Severini and Tantari, 2013a, 2013b, 2015), in which income is generated by k components, and the decomposition of the Gini (G) coefficients by income sources is undertaken in the following way:

$$G = \sum_{k=1}^{K} R_k * G_k * S_k \quad (1)$$

where R_k is the 'Gini correlation' between income component k and the rank of total income, G_k is the Gini coefficient for the k^{th} income component, and S_k is income share of the k^{th} income source.

The concentration of coefficients of the kth income source (C_k) is defined as:

$$C_k = R_k * G_k \quad (2)$$

The 'proportional contribution to inequality' of the k^{th} income source (P_k) is defined as:

$$P_k = R_k * G_k * S_k/G \quad (3)$$

and the Gini coefficient rate of change with respect to the mean of the k^{th} income component is defined as:

$$\frac{dG}{d\mu_k} = \frac{1}{\mu} * (C_k - G) \quad (4)$$

Data

The Hungarian Farm Accountancy Data Network (FADN) for the period 2007-2015 is used as a data source to evaluate the impact of CAP reform and economic recession on farm income inequality in Hungary. In addition, price indices as deflators obtained from the Hungarian Statistical Office are used to transform current forint values into constant forint values using 2010 as the base-year. Total farm income is comprised of two potential components: 1) income components, which can contain market income and off-farm income, and; 2) subsidy components, which can contain subsidies from Pillars 1 and 2. Pillar 2 support includes subsidies related to agri-environmental measures, LFAs and other rural development measures.

Table 1 presents summary statistics of variables used from the Hungarian FADN datasets at a farm level. A large variation between negative minimum

Variables	Obs	Mean	Std. Dev.	Min	Max
total income	17553	144,691.80	438,488.9	-630,617.5	10,500,000
off-farm income	17553	29,419.96	211,300.4	-8,788.5	8,132,372
market income	17553	50,281.12	232,651.6	-6,355,737.0	6,058,521
total subsidy	17553	64,990.67	203,350.5	0	5,088.339
Pillar 1 subsidy	17553	53,239.47	157,633.4	0	3,786,887
Pillar 2 subsidy	17553	11,751.20	56,867.9	0	1,749,941

Source: Authors' calculations

Table 1: Summary statistics of variables (Euro).

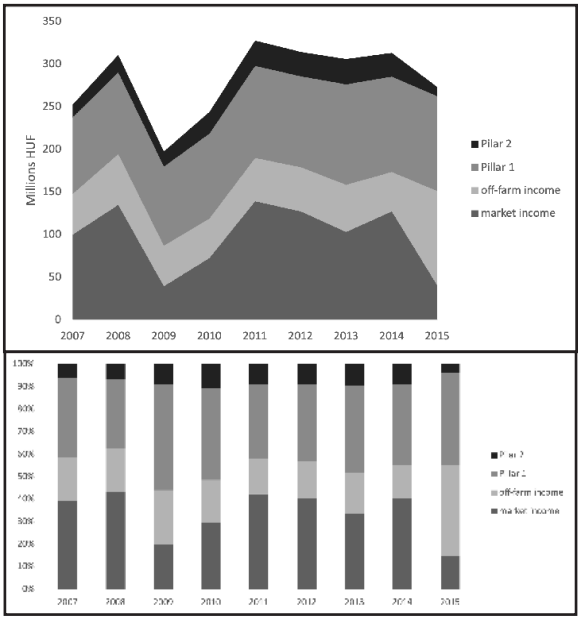
values and positive maximum values can be seen for total income, off-farm income and market income. As a remarkable is the negative minimum value for market income. Pillar 1 subsidies are more important than Pillar 2 subsidies in total CAP subsidies.

Results and discussion

The empirical results are presented in four steps. First, we present the evolution of farm household income structures in constant value terms and as relative shares. Second, we present total farm income inequality distribution by sources of income and total CAP subsidy distribution. Third, the farm household income inequalities rising the applied Gini coefficient decompositions. Finally, inequalities in total farm household income and total CAP subsidies distribution are presented by the Lorenz curves.

The evolution of total farm income and its components

Figure 1 illustrates the evolution in total farm income for total sample of FADN farms in Hungary (Figure 1 upper part). Total farm income tends to increase but undergoes considerable cyclical oscillation and a rapid decline in 2009 as well as in 2015 largely due to the considerable decline in market income. Due to this drop in market income, which is determined by farm output sales and output prices, its relative importance in total farm household income also declined (Figure 1 lower part). Off-farm income, except for an increase in 2015, remained rather stable both in terms of value and in the structure of total farm income. Subsidies from Pillar 1 remained more important than subsidies from Pillar 2. The share of subsidies from Pillars 1 and 2 in total farm household incomes tends to a slightly increase over time. The most remarkable is a substantial decline of market income and its role in total farm household income.



