The Economic Well-being of Farm Households in Germany

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Abstract

In this study, we explore the economic well-being of farm and nonfarm households in Germany. We applied an indicator that combines households' disposable income and net wealth consisting of financial assets and real estate to data from the Income and Consumption Survey (EVS) 2018. We found that the income available to farm households can support a standard of living equal to that of nonfarm (employed) households. Wealth affects households' economic well-being in both directions: farm households and workers/employees would be better off if their household income would assess their economic status. The opposite trend occurs for unem-ployed and pensioners/retirees. However, the analysis of farmers' well-being requires income data of multiple years regarding the income volatility of self-employment in agriculture. Consid-ering wealth to assess farm households' economic well-being means paying attention to their farm assets because they are highly intertwined with the household. The EVS misses farm characteristics and a reliable number of farmers' observations to assess their economic well-being over time to derive agricultural policy implications. Hence, there is currently a lack of statistical data and evidence to achieve the Common Agricultural Policy (CAP) 's second objective to pro-vide income support in a targeted manner.

Keywords

economic well-being; farm households; disposable income; wealth; the fair standard of living

1 Introduction

In 2018, the European Commission proposed a set of amendments to the Common Agricultural Policy (CAP). It justified basic income support for farmers beyond 2020, arguing that "farm income is still significantly below the average income of the economy" (EC, 2018a, 2018b). Around 60% of the CAP budget (41.74 bill. EUR of 58.82 bill. EUR) was spent on income support for farmers in 2018 (EC, 2019). The claim is that the average agricultural entrepreneurial income per family work unit is lower than average gross wages and salaries in the total economy. However, this is controversial and poorly documented (ECA, 2004, 2016; OECD, 2003, 2004). The Commission only takes farm income into account and overlooks the off-farm incomes that farm households often earn. When considering the need for income support, the Commission also lacks considering households' wealth because it provides a potential command over goods and services (EUROPEAN PARLIAMENT, 2015). This incomplete comparison does not appropriately reflect the intent of the CAP's second objective, "to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture" (ART. 39b; EU, 2009).

Given the importance of wealth to farmers' standard of living, the purpose of this paper is to examine the economic well-being of farm households in Germany. To gain insights into whether farm households are different from other households, we use a nationwide sample of households based on the Income and Consumption Survey (EVS). We combine household income and wealth to an economic well-being indicator to better picture a household's potential consumption-ability. This paper addresses the questions: (1) How does wealth affect a household's economic well-being, especially farm households? (2) Is the data on income and wealth provided by the EVS sufficient to evaluate farm households' economic well-being to derive agricultural policy measures?

Outside the EU, previous studies have focused on examining factors that affect farm households' economic well-being (MISHRA et al., 2002; JONES et al., 2006; MISHRA and EL-OSTA, 2009; ZHANG et al., 2021). In doing so, farm household wealth, expenditures of the households, and the total household income variability regarding their off-farm and on-farm income have been taken into account (MISHRA et al., 2002). Inside the EU, very few studies have recently examined the economic well-being of farm house-

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holds. Most of the literature focuses on farm income because of data availability constraints and the analyses' agricultural policy orientation (SEVERINI et al., 2016; SALVIONI et al., 2020; FINGER and EL BENNI, 2021). In the early 2000s, it has already been emphasized that households' wealth should not be ignored to assess agricultural policy measures' efficacy (THIELE, 2000). Since then, little attention has been given to this issue and the availability of household data. This is surprising, particularly given the CAP's current realignment and the increasing criticism on the basic income support system for the EU farmers (e.g., HEYL et al., 2020).

We aim to contribute to an improved understanding of the current economic well-being of farm households in Germany by providing empirical evidence for the importance of farm households' wealth. Additionally, we draw attention to the available data to analyze the standard of living of farm households considering CAP's second objective.

The remainder of this paper is organized as follows: in Section 2, we provide an introductory overview of the contextual background to farmers' economic well-being. In Section 3, we introduce the database and the methods of statistical analysis. In Section 4, we present and discuss the empirical results to the effect of wealth on economic well-being. In Section 5, conclusions are drawn from the analysis.

2 Background Information

2.1 Contextual Background

The standard of living mentioned in the CAP's second objective is a material concept related to farmers' economic status and economic well-being, determining their consumption possibilities. In recent years, a consensus emerged to consider households as the most suitable observation unit for evaluating living standards. Households have a great command over the consumption of goods and services, accumulate wealth, and can adopt diversification strategies to cope with increasing instability and risks in the sector (MISHRA et al., 2002; HILL, 2012; VROLIJK and POPPE, 2019).

A farm operator's income obtained from farming is not a reliable guide to his or her household income level because farm households are recipients of substantial amounts of off-farm income (EUROPEAN PARLIAMENT, 2015; HILL and BRADLEY, 2015; LASCHEWSKI et al., 2019). Evidence has shown that farming structures are becoming increasingly diversified, as parts of the farm business are legally separated from the original farm (FORSTNER and ZAVYALOVA, 2019). Official statistics providing household data lack comprehensive on-farm and off-farm income data. Consequently, the data quality is increasingly criticized on which policy measures for income support are based (ECA, 2016).

