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Assessing the Farm–Nonfarm Households' Income Gap along the Income Distribution in the European Union

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Abstract

This article investigates the presence of a farm–nonfarm income gap along the income distribution in the European Union. Our findings show that the income disparity between farm and nonfarm households varies at the opposite poles of the distribution within and between countries. On average, farm households in the lowest quartile are worse off than nonfarm households in the same quartile, whilst farm households in the highest quartile are better off than their nonfarm counterpart. We also provide some evidence on the time dynamics of the farm–nonfarm households' income gap by looking at its evolution after the Great Recession. Finally, the policy implications stemming from the results are presented. In particular, the importance of re-directing the Common Agricultural Policy public support in two main directions: from the richest farm households to the poorest farm households, to reduce within countries' inequality, and from the richest countries to the poorest countries, to reduce between countries' inequality.

Keywords: agricultural policy; CAP; farm sector; households welfare; inequality

Introduction

In a seminal paper, Gardner (1992) introduces the farm income problem and explains why farmer units systematically earn less than nonfarmer ones. Since the government intervention in the farm sector has been often justified on these grounds and, in the European Union (EU), a large share of the budget is devoted to direct payments decoupled from production to the farm sector, scholars have often considered the farm income problem a policy-relevant issue.

Many authors have assessed the farm income problem by looking at the farm–nonfarm gap at the mean or median level and have found that the gap has been progressively declined over time (de Frahan et al. 2017; El-Osta et al. 2007; Katchova 2008; Marino et al. 2021; Mishra et al. 2002; Rocchi et al. 2020). Heterogeneity within the farm sector is however an important facet of the farm income problem, and many scholars have called for further research to improve the design of policies directed at the farm sector and to nourish the debate about the Common Agricultural Policy (CAP) reform (Cunha and Swinbank 2009; Finger and El Benni 2021; Henke et al. 2018). To start with, there is a growing agreement that assessments of the income gaps should go beyond mean comparisons and be realized along the entire income distribution (Severini and Tantari 2013). An income gap amongst lower income groups seems to be – from a normative point of view – less fair and should be properly addressed by targeted policies. Moreover, income levels differ across farm households (FH) because of heterogeneous endowments in production

factors and skills and of differences in the environment and institutional settings in which the households operate (Hill 2019). These differences are also important from a policy perspective since they call again for more targeted interventions. Finally, the poor targeting of income support is a longstanding issue in agricultural policy evaluation, together with the analysis of structural drivers generating a bias of support towards larger farms and richer farmers (OECD 2003; Rocchi 2009). This is particularly true in the EU where public opinion prefers subsidizing small family farms over very large ones and the strong concentration of direct payments within the farm population is under scrutiny (Ellison et al. 2010; Finger and El Benni 2021).

To give a contribution to the above literature and to offer useful empirical evidence for the debate on the CAP reform, the present work aims to assess whether FH are experiencing a significant income gap in comparison to nonfarm households (NFH) in the EU. However, adding to previous studies, we assess the presence of the gap along the whole distribution of income. Such analysis allows to test whether the gap is more likely to be found amongst poorer or richer income groups. If this is the case, then the former should be given more attention and, eventually, a greater income support from a new farm policy.

The analysis proceeds in two steps. In the first step, we examine income farm–nonfarm inequality in the whole EU at a more descriptive level. To start with, this is done by comparing the (i) share of FH with the share of NFH along the income distribution and (ii) the income differences between these two groups. Then, following the approach proposed by Lakner and Milanovic (2013) who assume the existence of a global social welfare function common to all member states, we provide an analysis of growth incidence curves (GICs) for both FH and NFH in the EU global income distribution, based on a panel of mean income measures at the country-decile level for the 2004–2020 period.[1]

In a second step, by controlling for heterogeneities in the observable characteristics of the FH and NFH, we measure the income gap and its dynamics between these two groups at the mean [using an ordinary least squares (OLS)] and at various points of the distribution using a quantile regression, as it is standard in the literature on income gaps (Bui and Imai 2019; Christofides et al. 2013; Hospido and Moral-Benito 2016).

The above quantitative analyses are realized at the EU level, but also at the national level in five member countries belonging to the three most important EU geographical areas (Western, Mediterranean and Central Eastern countries). Such comparative regional analysis allows to consider the deep differences existing in terms of socio-economic situations, social welfare policies, institutions, infrastructures and farm subsidies provided by the CAP, across the EU member states.

Our regression results indicate that the income gap between FH and NFH varies when looking both at different countries within the EU and at the opposite poles of the income distribution within countries. Whilst further analyses and more specific data are needed,

[1]The analysis of inequality in the farm sector in the EU poses a challenge related to the political nature of the Union itself. Member states are independent political entities, carrying out redistributive policies at the national level. This is often considered a sufficient condition by some authors to reject any hypothesis of the existence of EU-wide social welfare function justifying a global inequality analysis (Atkinson and Brandolini 2010). However, income support under the CAP, despite being a *sector* policy, *is also* a redistributive policy implementing common measures across the whole Union. Therefore, an analysis of inequality between FH and NFH and within the farm sector itself at the EU level seems relevant to orient policy design.

our results seem to suggest that the CAP support, noticeably the direct payments that account for the largest share of its budget, could be better tailored to account for the different economic conditions of the single member states and within each of them and could be designed in a more flexible way in its implementation at the national level.

The article is organized as follows. Section 2 introduces the literature on the farm income problem, Section 3 describes the data and Section 4 describes the methodology. Section 5 contains the results of a descriptive comparative analysis of the FH and NFH income distribution during the observed period. Section 6 reports the results of a quantitative analysis employing a quantile regression approach to explore the income gap between FH and NFH along the whole income distribution. Section 7 critically discusses the main findings of the analysis, illustrate some policy implications and highlights some limitations of the analysis and possible areas for further research.

1. The Farm Income Problem and the Role of the Public Intervention

Historically, public support to the farm sector in the United States and in the EU has often been justified by the existence of an income gap between farmers and/or nonfarmers. Such gap, which gives rise to the so-called farm income problem, is discussed by Gardner (1992) who provides an extensive theoretical and empirical review of the literature. Whilst the farm income problem has been first supported by the scientific community, it has been more recently scaled back. For instance, in the United States, studies have conclusively shown the disappearance of the farm income problem under any available method of analysis (e.g., El-Osta et al. 2007; Katchova 2008; Mishra et al. 2002). A similar trend of convergence has been detected also in the EU (e.g., de Frahan et al. 2017; Eurostat 2003; Marino et al. 2021; OECD 2003; Rocchi et al. 2020). de Frahan et al. (2017) found that FH incomes are not particularly lower on average than NFH incomes in most OECD countries. Rocchi et al. (2020) and Marino et al. (2021) also find that, under certain circumstances, farm units are even richer than their counterparts. However, some have shown a greater income inequality and poverty in the farm community than in the nonfarm community (de Frahan et al. 2017).

Despite the convergence between farm and nonfarm income, policy statements in many countries still claim that one of the aims of agricultural policies is to ensure equal standard livings between farmers and the rest of the economy or to other industries. This is particularly true in the case of the EU.[2] In a recent report, the European Commission claims that the agricultural income per worker in the EU-27 is on average about 41% of the mean wage in the whole economy (period 1995 to 2018) even if the income gap between the two groups seems to slowly decline over time. The existence of the farm–nonfarm income gap is one of the most important justifications of the specific objective 1 of the CAP, namely, the support to a viable farm income and to the resilience of the sector. In order to accomplish the other eight specific objectives, the CAP globally accounts for around 35% of the 2020 EU budget whilst 69% of the

[2]The European Commission has often claimed that the CAP must 'ensure a fair standard of living to farmers'. Whilst the CAP now pursues a large set of objectives, we can still find that one of its main objectives is to 'support viable farm income and resilience across the EU territory …' (European Commission 2018).

CAP expenditure is channelled by direct payments that specifically support farm income.[3]

To better understand if public support to the farm sector is still justified, scholars have investigated other aspects of the farm income problem, for example, the extent of inequality. The rationale is that FH and NFH may have similar average well-being but the distribution of income and wealth amongst these two groups may be different. For instance, Katchova (2008) looks at the degrees of inequality in the income and wealth distributions of the American farmers by looking at the Gini coefficients. Mishra and Moss (2008) instead use a Theil informational approach to analyse inequality in consumption amongst FH. Finally, a promising approach is introduced by Chang (2012) using Taiwan data. The author employs an unconditional quintile regression to distinguish the different performance of farmers and nonfarmers at the upper, middle and lower extremes of the distribution. Whilst new in the literature on the farm income, such method is quite standard to explain inter-sectorial differences (e.g., Agyire-Tettey et al. 2018; Thu Le and Booth 2014).