Source: Authors' calculations

Figure 1: Income and income composition for total farms, 2007–2015.

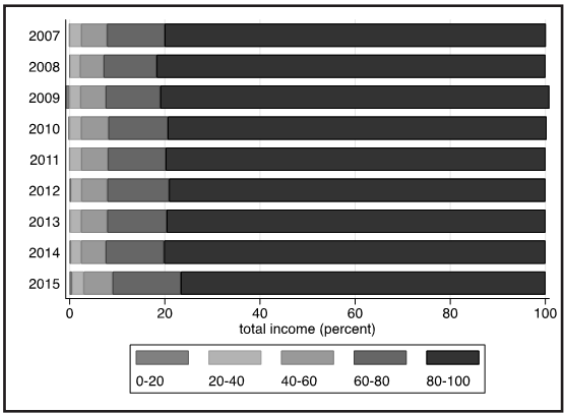
Farm income inequality and CAP subsidy distribution

Figure 2 presents rather unequal distribution of total farm income that remained rather stable over the years 2007-2015: 20% of the largest farms according to total farm income contributed around 80% of total farm income. The second largest group of farms contributed additional around 10% of total farm income. Finally, all other 60% of smaller sized farms according to total farm income contributed less than 10% of total farm income.

A strong concentration of income source on a smaller percentage of largest farms is also confirmed for distribution of total subsidy payments. The comparison of Figure 2 and 3 confirmed rather similar distribution of total farm income with distribution of total subsidies according to the farm size: 20% of the largest farms according to total subsidy payments received around 80% of total CAP subsidies; the second largest group

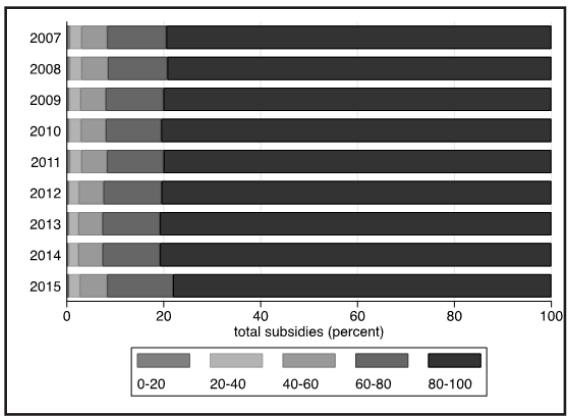
of farms received additional around 10% of CAP subsidies, and all other 60% of smaller sized farms according to total subsidy payments received less than 10% of CAP subsidies.

The unequal distribution of total farm income and CAP subsidies strongly revealed dual structure of Hungarian farms where a smaller number of largest commercial farms dominates in the structure of total farm incomes and total CAP subsidies received by farms over a larger number of smaller, mostly individual farms.



Note: Cumulative percentage of total income by the quintiles of farm size.
Source: Authors' calculations

Figure 2: Distribution of total farm income between 2007 and 2015.



Note: Cumulative percentage of total income by the quintiles of farm size.
Source: Authors' calculations

Figure 3: Distribution of total CAP subsidy payments between 2007 and 2015.

Gini coefficient decompositions

The Gini (G_k) coefficients decomposition according to the different farm income sources ranged between 0 and 1, except for market income (Table 2), which overshoots 1 due to a negative farm income caused by losses from farm market activities (Manero, 2017; Bojnec and Fertő, 2019). Market income, off-farm income, and Pillar 2 subsidies (LFA payments, agri-environmental measures, and other rural development programs) are much more unequally distributed than subsidies from Pillar 1 (direct payments). Market income depends on quantity of sales and farm prices as well as possible relative farm output price changes between farm production specializations. Not all farms are engaged in off-farm income activities. LFA payments depends on a farm location in a specific, for farm less favourable production conditions. Agri-environmental payments are based on a voluntary farm participation in implementation of these farming practices. While other rural development payments largely depend on specific farm project investment and on-farm diversification activities supporting by rural development program.

Between 2007 and 2015, the Gk coefficients suggest substantial overshoots 1 for market income, a slight increase in income inequality from off-farm income, and Pillar II subsidies, while the G_k coefficient remains at similar level for Pillar 1 subsidies. Pillar 1 direct payment subsidies are often paid for use of farm-inputs such as cultivation per a hectare of utilized agricultural areas with certain crops and per a head of livestock payments.

The proportional contribution (S_k) to farm income inequality by income sources changed between 2007 and 2015. While in 2007, market income, Pillar 1, and off-farm income play a crucial role in terms of their proportional contribution to farm income inequality, this changed in 2015 with a substantial decline of market income and increased of off-farm income and Pillar 1 subsidies. Interestingly, unlike for Slovenia (Bojnec and Fertő, 2019), the proportional contribution of subsidies from Pillar 2 in Hungary is less important than from Pillar 1 for farm income inequality. The S_k for off-farm income remains at relatively low value but makes a relatively stable proportional contribution to farm income inequality. The most remarkable is the substitution effect of market income with off-farm income and further increase of Pillar 1 subsidies to the proportional contribution to farm income inequality. As can be seen from Table 1, there is also a strong correlation between the columns S_k and the Share suggesting that they capture similar structures.