Furthermore, farmers' economic status is not simply dependent on their annual income but also reflects their wealth. It has been pointed out that the CAP aiming to ensure a fair standard of living for farmers should not ignore the wealth position of the intended recipients of income support (HILL, 2012; THIELE, 1998). Yet, the net wealth of farm households is firmly set aside by policy-makers when deciding the shape of agricultural policy. Information on wealth and income is essential to evaluate agricultural policy measures' effectiveness and efficacy to achieve the CAP's income objectives (EUROPEAN PARLIAMENT, 2015).

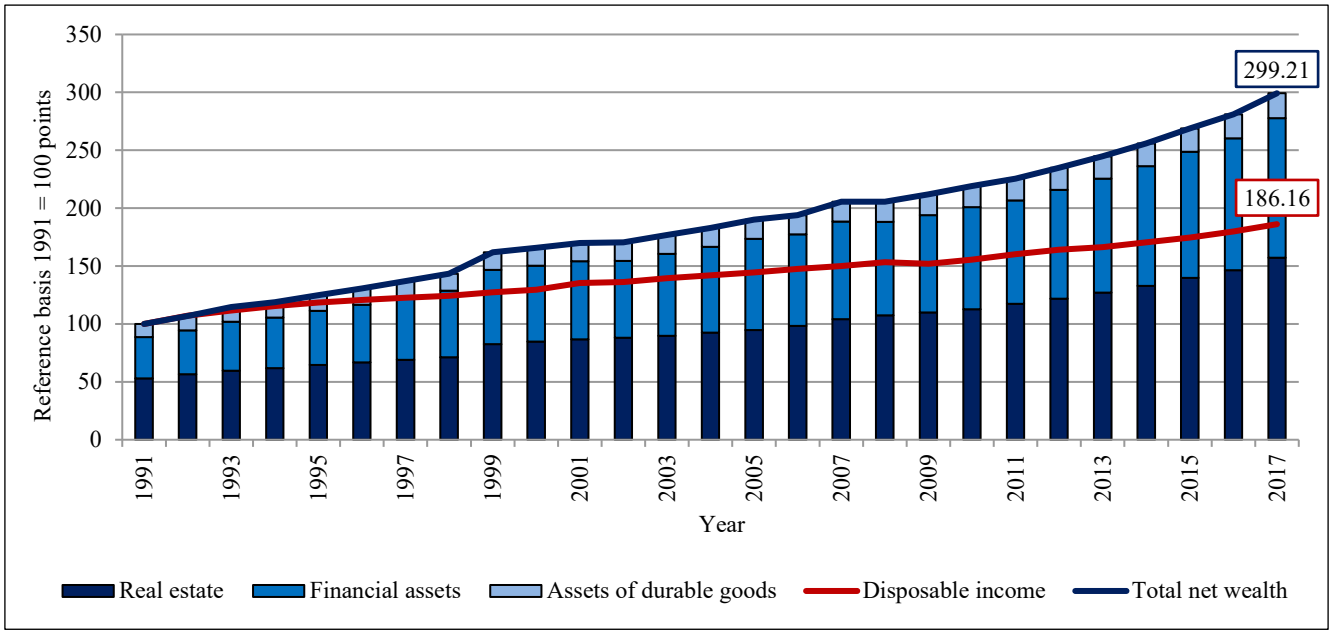
2.2 Wealth and its Components

Data on household wealth can help understand how certain types of assets or liabilities are distributed within society and how different types of households respond to financial shocks and other economic developments (BALESTRA and TONKIN, 2018). Since the early 1990s, the average households' net wealth of German households has grown more rapidly than the average disposable income (Figure 1).

Between 1991 and 2017, total disposable household income has grown by 3.31% p.a., from 1,004.47 bill. EUR to 1,869.92 bill. EUR. In that time, the total net wealth has increased even more by 7.66% p.a., from 4,562.2 bill. EUR to 13,650.5 bill. EUR. Financial assets and real estate account for the most significant household wealth shares, whereas the value of durable goods has remained comparatively stable (DESTATIS, 2018a). This development indicates the increasing importance of wealth regarding the economic status of German households.

When defining households' total net wealth, there is an ongoing discussion about pensions and their functioning as assets. Pensions are the discounted expected present value of future entitlements from the public, occupational, and private pension schemes. It has been argued that pension wealth serves as a substitute for other forms of private savings (BÖNKE et al., 2017). However, pensions function differently than different types of asset values such as financial assets, real estate, or assets of durable goods: pensions

Figure 1. Development of disposable income and net wealth of households in Germany between 1991 and 2017. Numbers are inflation-adjusted.