Some scholars have also explored the extent of global inequality by looking at differences between macro regions. For instance, in the EU, Rocchi et al. (2020) find that an average income gap between FH and NFH still exists in the EU but with relevant differences across geographical areas. Whilst in Central Eastern countries the income gap seems to be relatively persistent over time, in the Mediterranean and, even more, in Western Continental EU members, the income gap between FH and NFH has vanished. Similar findings are provided by Marino et al. (2021): once observable and unobservable characteristics of households are accounted for, a significant difference in the average income between FH and NFH no longer exists in the EU but there are significant differences between old and new member states, with the latter still showing a significant farm income problem.

Accounting for differences amongst EU countries is justified because of at least two main reasons: countries differ in terms of both the CAP funding and the relative importance of the farm sector. For example, whilst direct payments account for around 54% of the whole CAP expenditure in Finland, they account for around 73% of the CAP expenditure in France in 2020.[4] Similarly, whilst the primary sector (including agriculture, forestry and fishing) accounts for 1.8% of the whole EU gross value added, its relative importance varies amongst EU countries being, for example, 1.8% in France and 4.4% in Romania according to 2020 European Commission data. Additionally, EU countries differ also for other aspects including, amongst others, the level of income. For example, whilst the gross domestic product (GDP) in purchasing power standards (PPS) per capita in Finland has been 111.1% of the average EU-27 income in the period 2016 to 2018, the GDP in PPS per capita in Romania has been 63.1%. This suggests that differences amongst countries should be accounted for in empirical analysis when possible.

Finally, previous analyses show that results strongly depend on the definition of the FH with narrow farmers – living mostly on farm income – having an income well above the average of the total population whilst broader farmers – all households with at least some

[3]European Commission data through the DG Agriculture and Rural Development (https://agriculture.ec.europa.eu/system/files/2022-11/cap-expenditure-graph1_en.pdf).
[4]European Commission data through the Agridata platform (https://agridata.ec.europa.eu/extensions/DataPortal/cmef_indicators.html).

agricultural income – being poorer than their narrow counterpart. The latter results suggest that there might be room for a redistribution of agricultural public support both across member states (in favour of Central Eastern countries and new members) and within the agricultural sector, from richer to poorer farmers.

We propose to investigate income inequalities between FH and NFH by combining the above results in two ways. First, we exploit European data – with a focus on countries belonging to the EU – to explore income gaps between FH and NFH along the distribution. We do so by using both descriptive analysis and an unconditional quantile regression (UQR) as in Chang (2012). Considering the above literature, we first expect that EU FH will show an economic disadvantage with respect to NFH in the lower part of the distribution and an economic advantage in the upper part of the distribution. Second, by exploring these differences within countries classified either as Old and New member or according to the geographical belonging (Mediterranean, Western or Central European), we expect that FH in the top part of the distribution will be richer than their counterpart in particular in the Old members or in the richer Western or Mediterranean countries.

We believe that, by combining the two aspects, the effectiveness of farm policies can be better assessed. Being able to distinguish the performance at the upper extremes of the distribution from the performance in the middle and lower ends of the distribution is critical to the design of a more effective policy for the farm sector.

2. The EU-SILC Dataset and the Definition of the Farm Households

To compare the income of FH with the income of the NFH, we employ the EU Statistics on Income and Living Conditions (EU-SILC), a harmonized survey that collects multidimensional microdata on income, poverty, social exclusion and living conditions in Europe. EU-SILC is an example of international, harmonized household survey suitable to support studies on global income distribution (Lakner and Milanovic, 2013). Although it has not been developed for the assessment of farm welfare, the availability of a detailed set of data on the sectors to which individuals belong as well as their job occupation allows identifying farmers and then FH (Hill 2012). Additionally, EU-SILC is particularly useful to conduct an empirical analysis on the income gap between FH and NFH in the EU since it also provides information that can be used to account for observable differences like levels of education, gender and age amongst the others. Considering the imminent CAP reform, and despite the limitation of EU-SILC not being created for this purpose, we believe it is worth to conduct such analysis.

To identify FH, we first create a sub-sample of self-employed individuals, since farm income is generated from self-employment. Within this sub-sample, farmers are identified using two variables: the ISCO-88 and the NACE classification used at EU level for both economic and social statistics. Whilst the first identifies the individual main occupation, the second identifies the sector in which the individual is employed. Once farmers are identified, we can create our unit of investigation: the so-called broad definition of the FH sector.[5] We refer to those families that have at least one self-employed member

[5]In the literature (Hill 2012; Marino et al. 2021; Rocchi et al. 2020), it exists also a narrow definition of FH that considers only those families whose farm income is the major source of income (i.e., at least half of the total household income). Although such definition would be suited for our analysis, unfortunately, the number of FH in such case would be considerably reduced to conduct analysis along the entire income distribution.

working in agriculture. Once FH have been identified, NFH are defined by simply excluding all FH.[6] The two samples, FH and NFH, consist of all types of households including those out of the workforce and relying on transfers and other non-wage income.

EU-SILC includes all countries belonging to the EU. However, since some countries have a small number of FH, similar to other studies (de Frahan et al. 2017), we restrict the sample to those countries with at least 100 FH each year to limit the risk that sampling errors affect the statistical results. We end up with an EU-wide sample including the following countries for the years 2004–2020: Austria, Bulgaria, Croatia, Estonia, Greece, Spain, Finland, France, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Netherlands, Poland, Portugal, Romania and Slovenia.[7] We will focus also on five countries with a larger sample of FH that belong to three macro regions of the EU: France and Finland (Western Continental countries), Italy (Mediterranean countries) and Poland and Romania (Central Eastern countries).

As a measure of economic welfare, we consider the per-capita equivalized disposable income calculated at the household level using a common equivalence scale.[8] More specifically, we consider the real values of the income variable, adjusted for purchasing power parities to account for differences in price levels (adjusting for purchasing power parties, PPP) and deflated at 2015 prices using the Harmonized Index of Consumer Prices.[9] The use of disposable income measured at the household level to compare households' welfare across sectors represents one of the most important advantages offered by using a general purpose, economy-based survey like EU-SILC. Our aim is indeed to assess the relative position of FH within the income distribution of the whole European society. A sector-oriented survey such as, for example, the Farm Accountancy Data Network sample would not allow such analysis.

In Section 5, to reduce the income gap between FH and NFH that depend on observable characteristics, we consider a standard set of variables recognized in the literature as determinants of household income (Becerril and Abdulai 2010; De Janvry and Sadoulet 2001; Mendola 2007). Some variables are computed at the householder level.[10] Once the householder is identified, we consider his/her age, gender, education, if he/she is married and if he/she has a good health status. Other covariates are defined at the household level. In particular, we consider the number of components and if the household lives in a rural area.

3. The Empirical Methodology

The effect of being a farm household on income can be measured, as a starting point, through an OLS regression of the following Mincer-type earnings equation (1):

[6]For details, Section S1 reports the EU-SILC variables that have been used for the identification of our units of analysis.
[7]Not all countries/years are represented in our sample. Table S1 reports for each countries the years in which we have observations according to our rule.
[8]EU-SILC provides equivalence scale equal to 1 for the reference person, 0.5 for other adult members (14 years old or elder) and 0.3 for members up to 13 years old.
[9]Eurostat provides the coefficients to perform Purchase Power Parities and price variation adjustments (http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=prc_ppp_ind&lang=en. Accessed on 14/09/2022). Details on the methodology can be found in Mack and Lange (2015).
[10]The householder is defined using the following criteria: he/she must be responsible of the accommodation; if there are two individuals responsible of the accommodation, the one earning the greatest income is considered; if still no unique householder is identified, we consider the eldest.

$$ln(hh\_income)_i = \alpha + x_i\beta + farm\ household_i\gamma + u_i \quad (1)$$

where $ln(hh\_income)_i$ is the natural logarithm of the disposable income of the ith household, *farm household* is a binary variable taking value 1 if the observation i identifies a farm household, x is a vector of control variables (including year and country dummies in most of our specifications) and u is the error term.

We are interested in the estimation of γ that (multiplied by 100) measures the conditional wage penalty/premium for the FH. The OLS model is estimated on a sample of pooled observations of individual-year pairs.