The Pseudo-Gini correlation (R_k) coefficients of the different farm income sources are greater than 0, suggesting that income from the specific income sources is mainly distributed to farms in the upper tail of farm income distribution (El Benni and Finger, 2013). Except for market income

in 2015, all other sources of income are strongly correlated with total farm income. The highest Pseudo-Gini coefficients are found for off-farm income and subsidies from Pillar 1. Unlike for Slovenia (Bojnec and Fertő, 2019), the Pseudo-Gini coefficients suggest that subsidies from Pillar 2 in Hungary are a slightly less important than subsidies from Pillar I. This can be explained by a greater role of direct payments from Pillar 1 for crops as an important source of income for Hungarian farms.

The estimated changes in the Gini Elasticities for the different income sources relating to farm income distribution, which is presented in the last column in Table 2, they range between less than zero (negative values) and more than zero (positive values). Values above 0 for market income and off-farm income in 2005 and off-farm income and Pillar 2 subsidies show that an increase in the income source under consideration of 1 per cent increased total farm income inequality (as measured using the Gini coefficient) by the defined percentage, ceteris paribus. While values below 0 for an increase in Pillars 1 and 2 subsidies in 2007 and an increase in market income and Pillar I subsidies in 2015 decreased the inequality of total farm income.

The values for the Gini elasticity of market income and off-farm income are positive in 2007. A 1% increase in market income and off-farm income could increase the Gini coefficient of total income by 0.0114% and 0.024%, respectively. The Gini elasticities of Pillar 1 and Pillar 2 subsidies present an equalizing effect in 2007, 1% increase in Pillar 1 and Pillar 2 subsidies reduce the Gini coefficients of total income by 0.0315% and 0.0039%.

The Gini elasticities show different impacts in 2015 by income sources. The market income and Pillar 1 subsidies reduce the Gini coefficient of total income by 0.0642% and 0.0223%. The off-farm income and Pillar 2 subsidies increase the Gini coefficient of total income by 0.0864% and 0.0001%.

Lorenz curves of total farm income and CAP subsidies distribution

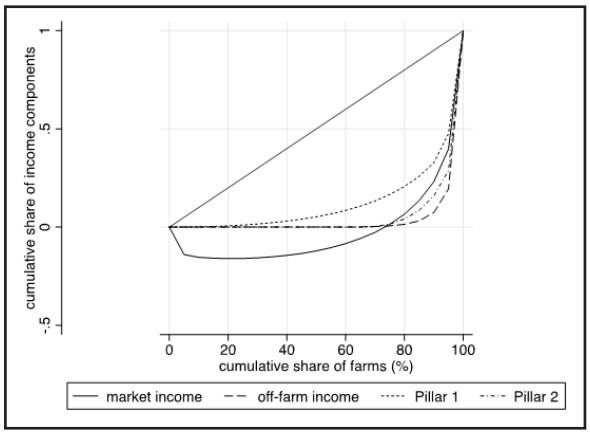
The Lorenz curves reinforce the striking finding on unequal distribution in farm income components according to their farm size. Almost 80% of Pillar 2 subsidies and particularly off-farm income were received by the largest 20% of farms, and these patterns were further strengthened between 2007 and 2015. Interestingly, Pillar 1 subsidies were a slightly less concentrated, but their inequality a slightly increased between the analysed years. The most striking finding is the negative market income for a large majority of the Hungarian FADN farms. In 2007, more than 70% of smaller farms experienced negative market income (Figure 4). Up to 2015, the percentage of farms with negative market income further increased and the negative market income became of larger size for a greater percentage of farms: around 95% of farms experienced negative market income (Figure 5). We can conclude that subsidies from Pillars 1 and 2 and off-farm income for a large majority of Hungarian farms were spent to cover losses or negative farm market income, and except for the largest farms according to total farm income, to reduce farm income inequality.