The OLS enables the estimation of the effect of covariates at the mean, but given the positive skewness of the distribution and the presence of extreme values, the effects of covariates will differ along the distribution, making it appropriate to examine factors influencing income not only at the mean but also at different percentiles along the distribution. In order to capture the effect of being a farm household at different levels of income, several decompositions based on the so-called conditional distribution methods might potentially be employed (Fortin et al. 2011). We adopt the UQR approach developed by Firpo et al. (2009), which allows to directly compare the results of income gaps for farm household at different quantiles of the income distribution (Fortin et al. 2011).[11] This procedure is computationally simple and easy to interpret since the so-called recentred influence function (RIF) is estimated with a robust method that regresses the influence function of the unconditional quantile of the dependent variable – the logarithm of disposable income – on all the independent variables. In analytical terms, for each quantile q_τ, we estimate a RIF regression, which is the same as any standard regression except for the fact that the dependent variable is replaced by a recentred influence function of the statistics of interest. This method allows to get results at different quintiles of the income distribution and to compare them to each other directly, since the resulting decomposition is path independent.

We thus compare Equation (1) with Equation (2):

$$q_\tau\left(ln(hh\_income)_i\right) = \alpha(\tau) + x_i\beta(\tau) + farm\ household_i\gamma(\tau) + u_i \quad (2)$$

where $q_\tau\left(ln(hh\_income)_i\right)$ is the τth quantile of the distribution of the log household disposable income. The vector of estimated coefficients $\beta(\tau)$ provides the estimated rates of return to the different covariates at the τth quantile of the distribution. The estimated coefficient $\gamma(\tau)$ represents the farm household income penalty/premium at the various τth quantiles.

4. FH and NFH in the EU Income Distribution: A Descriptive Analysis

In the present section, we offer a descriptive analysis of the differences between FH and NFH along the income distribution. Our main aim is to assess if the FH have a

[11]An important difference between conditional quantile regressions (Koenker and Bassett 1978) and this approach is that conditional quantiles do not average up to their unconditional population counterparts. As a result, the estimates obtained by running a quantile regression cannot be used to estimate the impact of an explanatory variable on the corresponding unconditional quantile of the dependent variable Y.

monetary disadvantage with respect to NFH. We do so in two ways. First, we look at the number of FH and NFH along quartiles and their relative income gaps.[12] Second, we look at the farm and nonfarm GICs to capture graphically the growth rate of per capita income for every ventiles of the income distribution between two points in time.

FH and NFH along Quartiles of the Income Distribution

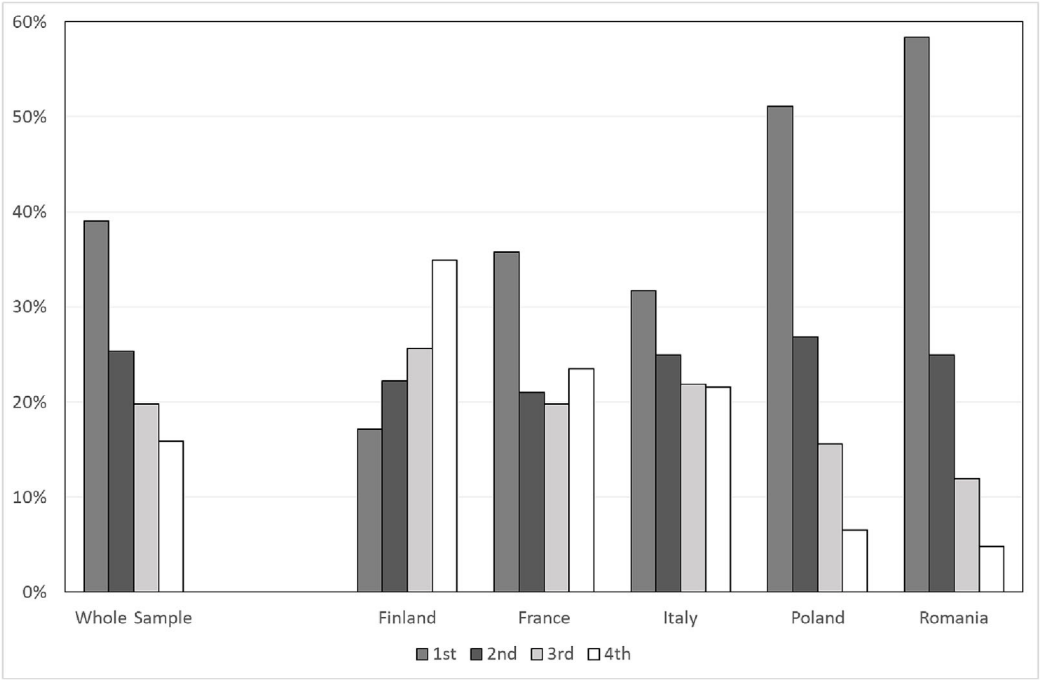
To assess the situation of the FH along the income distribution, we first focus on their distribution along quartiles computed on the general income distribution of the EU population during the period 2004 to 2020. Whilst Table S2 reports the number of FH and NFH for each quartile in the whole sample and for five representative countries in the period going from 2005 to 2020, Figure 1 shows the number of FH for each quartile over the total number of FH. When considering the EU sample, almost 40% of FH falls in the lowest quartile whilst only 15% in the upper quartile. Such results can be explained by looking at the relative position of FH in the Central Eastern European countries such as Poland and Romania. A different picture is offered by Finland, with most FH belonging to the upper quartile. Italy and France show instead a more equilibrated picture, with farmers more equally distributed over quartiles. Overall, the figure shows that most FH, especially in the relative poorer Central Eastern countries, tend to be concentrated in the lowest part of the income distribution whilst the situation is quite different for the rest of countries where either the situation is more equilibrated – Italy and France – or FH tend to be concentrated in the upper part of the income distribution (Finland). Overall, looking only at the EU picture masks a lot of heterogeneities within and between countries.

Moving now to the economic welfare, we compare income gaps between FH and NFH. More specifically, we consider the total per-capita equivalized disposable income. Figure 2 reports the ratio of FH to NFH average incomes for each quartile. The ratio allows to analyse if FH are better or worse off than NFH along the distribution. Values of the ratio above 1 point to FH being relatively richer than NFH. Looking at the pooled EU sample, FH are worse off (ratio < 1) than NFH along the whole distribution. Nevertheless, several differences emerge when we consider single countries. We find that FH in the middle lower, middle upper and upper quartiles in Finland and France (also in Italy except for the upper quartile) have an almost similar or higher income than NFH on average. A different picture emerges when considering countries of the Central Eastern part of the EU, where FH incomes are always below NFH incomes.

Overall, Figure 2 shows very significant FH–NFH income disparities at the European level particularly for the poorest quartiles, but these differences are greatly minimized when the analysis is done at the country level. Such evidence underlines the importance of properly assessing income gaps between groups according to the specific policy purpose. On the one hand, if we are interested in the extent of EU convergence, a pooled

[12]We choose to explore the income distribution along quartiles as a reasonable compromise between tertiles and quantiles. The former might provide few information on the differences in the income distribution whilst the latter – despite being more informative – might result in asking too much to our data given that FH are a small population over the general population and EU-SILC was not specifically designed to analyse the sample of FH.

Figure 1: Distribution of Farm Households over Income Quartiles. Sample Shares. Whole Sample and Selected Countries. 2004–2020.



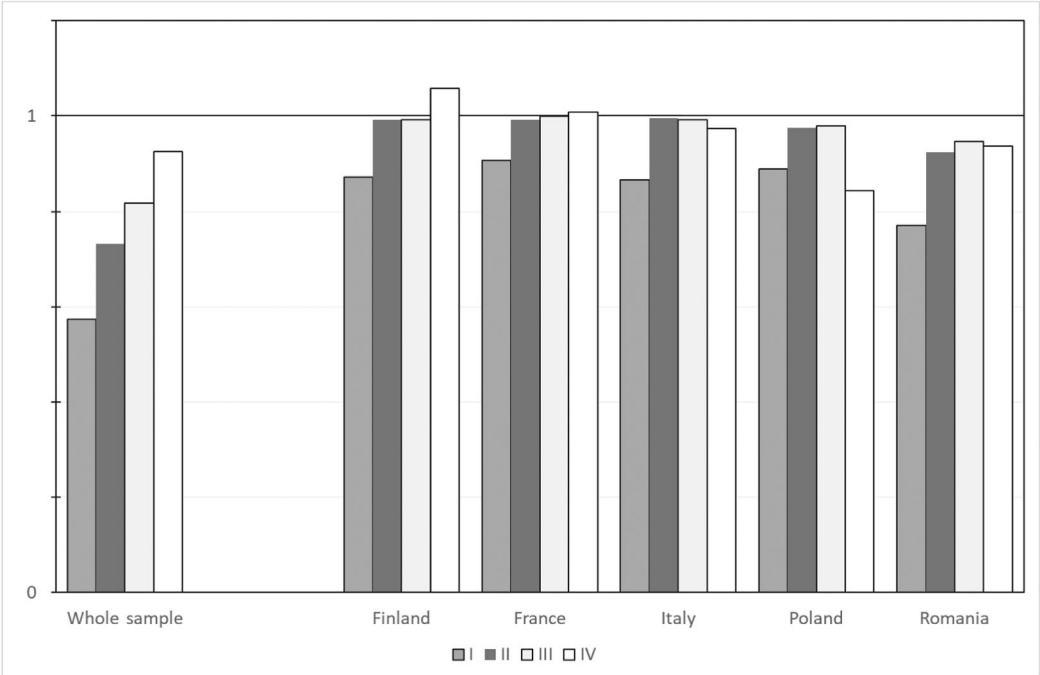
Notes: The histograms show the number of farm households in each quartile over the overall farm household population. The sample is indicated in Table S1. Source: Own elaborations on European Union Statistics on Income and Living Conditions data.

level analysis of the EU countries can be more useful, since it gives us information on the disparity existing between countries. On the other hand, if we want to assess income gaps between FH and NFH to justify a support to fill the gap between the two groups, we need to go beyond income disparities calculated at the EU level (as is done regularly by the EU Commission) since it greatly exaggerates the income disparities that prevail at the national level. There are enormous differences existing between countries and the situation need to be assessed within countries. Clearly, both convergence and reduction of disparity amongst social groups are important policy objectives but require different tools to be assessed.

EU GICs for the FH and NFH

We analyse the global income distribution in the EU following the approach proposed by Lakner and Milanovic (2013). They derive global GICs showing which parts of the global distribution benefited the most (and the least) between 1988 and 2008. As in their study, we first created a panel of 2430 'observations' of the average per-capita, equivalized income of the households included in each income decile of each country/year combination

Figure 2: Ratio of Farm to Nonfarm Incomes over Quartiles. European Union and Selected Countries. 2004–2020.



Notes: The histograms show the ratio of the average incomes of farm and nonfarm households in each quartile. Whole sample is indicated in Table S1. Source: Own elaborations on European Union Statistics on Income and Living Conditions data.

for the period going from 2005 to 2020.[13] Then, to consider income's underreporting, common amongst higher percentiles, we corrected the estimates as is common in the literature (Lakner and Milanovic 2015):

- we compared the estimated mean income for each country/year with the estimates of average per capita consumption expenditures[14] from national accounts;
- when we found that consumption expenditures were higher than incomes estimated with EU-SILC data, we adjusted proportionally the total income and recalculated the share for the first 95% of the population;

[13]Benczúr et al. (2017) use EU-SILC data for a similar analysis for the years ranging from 2003 to 2016 using data on individual incomes. Differently from their study, we use estimates at the household level that are then classified according to the sector (FH vs. NFH). Note that we differ from their study, as well as other studies using EU-SILC, because we use a subsample where country/years units with less than 100 FH are dropped (see Table S1). This is done in order to compare FH and NFH, but it makes it difficult to compare our growth incidence curves with other studies which have a more complete sample.

[14]We used data on final consumption aggregates by durability available at the Eurostat public database (https://ec.europa.eu/eurostat/web/main/data/database). Differently from Lakner and Milanovic, we excluded household expenditures for durable goods and individual expenditure of general government and of non-profit institutions serving households. Since national accounts of consumptions refer to the entire population, and we do not have data on FH consumptions, we assume that FH have the same gap between income and consumption as the entire population.

- we allocate the positive differences between official private consumption data and household survey incomes to the top 10% within every country and 'elongates' the distribution using a Pareto imputation for top 1% and top 5%; and
- we recalculate the mean income in the top 10%.

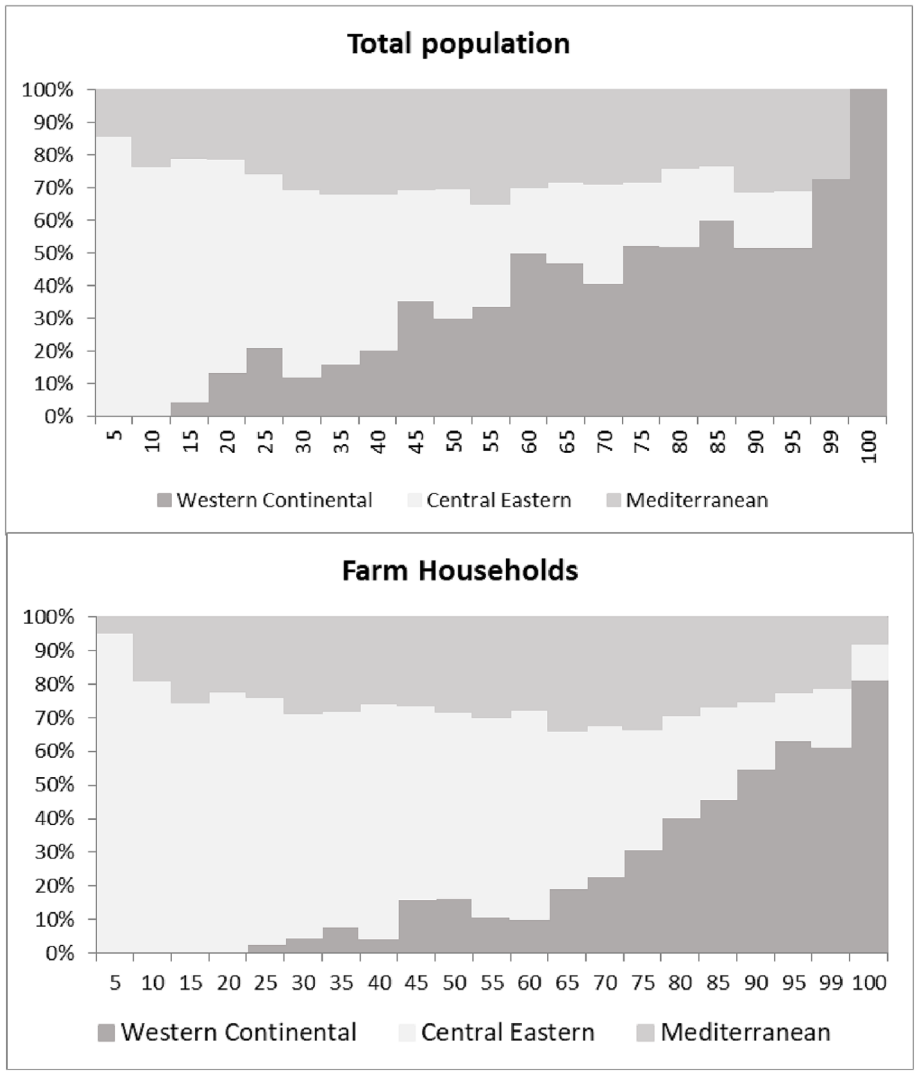
These new observations are then assigned to EU ventiles (5% of observed population) with the top ventile splitted into top 1% and 4% between P95 and P99. Table S3 reports the average income (population-weighted) estimates in reference years[15] for the total population (including FH) and for FH for each ventile. Table S4 provides instead the distribution of households for each ventile amongst three different geographical areas (Western, Mediterranean and Central Eastern), both for total population and for FH only.[16] To graphically display these geographic differences, Figure 3 shows the share (y-axis) of total population (upper panel) and the FH (bottom panel) belonging to the three geographical areas in each ventile of the global distribution across the whole period (x-axis). As one would expect, in the upper ventiles of both panels, it is more likely to find households from the Western Continental countries, whilst in the lower ventiles from the Central Eastern households. The incidence of Mediterranean households is quite homogeneous across ventiles, even though more concentrated above the median of the global distribution. The only relevant difference between the two panels is the presence of FH belonging – although in a very small percentage – to Mediterranean and Central Eastern countries in the top 1%. In other words, in any geographical area of the EU, we can find FH in the top 1% of the EU global income distribution.

More importantly for the scope of our study, Figure 4 compares the variation of incomes observed in the total population over the 2004–2020 period with the variation in the farm population by using GICs.[17] Note that the graph – in the background – reproduces the incidence of geographical areas in the composition of the group of the FH included in each ventile as in the Figure 3 (bottom panel). With respect to the income growth over the period under analysis, on average, the incomes of FH have shown a decrease corresponding to an annual growth rate of −0.57% (dotted grey line in the graph). A different situation emerges for the total population with a growth rate of +0.12% (dotted black line).