In their study, Enjoras et al. (2014) point out that public policy income redistribution poses a significant challenge to farm management and policy-making due to fluctuations in agricultural incomes. The framework for income redistribution in the EU is provided by the CAP, which has been undergoing reforms since the 1990s (Sinabell, 2013). One of the tools for this is direct payments or single area payments within Pillar 1, which are for several EU countries, including for Hungarian

Source	Sk	Gk	Rk	Share	Elasticity
	2007				
market income	0.3947	1.0594	0.7504	0.4061	0.0114
off-farm income	0.1895	0.9396	0.9265	0.2135	0.024
Pillar 1	0.3553	0.7589	0.9279	0.3238	-0.0315
Pillar 2	0.0604	0.9089	0.7958	0.0566	-0.0039
	2015				
market income	0.1468	3.3743	0.1228	0.0826	-0.0642
off-farm income	0.4065	0.9584	0.9314	0.493	0.0864
Pillar 1	0.4068	0.7532	0.9237	0.3845	-0.0223
Pillar 2	0.0398	0.938	0.7868	0.0399	0.0001

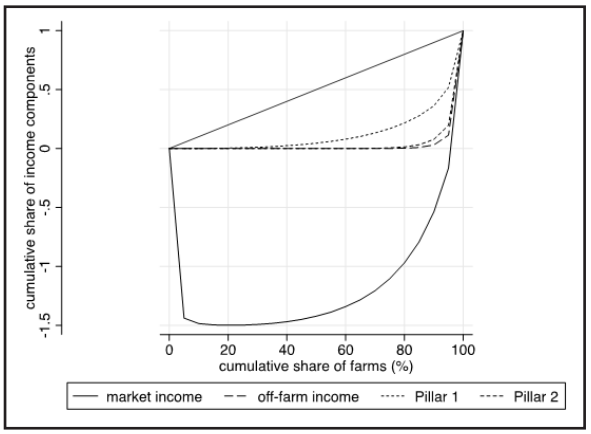
Source: Authors' calculations

Table 2: Gini decomposition of farm income in 2007 and 2015.



Source: Authors' calculations

Figure 4: Lorenz curves of farm income components in 2007.



Source: Authors' calculations

Figure 5: Lorenz curves of farm income components in 2015.

farms, the most important expenditure within CAP. The decoupling of direct payments from the level of farm production is intended to reduce income inequalities. The impact of it has been investigated in several studies (Ciliberti and Frascarelli, 2018). Based on the previous literatures, it becomes clear that the concentration of direct payments towards larger input-based farms is rather heterogeneous, with a high concentration in some EU Member States (Severini and Tantari, 2014). With the single payment scheme, differences in concentration cannot be clearly explained. The impact may vary not only from region to region but also from country to country. However, previous studies agree that CAP payments should be decoupled from the level of farm production and it is necessary to limit the amount of direct payments that can be paid to the largest beneficiaries (Nitta et al., 2020). Previous studies (El Benni and Finger, 2013; Tantari et al., 2019; Bojnec and Fertő, 2019b) used FADN data to show how income inequalities in the different regions or farming sectors with different production conditions evolved as a result of direct and other CAP payments.

The effect of farm market incomes, off-farm income, and CAP subsidies from Pillars 1 and 2 on farm income distribution is examined using the Gini coefficient decomposition. The Gini coefficient is a greater than 1 and increased between the years 2007 and 2015 due to a negative value for farm market income. The negative market income for a large majority of Hungarian FADN farms suggests that without CAP subsidies and off-farm income most of farms would more likely not be able to cover their operation costs and be able to survive.

A large dependence of farms on CAP subsidies and non-farming activities can be a treat for future development as they not only largely reduce the farm income inequality among Hungarian farms and rural areas, but they are also keeping them a live to maintain farming, particularly the restructuring and exit of less efficient and competitive farms. It might be also that several farms can be indebted, what has not been investigated and can be an issue for research in future.

There is less clear pattern regarding the convergence processes toward a reduction in concentration of CAP subsidies that would allow for a more equal distribution of support for lower income farms. Direct payments from Pillar 1 correlate to the level of farm income for Hungarian farms still more than the source of market-driven income that is rather volatile with a declining pattern. Therefore, direct payments from Pillar 1 represent a significant proportion of total farm income and have an impact on income equality (Ciliberti and Frascarelli, 2018). However, the system of CAP payments needs to be reformed to eliminate inequalities in the distribution of payments between the farms and regions of the EU. To improve the efficiency and equity of CAP measures, income support needs to be better defined and information provided on the farm income and wealth situation of the agricultural population.

Conclusion

The paper investigated the development of income inequality in Hungarian agriculture over the period 2007–2015 using FADN data. A shift in CAP policy and related measures, off-farm income, and particularly volatile and declining farm market income have determined the evolution and structure of farm incomes. While CAP subsidies can distort production activities and agri-food markets and postpone farm restructuring, they can also reduce farm household income inequality.

Our calculations highlight the importance of CAP subsidies in Hungarian farms and indicate that the role of CAP subsidies in farm incomes increased during the period of analysis. This can be explained by the existence of large-scale commercial and other crop farms in association to Pillar 1 direct payments, the small-sized farms and poor natural conditions for agricultural production in association to Pillar 2 rural development payments. CAP reform in rural development policy during the period 2007-2015 contributed towards the stabilization of farm incomes, which were volatile, declining and even negative for a large majority of Hungarian farms for market income.

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