The growth rates of incomes are different amongst the ventiles of the global distribution. When looking at the total population (solid black line), the growth incidence curve shows that incomes were almost stagnating between the 25th to the 95th percentiles (mostly households from Central Eastern and Mediterranean member states) and decreasing at the two extremes of the distribution (namely, the 10th percentile, with households mostly from Central Eastern countries and the 90th, for the largest part composed by Western Continental households). The comparison of the GICs of the total population with the incidence curves for FH shows some interesting features. The FH curve shows an almost constant increase moving from the bottom to the top of the distribution,

[15]Reference years are 3- to 4-year averages. More specifically, reference year 2005 corresponds to 2004–2006, reference year 2008 to 2007–2009; reference year 2011 to 2010–2013, reference year 2015 to 2014–2017 and, finally, reference year 2019 to 2018–2020.
[16]Data for each country are available upon request.
[17]The growth rates have been calculated based on the percentage variation of incomes between 3-year average incomes estimates centred on reference years 2005 and 2019.

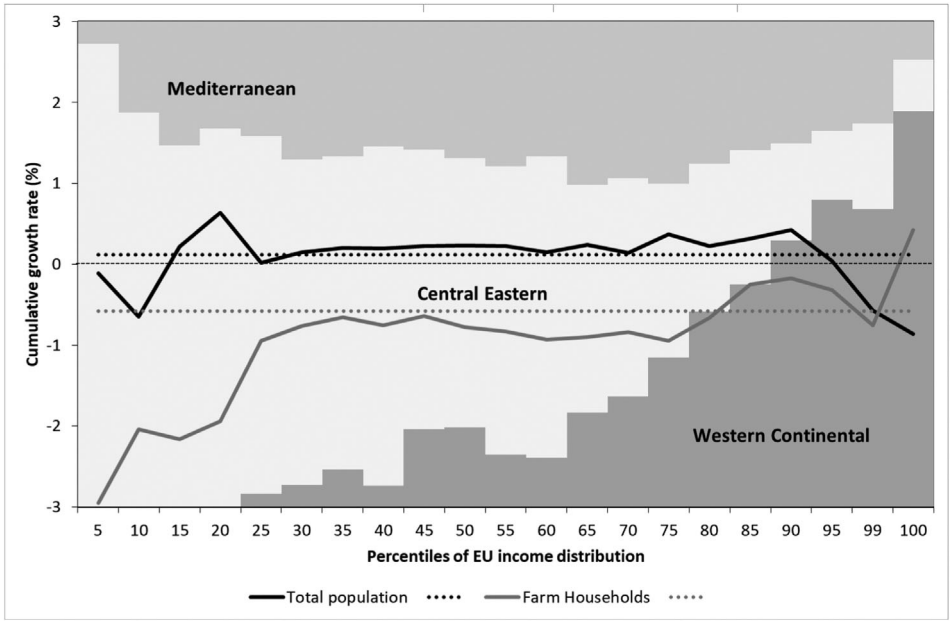
Figure 3: Incidence of Geographic Areas in the Composition of Ventiles in the European Union (EU) Global Distribution. 2005–2020. Farm Households versus Total Population. [Colour figure can be viewed at wileyonlinelibrary.com]



Notes: The x-axis shows ventiles of the global income distribution in the whole period (2004–2020). The y-axis shows the share of total EU households (top panel) and the EU farm households (bottom panel) belonging to each ventile for the Western continental, Central Eastern and Mediterranean countries. Source: Own elaborations on EU Statistics on Income and Living Conditions data.

reflecting the overall increase of inequality with poorer households suffering the higher decrease in income (remarkably severe in the lowest percentiles) within the FH group during the entire period. Interestingly, FH below the 99th percentile of the global distribution experienced a decrease in their incomes worse than the average of the total population.

Figure 4: Growth Incidence Curves for Farm Households and Total Population. 2005–2019. Annual Growth Rate by Income Quantile.



Notes: The x-axis shows ventiles of the global income distribution in the whole period (2004–2020). The y-axis shows the growth rate of the ventiles' average income. The background of the graph represents the share of farm households in each income ventile in the three geographic areas (as in Figure 3, bottom panel). Dotted lines represent the growth rate of income in the mean of the two groups. Source: Own elaborations on European Union (EU) Statistics on Income and Living Conditions data.

Conversely, FH belonging to the top 1% of the distribution improved their position relative to the other households in the same percentiles. These households mostly live in the Western Continental member states, with a minor share coming from Mediterranean and Central Eastern countries.

5. Farm versus Nonfarm Household Income across the Whole Income Distribution: A Regression Analysis

This section explores income gaps between FH and NFH by using regression analysis to control for observable characteristics and for differences along the income distribution. We consider the results of an OLS regression [Equation (1)] and complete them by using an UQR [Equation (2)] at the European level (Table 2) and then at the country level (Table 3). We also investigate specific time dynamics by analysing the evolution of the income gap before and after the Great Recession (Tables 4 and 5). Note that the dependent variable, that is, the household disposable income is expressed in logarithm.

We account for observable differences between FH and NFH using a set of variables generally assumed to affect income: age (*agehead*), education (*educhead*), marital status

Table 1: Average Values of Covariates in the FH and NFH Groups. Mean Difference Test.

Quartile	*FH*	*NFH*	$p > t$	*FH*	*NFH*	$p > t$
		agehead			*marriedhead*	
I	49.564	55.132	***	0.666	0.367	***
II	51.225	56.339	***	0.727	0.439	***
III	51.778	53.628	***	0.735	0.493	***
IV	51.411	52.745	***	0.697	0.542	***
		educhead			*hh_rural*	
I	2.309	2.235	***	0.843	0.332	***
II	2.440	2.462		0.810	0.301	***
III	2.611	2.958	***	0.765	0.250	***
IV	2.913	3.735	***	0.699	0.180	***
		malehead			*hh_size*	
I	0.832	0.519	***	2.399	1.573	***
II	0.820	0.578	***	2.410	1.556	***
III	0.833	0.650	***	2.340	1.605	***
IV	0.821	0.695	***	1.998	1.550	***
		healhead				
I	1.569	1.296	***			
II	1.569	1.380	***			
III	1.591	1.524	***			
IV	1.657	1.657				

Notes: Average differences between FH and NFH across observable characteristics and quartiles (age, education, sex, health, civil status, urban/rural residence and number of the member of the households). *p*-values of *t*-test are reported.
Abbreviations: FH, farm households; NFH, nonfarm households.
$^{*}p < 0.1$. $^{**}p < 0.05$. $^{***}p < 0.01$.

(*marriedhead*), health condition (*healhead*) and sex of the householder (*malehead*), the number of family members (*hh_size*) and the urban/rural residence (*hh_rural*) of the household.[18]

Farm versus Nonfarm Income Gap across the Whole Distribution

Before moving to regression analysis, we investigate whether FH and NFH differ in their observable characteristics. Table 1 reports the average of each of the above characteristics for FH and NFH along the income distribution. We also report the *p*-value of a *t*-test to assess if the difference is statistically significative. In almost all quartiles, the two groups differ considerably: the householders of the FH are more likely to be younger in all quartiles, more likely to be educated in the bottom 25th, but less likely to be educated in the top two quartiles, more likely to be male in all quartiles, more likely to be healthier except in the top 25th and more likely to be married in all quartiles. Finally, looking at the household's characteristics, as expected, FH are more likely to live in rural areas and more likely to have large families. Overall, Table 1 provides evidence that we need to control for observable characteristics given the significative differences amongst the two groups.

We now report estimates of OLS regression and UQR using the above covariates as control. All estimations consider bootstrapped standard errors. Moreover, non-parametric

[18]Description statistics and definition of our variables are provided in Appendix S1 (Tables S5 and S6).

bootstrap confidence intervals are reported in the tables in Appendix S1 following Lin et al. (2013) that recommend reporting effect sizes, since large sample size leads to small *p*-values.

The OLS results (first column of Table 2) show that the variable of interest (the farm household dummy) has a negative coefficient pointing to FH being worse off than NFH. However, OLS only gives information about the means which can be of limited interest if we suspect the presence of important heterogeneities along the entire distribution. For such reason, we report in Table 2 also the results of the UQR. We find that whilst the lower quartile (25th) and the median (50th) still show FH being worse off than NFH, the upper quartile (75th) instead reveals that richer FH are even richer than NFH. Such results give strength to the above descriptive analysis, but it also allows to control for observed characteristics as done in other studies (Katchova 2008; Marino et al. 2021). The sign and significance of the covariates in Table 2 are in line with the literature: households whose headholder is middle-age, educated, male, in good health and married, not living in rural areas and not having many children are more likely to be richer.

The above results however rely on the assumption that inequality can be conceptualized only at the EU level (Lakner and Milanovic 2015). To relax this assumption, we also explore inequality at the country level as anticipated in the Introduction I. In Table 3, we report, for the sake of brevity, only the coefficient referring to the farm–nonfarm income

Table 2: OLS and UQR estimates at the whole European Union level 2004–2020. All countries (Euro 2015, PPP).

Variables	*OLS*	*Q25*	*Q50*	*Q75*
farm household	−0.2931***	−0.2742***	−0.0620***	0.0359***
	(0.0018)	(0.0018)	(0.0016)	(0.0012)
agehead	0.0198***	0.0079***	0.0225***	0.0291***
	(0.0003)	(0.0004)	(0.0004)	(0.0003)
agehead squared	−0.0001***	−0.0000***	−0.0002***	−0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
educhead	0.1629***	0.1330***	0.1559***	0.1741***
	(0.0005)	(0.0006)	(0.0010)	(0.0011)
malehead	0.1061***	0.0969***	0.1063***	0.0993***
	(0.0016)	(0.0020)	(0.0021)	(0.0015)
healhead	0.1028***	0.1197***	0.1026***	0.0842***
	(0.0007)	(0.0015)	(0.0015)	(0.0008)
marriedhead	0.1134***	0.1386***	0.0647***	0.0534***
	(0.0014)	(0.0019)	(0.0016)	(0.0017)
hh_rural	−0.1034***	−0.1291***	−0.0616***	−0.0461***
	(0.0010)	(0.0021)	(0.0015)	(0.0012)
hh_size	−0.0572***	−0.0484***	−0.0604***	−0.0637***
	(0.0006)	(0.0009)	(0.0010)	(0.0009)
Constant	8.3265***	8.3867***	8.4261***	8.5726***
	(0.0061)	(0.0089)	(0.0143)	(0.0107)
R-squared	0.413	0.347	0.311	0.221

Notes: The dependent variable is the logarithm of real equivalized disposable household income (PPP) in euro. Bootstrap standard errors in parentheses. Observations: 1,627,328; Country and Year dummies included.
Abbreviations: OLS, ordinary least squares; PPP, purchasing power parities; UQR, unconditional quantile regression.
$^{*}p < 0.1$. $^{**}p < 0.05$. $^{***}p < 0.01$.

Table 3: OLS and UQR Estimates. Farm Households Dummy Coefficients 2004–2020. Whole Sample and Selected Countries (Euro 2015, PPP).

Country	*OLS*	*Q25*	*Q50*	*Q75*
European Union	−0.2931***	−0.2742***	−0.0620***	0.0359***
	(0.0018)	(0.0018)	(0.0016)	(0.0012)
Finland	−0.0231**	−0.0266**	0.0047	0.0799***
	(0.0090)	(0.0104)	(0.0091)	(0.0098)
France	−0.1195***	−0.2023***	−0.0761***	0.0280***
	(0.0011)	(0.0026)	(0.0024)	(0.0020)
Italy	−0.1425***	−0.1244***	−0.0501***	0.0024
	(0.0097)	(0.0113)	(0.0091)	(0.0116)
Poland	−0.3042***	−0.2851***	−0.2469***	−0.2053***
	(0.0031)	(0.0048)	(0.0039)	(0.0025)
Romania	−0.5173***	−0.7525***	−0.3396***	−0.1556***
	(0.0081)	(0.0207)	(0.0080)	(0.0067)

Notes: The dependent variable is the logarithm of real equivalized disposable household income (PPP) in euro. Bootstrap standard errors in parentheses. Number of observations for each country reported in Tables S7–S12. Year dummies included (regressions at the European Union level also include country dummies).
Abbreviations: OLS, ordinary least squares; PPP, purchasing power parities; UQR, unconditional quantile regression.
$^{*}p < 0.1$. $^{**}p < 0.05$. $^{***}p < 0.01$.

gap (γ), namely, the coefficient of the farm household dummy of Equations (1) and (2). Results for single countries are contrasted with those at the EU level from Table 2. Complete regression tables are reported in Appendix S1 (Tables S7–S12).

Whilst OLS coefficients in the selected five countries show a significative and negative sign similar to the on at the EU level, the picture emerging from the UQR estimates is particularly revealing of specific countries' heterogeneities. In countries belonging to the Central Eastern countries like Poland and Romania, FH are worse off in all quartiles of the distribution. Conversely, in some countries of the Western and Mediterranean, more specifically Finland, France and Italy, FH in the upper quartile are better off than NFH. The sign of the FH dummy is positive and significative (but not in Italy). Our findings are consistent with those obtained in previous analyses on the EU (de Frahan et al. 2017; Marino et al. 2021; Rocchi et al. 2020) comparing the income gap between FH and NFH and showing that farm household of rich countries tend to be richer than their nonfarm counterpart.

Time Dynamics: The Role of the Great Recession

In the present section, we explore time dynamics of the farm–nonfarm income gap. To gain insight from specific time shocks, we decided to focus on the Great Recession because of its relevance for household wellbeing. To do so, we created a dummy (*afterGR*) taking value 1 in the years after the financial crisis, namely, after 2009. We then include this dummy in the regressions as well as its interaction with the farm household dummy (*afterGR_farm household*) to explore what happened to the gap between farm and nonfarm household before and after the Great Recession. Tables 4 and 5 provide evidence for the EU and the five countries.

Table 4: OLS and UQR Estimates at the Whole European Union Level 2004–2020. All Countries (Euro 2015, PPP).

Variables	*OLS* *Coeff*	*Q25* *Coeff*	*Q50* *Coeff*	*Q75* *Coeff*
farm household	−0.3006***	−0.3249***	−0.0720***	0.0283***
	(0.0014)	(0.0023)	(0.0013)	(0.0013)
afterGR	0.0019	0.0390***	0.0080***	−0.0169***
	(0.0019)	(0.0024)	(0.0017)	(0.0016)
afterGR_farm household	0.0099***	0.0712***	0.0140***	0.0118***
	(0.0029)	(0.0027)	(0.0024)	(0.0021)
agehead	0.0199***	0.0081***	0.0225***	0.0291***
	(0.0003)	(0.0004)	(0.0004)	(0.0003)
agehead squared	−0.0001***	−0.0000***	−0.0002***	−0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
educhead	0.1638***	0.1350***	0.1567***	0.1739***
	(0.0006)	(0.0006)	(0.0010)	(0.0011)
malehead	0.1057***	0.0962***	0.1059***	0.0991***
	(0.0016)	(0.0021)	(0.0022)	(0.0016)
healhead	0.1045***	0.1227***	0.1042***	0.0846***
	(0.0008)	(0.0016)	(0.0015)	(0.0008)
marriedhead	0.1120***	0.1360***	0.0633***	0.0531***
	(0.0014)	(0.0019)	(0.0017)	(0.0017)
hh_rural	−0.1023***	−0.1273***	−0.0604***	−0.0455***
	(0.0010)	(0.0023)	(0.0016)	(0.0013)
hh_size	−0.0573***	−0.0484***	−0.0604***	−0.0638***
	(0.0006)	(0.0009)	(0.0010)	(0.0009)
Constant	8.3261***	8.3577***	8.4535***	8.6157***
	(0.0062)	(0.0095)	(0.0141)	(0.0108)
R-squared	0.411	0.345	0.310	0.220

Notes: The dependent variable is the logarithm of real equivalized disposable household income (PPP) in euro. Bootstrap standard errors in parentheses. Observations: 1,627,328; Country dummies included.
Abbreviations: OLS, ordinary least squares; PPP, purchasing power parities; UQR, unconditional quantile regression.
$^{*}p < 0.1$. $^{**}p < 0.05$. $^{***}p < 0.01$.

Table 4 shows that our main result of interest is robust in spite of the different model's specification: the OLS coefficient of the farm household dummy is still negative as well as the UQR coefficients in the lower quartiles, whilst the UQR coefficient in the upper quantiles still shows that that FH are richer than NFH. However, by looking at the coefficient of the interaction between FH and the Great Recession, Table 4 shows that the farm–nonfarm gap has narrowed after the Great Recession in the lower quartiles (25th and 50th) whilst the income advantage has further increased in the upper quantile (75th). According to this evidence, FH incomes seem less affected by the negative consequences of the 2008 macroeconomic downturn than NFH. This is not surprising given the usual view of agriculture as counter-cyclical industry, mainly producing to satisfy an income inelastic component of final demand (food). Our findings are in line with evidence about the higher resilience of farming sector during the Great Recession (Giannakis and Bruggerman 2020; Petrick and Kloss 2013).

We now move to analyse the income dynamics within the five countries: Table 5 shows again that our previous results are robust. But the picture is substantially different

Table 5: OLS and UQR Estimates Farm Households Dummy and Interaction with GR Dummy Coefficients 2004–2020. Whole Sample and Selected Countries (Euro 2015, PPP).

Country	*Variables*	*OLS*	*Q25*	*Q50*	*Q75*
European Union	*farm household*	−0.3006***	−0.3249***	−0.0720***	0.0283***
		(0.0014)	(0.0023)	(0.0013)	(0.0013)
	afterGR_farm household	0.0099***	0.0712***	0.0140***	0.0118***
		(0.0029)	(0.0027)	(0.0024)	(0.0021)
Finland	*farm household*	−0.0265*	−0.0156	0.0058	0.0926***
		(0.0140)	(0.0140)	(0.0114)	(0.0107)
	afterGR_farm household	0.0024	−0.0203	−0.0057	−0.0254
		(0.0175)	(0.0190)	(0.0163)	(0.0174)
France	*farm household*	−0.1243***	−0.2153***	−0.0723***	0.0331***
		(0.0021)	(0.0031)	(0.0030)	(0.0022)
	afterGR_farm household	0.0098***	0.0223***	−0.0050*	−0.0044*
		(0.0018)	(0.0028)	(0.0028)	(0.0024)
Italy	*farm household*	−0.0992***	−0.1003***	−0.0305***	0.0009
		(0.0100)	(0.0187)	(0.0094)	(0.0052)
	afterGR_farm household	−0.0718***	−0.0405*	−0.0347**	0.0024
		(0.0172)	(0.0221)	(0.0158)	(0.0189)
Poland	*farm household*	−0.3440***	−0.3822***	−0.2220***	−0.1186***
		(0.0040)	(0.0098)	(0.0040)	(0.0035)
	afterGR_farm household	0.0637***	0.1482***	−0.0312***	−0.1230***
		(0.0046)	(0.0101)	(0.0049)	(0.0052)
Romania	*farm household*	−0.4464***	−0.7406***	−0.2773***	−0.0581***
		(0.0096)	(0.0203)	(0.0075)	(0.0087)
	afterGR_farm household	−0.1095***	−0.0302	−0.0962***	−0.1458***
		(0.0125)	(0.0211)	(0.0098)	(0.0105)

Notes: The dependent variable is the logarithm of real equivalized disposable household income (PPP) in euro. Bootstrap standard errors in parentheses. Number of observations for each country reported in Tables S13–S18 in Appendix S1. Regressions at the EU level include country dummies.
Abbreviations: GR, Great Recession; OLS, ordinary least squares; PPP, purchasing power parities; UQR, unconditional quantile regression.
$^{*}p < 0.1$. $^{**}p < 0.05$. $^{***}p < 0.01$.

amongst countries. For instance, whilst in Finland the financial crisis seems to have had no effect on the gap, in France, it has instead narrowed the gap in the lower quartile (25th). Italian FH who were already worse off than NFH, especially those at the 50th quartile, were further hit by the Great Recession. However, FH in the upper quartile slightly improve their position relative to their NFH. In Poland, FH at the 25th quartile have seen the gap with their nonfarm counterpart reduced after the Great Recession, but the opposite happened at the 50th and 75th quartiles where FH experienced a worsening of their disadvantage with respect to NFH. Finally, Romanian FH at the 50th and 75th have experienced the same trend of the Poland FH.

These differences within the countries cannot be easily explained because of the many factors that could have played a role in it. Although it is not within the scope of this article, it is worth mentioning some factors that might explain the FH-NFH heterogeneity between countries and within quartiles after the Great Recession, for example, the different timing of the entry in the EU, difference in credit availability and interest rates that create heterogeneous exposure to the financial crisis, the different structure of the farm sector with Romania and Poland being more commodity oriented and the significant variation

in specialization between subnational regions, which drives geographic heterogeneity in economic outcomes such as unemployment, real wages and productivity (Milio et al. 2014; Peritz et al. 2022).

6. Discussion and Policy Considerations

The present work assesses the farm–nonfarm income gap in the EU. Several works have shown that the income gap between agricultural and non-agricultural households has gradually decreased in the last decades (de Frahan et al. 2017; El-Osta et al. 2007; Katchova 2008; Mishra et al. 2002). Recent analyses confirm that, once accounting for differences in both observable and unobservable factors affecting the income level, the gap has vanished also in the EU (Marino et al. 2021; Rocchi et al. 2020). However, such results fall short in recognizing the complexity of the comparison amongst the two groups. This study adds to previous analyses on the farm income gap in Europe considering three relevant dimensions of the problem.

The first dimension refers to the between-country inequality and the possible convergence in the EU. The EU global income distribution shows an unbalanced geographical pattern: FH living in Central Eastern countries belong, for the largest part, to the bottom of the distribution and are poorer than NFH along all income distribution. In other words, the geographical pattern of income distribution reveals that the farm income problem is likely to be concentrated in specific regions and that FH living in Central Eastern countries experience a greater disadvantage compared with those living in the rest of Europe.

The second dimension concerns the extent of inequality existing between FH and NFH along the income distribution. On average, FH still show an income gap when compared with the NFH. But the results of the quantile regression also show that, whilst FH in the lowest quantiles are likely to be worse off than their NFH counterpart, the opposite happens at the highest quantiles of the income distribution: rich FH are better off than rich NFH. In other words, in the upper part of the income distribution, the farm income problem not only vanishes but also is even reverted in favour of FH, at least in the Western countries of the EU.

Third, we provide evidence of inequality in the farm sector. Using growth incidences curves, we show the unequal income growth for farm families belonging to different income groups: richer FH have captured most of the total growth of the farm sector. We also show that FH in the top part of the EU global distribution have done much better than NFH. Such result is line with the evidence provided by previous studies (de Frahan et al. 2017; Severini and Tantari 2013), showing that the FH sector has higher inequality than the NFH one.

Our results seem to suggest some policy implications. The CAP income support, under the current configuration, might not be able to bridge the income gap between FH and NFH despite the relevant share of the EU expenditure used to finance income support policies such as direct payments. Especially poorer FH still show a disadvantage in term of economic welfare with respect to NFH. Therefore, attentions should be given to assess to what extent the CAP support is provided mainly to affluent FH and whether this is justified from a normative point of view. The results of our analysis show that the farm income problem does not apply anymore to the upper part of the income distribution, suggesting some room for manoeuvre to reform the direct payment policy along two main directions.

First, the direct income support should be more specifically directed towards low-income FH. Second, resources provided to richest FH should be used to overcome the structural reasons underlying the observed income gaps in the lower part of the distribution. Moreover, a revised support to the income of FH should carefully consider also the observed between-country inequality. A better targeted income support, whilst reducing the income gaps between farmers from different countries, should at the same time avoid fostering EU global inequality.

The policy implications of our results seem to be in line with the literature showing that the problem of the poor targeting of the farm income support under the CAP is likely to depend on structural characteristics of the sector (OECD 2003; Rocchi 2009; Severini and Tantari 2015). The effectiveness of a sectorial policy like the CAP support (noticeably direct payments) in achieving a social objective, namely, enhancing poorer farmers' economic welfare, should be questioned if such objective could be better achieved by general fiscal and social policies. But, a homogeneous EU-wide measure for income support under the CAP, to be effective, should account for other welfare policies carried out by each EU Member States and for the co-ordination problems that might arise.

The study is affected by two limitations that it is worth mentioning here to correctly interpret our results and to draft the research agenda for future analyses. First, data do not allow to explicitly assess the role of CAP income support within FH income, because of the aggregate nature of the reported income. EU-SILC data in fact do not allow to perform a counterfactual analysis of the impact of CAP support on farm–nonfarm income gap. Investigating the role of CAP payments as a component of the economic welfare of European farmers could be possible if the EU-SILC database would be extended including this piece of information or by matching existing data from different databases.

The last limitation refers to the methodology used in the analysis. We provide a descriptive analysis that we believe is extremely valuable given its novelty. To our knowledge, this is the only study assessing the presence and the extent of the farm income problem along the distribution. However, we are not able to provide estimates clean from potential problems of unobserved individual heterogeneity. Despite quantile regression could contribute to partially reduce the latter, most of our choices are determined by data availability, as the total number of FH within the EU-SILC sample is small, and even more at the level of single quantiles. This prevented us to exploit the panel structure of the sample, using fixed effects to reduce concerns about unobservable heterogeneity or to define the FH sector in a narrower way. Moreover, the EU-SILC survey is not designed to explore the FH sector and the information provided does not include variables suitable to be used as instruments for a causal interpretation of our results. For all these reasons, the latter, whilst in line with those obtained in previous analyses on the same topic, should be considered only preliminary evidence to be confirmed by further research.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from EU-SILC. Restrictions apply to the availability of these data, which were used under license for this study. Data are available at https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions with the permission of EUROSTAT.

We will provide codes to reproduce tables and figures of the article.

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REFERENCES

Agyire-Tettey, F., Ackah, C.G. and Asuman, D. (2018) 'An Unconditional Quantile Regression based Decomposition of Spatial Welfare Inequalities in Ghana'. *The Journal of Development Studies*, Vol. 54, No. 3, pp. 537–556.

Atkinson, A.B. and Brandolini, A. (2010) 'On Analyzing the World Distribution of Income'. *The World Bank Economic Review*, Vol. 24, No. 1, pp. 1–37.

Becerril, J. and Abdulai, A. (2010) 'The Impact of Improved Maize Varieties on Poverty in Mexico: A Propensity Score-Matching Approach'. *World Development*, Vol. 38, No. 7, pp. 1024–1035.

Benczúr, P., Cseres-Gergely, Z. and Harasztosi, P. (2017) EU-Wide Income Inequality in the Era of the Great Recession (No. 2017/14). JRC Working Papers in Economics and Finance.

Bui, T.P. and Imai, K.S. (2019) 'Determinants of Rural-Urban Inequality in Vietnam: Detailed Decomposition Analyses based on Unconditional Quantile Regressions'. *The Journal of Development Studies*, Vol. 55, No. 12, pp. 2610–2625.

Chang, H.H. (2012) 'Consumption Inequality between Farm and Nonfarm Households in Taiwan: A Decomposition Analysis of Differences in Distribution'. *Agricultural Economics*, Vol. 43, No. 5, pp. 487–498.

Christofides, L.N., Polycarpou, A. and VrachimisK.. (2013) 'Gender Wage Gaps, 'Sticky Floors' and 'Glass Ceilings' in Europe'. *Labour Economics*, Vol. 21, pp. 86–102.

Cunha, A. and Swinbank, A. (2009) 'Exploring the Determinants of CAP Reform: A Delphi Survey of Key Decision-Makers'. *JCMS: Journal of Common Market Studies*, Vol. 47, No. 2, pp. 235–261.

De Janvry, A. and Sadoulet, E. (2001) 'Income Strategies among Rural Households in Mexico: The Role of Off-Farm Activities'. *World Development*, Vol. 29, No. 3, pp. 467–480.

Ellison, B.D., Lusk, J.L. and Briggeman, B.C. (2010) 'Taxpayer Beliefs about Farm Income and Preferences for Farm Policy'. *Applied Economic Perspectives and Policy*, Vol. 32, pp. 338–354.

El-Osta, H.S., Mishra, A.K. and Morehart, M.J. (2007) 'Determinants of Economic Well-Being among US Farm Operator Households'. *Agricultural Economics*, Vol. 36, No. 3, pp. 291–304.

Eurostat. (2003) Income of Agricultural Households Sector – 2001 Report. Luxembourg City: Office for Official Publications of the European Communities, European Commission (2020). EU Agriculture in numbers performance on the nine specific objectives of the CAP. Bruxelles, May 2020. Available at: https://agriculture.ec.europa.eu/cap-my-country/performance-agricultural-policy/agriculture-country/cap-specific-objectives-country_en, Accessed on 16 December 2022

Finger, R. and El Benni, N. (2021) 'Farm Income in European Agriculture: New Perspectives on Measurement and Implications for Policy Evaluation'. *European Review of Agricultural Economics*, Vol. 48, No. 2, pp. 253–265.

Firpo, S., Fortin, N.M. and Lemieux, T. (2009) 'Unconditional Quantile Regressions'. *Econometrica*, Vol. 77, pp. 953–973.

Fortin, N., Lemieux, T. and Firpo, S. (2011) 'Decomposition Methods in Economics'. *Handbook of Labor Economics*, Vol. 4, pp. 1–102.

de Frahan, B.H., Dong, J. and De Blander, R. (2017) 'Farm Household Incomes in OECD Member Countries over the Last 30 Years of Public Support'. In *Public Policy in Agriculture* (Routledge), pp. 148–175.
Gardner, B.L. (1992) 'Changing Economic Perspectives on the Farm Problem'. *Journal of Economic Literature*, Vol. 30, No. 1, pp. 62–101.
Giannakis, E. and Bruggerman, A. (2020) 'Regional Disparities in Economic Resilience in the European Union across the Urban–Rural Divide'. *Regional Studies*, Vol. 54, No. 9, pp. 1200–1213.
Henke, R., Benos, T., De Filippis, F., Giua, M., Pierangeli, F. and Pupo D'Andrea, M.R. (2018) 'The New Common Agricultural Policy: How Do Member States Respond to Flexibility?' *JCMS: Journal of Common Market Studies*, Vol. 56, No. 2, pp. 403–419.
Hill, B. (2012) *Farm Incomes, Wealth and Agricultural Policy Filling the CAP's Core Information Gap* (Cabi).
Hill, B. (2019) 'EU Policies and Rural Employment'. In *Rural Policies and Employment: Transatlantic Experiences*, pp. 25–43.
Hospido, L. and Moral-Benito, E. (2016) 'The Public Sector Wage Premium in Spain: Evidence from Longitudinal Administrative Data'. *Labour Economics*, Vol. 42, pp. 101–122.
Katchova, A.L. (2008) 'A comparison of the Economic Well-Being of Farm and Nonfarm Households'. *American Journal of Agricultural Economics*, Vol. 90, No. 3, pp. 733–747.
Koenker, R. and Bassett, G., Jr. (1978) 'Regression Quantiles'. *Econometrica: Journal of the Econometric Society*, pp. 33–50.
Lakner, C. and Milanovic, B. (2013) Global Income Distribution: From the Fall of the Berlin Wall to the Great Recession. World Bank Policy Research Working Paper No. 6719.
Lin, M., Lucas, H.C., Jr. and Shmueli, G. (2013) 'Research Commentary—Too Big to Fail: Large Samples and the p-Value Problem'. *Information Systems Research*, Vol. 24, No. 4, pp. 906–917.
Mack, A. and Lange, B. (2015) Harmonization of Income Data in EU-SILC. GESIS Papers, 18/2015.
Marino, M., Rocchi, B. and Severini, S. (2021) 'Conditional Income Disparity between Farm and Nonfarm Households in the European Union: A Longitudinal Analysis'. *Journal of Agricultural Economics*, early view. https://doi.org/10.1111/1477-9552.12420
Mendola, M. (2007) 'Agricultural Technology Adoption and Poverty Reduction: A Propensity-Score Matching Analysis for Rural Bangladesh'. *Food Policy*, Vol. 32, No. 3, pp. 372–393.
Milio, S., Durazzi, N., Garnizova, E., Janowski, P., Olechnicka, A. and Wojtowicz, D. (2014) 'Impact of the Economic Crisis on Social, Economic and Territorial Cohesion of the European Union'. In *Regional Development* (Vol. Study Vol. 2) (Brussels, Belgium: European Parliament).
Mishra, A.K., El-Osta, H.S., Morehart, M.J., Johnson, J.D. and Hopkins, J.W. (2002) *Income, Wealth, and the Economic Well-Being of Farm Households* (No. 1473-2016-120697) (USDA).
Mishra, A. and Moss, C.B. (2008) 'Measurement of inequality by components of farm household consumption expenditures'. *Applied Economics*, Vol. 40, No. 10, pp. 1241–1252.
OECD – Organisation for Economic Co-operation and Development (2003) *Farm Household Income: Issues and Policy Responses* (Paris: OECD Publications).
Peritz, L., Weldzius, R., Rogowski, R. and Flaherty, T. (2022) 'Enduring the Great Recession: Economic Integration in the European Union'. *The Review of International Organizations*, Vol. 17, No. 1, pp. 175–203.
Petrick, M. and Kloss, M. (2013) 'Exposure of EU Farmers to the Financial Crisis'. *Choices*, 2nd Quarter 2013, Vol. 28, No. 2 https://www.choicesmagazine.org/UserFiles/file/cmsarticle_297.pdf

Rocchi, B. (2009) 'The CAP Reform between Equity and Targeting: A Structural Policy Analysis for Italy'. *European Review of Agricultural Economics*, Vol. 36, No. 2, pp. 175–201.
Rocchi, B., Marino, M. and Severini, S. (2020) 'Does an Income Gap between Farm and Nonfarm Households Still Exist? The Case of the European Union'. *Applied Economic Perspectives and Policy*, early view. https://doi.org/10.1002/aepp.13116
Severini, S. and Tantari, A. (2013) 'The Effect of the EU Farm Payments Policy and its Recent Reform on Farm Income Inequality'. *Journal of Policy Modeling*, Vol. 35, No. 2, pp. 212–227.
Severini, S. and Tantari, A. (2015) 'Which Factors Affect the Distribution of Direct Payments among Farmers in the EU Member States?' *Empirica (Journal of European Economics)*, Vol. 42, No. 1, pp. 25–48.
Thu Le, H. and Booth, A.L. (2014) 'Inequality in Vietnamese Urban–Rural Living Standards, 1993–2006'. *Review of Income and Wealth*, Vol. 60, No. 4, pp. 862–886.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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