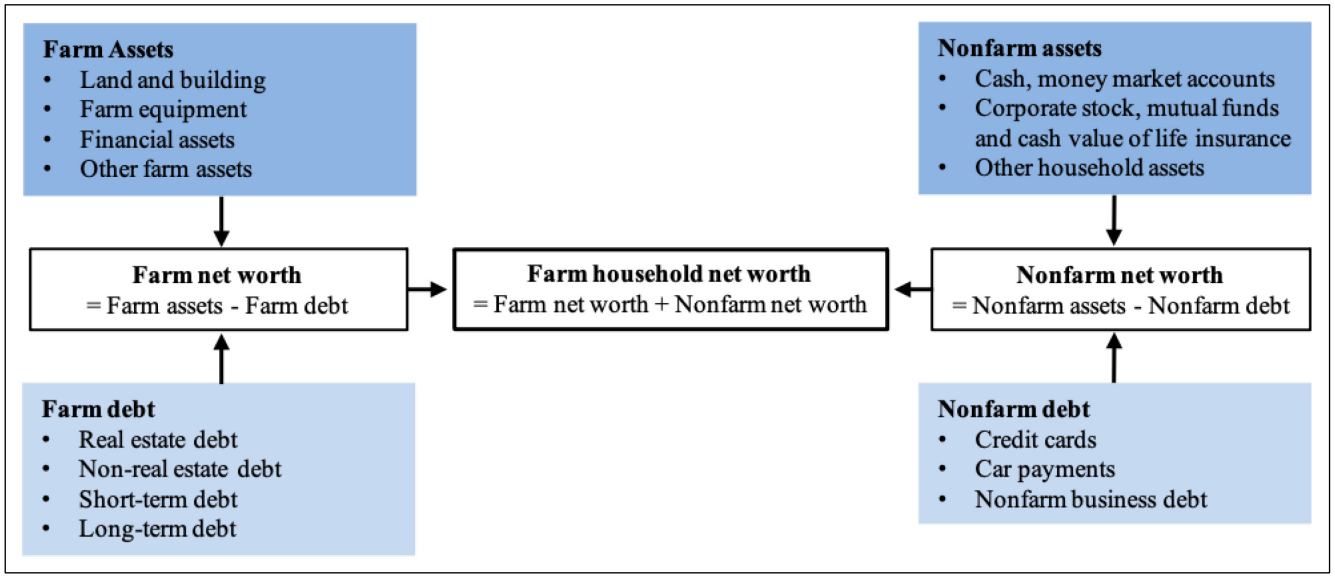
Source: DESTATIS (2018a), own calculation

1do not provide utility or security against shocks in the present; they do not generate income; and they do not fulfill any inheritance function (GRABKA and WESTERMEIER, 2014). Most German farmers do not participate in public pension schemes. Instead, they mainly accumulate their retirement savings based on (LAW OF FARMERS' RETIREMENT PROVISION (1994) to cover their post-retirement consumption needs. That means that farmers hold higher amounts of financial assets and real estate and fewer precautionary savings from public pension insurance than members of other professions (THIELE, 1998). Referring to GRABKA and WESTERMEIER (2014), we do not include pension wealth in the following comparative analysis of farm and nonfarm households' economic well-being.

Farm households' wealth has a special position as it is highly intertwined with the farm business (Figure 2) because production and consumption occur at a central place.

The household wealth of farmers combines farm assets (minus farm debt) and nonfarm assets (minus nonfarm debt). Farm households derive their wealth

Figure 2. Farm households' net worth



Source: adapted from MISHRA et al. (2002)

from a variety of sources. It ranges from physical holdings of both the business and household to various types of financial assets, all differing in level of liquidity, capital certainty and visibility. It may be acquired through savings, inheritance, or household asset appreciation (MISHRA et al., 2002). Within the farmers' group, wealth is more unequally distributed than are incomes, and farmers who own land are likely to have a markedly different economic status from those who are tenants. Wealth is significant to strategic decisions, such as staying in or exit from farming (EUROPEAN PARLIAMENT, 2015) or diversifying economic activities on or off the farm (WELTIN et al., 2017; MISHRA et al., 2002). Farms have grown increasingly in size and specialization (EUROSTAT, 2018a), affecting farm financial management and the farm household. Gross capital formation on farm assets depends on the share and degree of specialization and farm size. In this regard, farm characteristics are crucial for analyzing farm households' wealth and evaluating their economic well-being.

2.3 Literature Review on Farms' Economic Status

On-farm diversification is becoming a key strategy for an increasing number of farms (SALVIONI et al., 2020; MISHRA et al., 2004). Considering off-farm activities, approximately half or more of all households that operate farms in the EU also have some other gainful activity (EUROSTAT, 2018a). Depending on the agricultural business and household characteristics, the extension of on-farm and off-farm business activity represents a vital adaptation strategy to cope with the variability in climate, farm income risk, market pressures, shortage of hired labor, and changing political framework conditions (SALVIONI et al., 2020; WELTIN et al., 2017; MERANER et al., 2015). Those risk management tools stabilize the households' income in developed and developing countries (D'SOUZA et al., 2020; SENADZA et al., 2018; PIENIADZ et al., 2009; KHANAL and MISHRA, 2015).

Since farming today is only one of several economic endeavors of farm households, household income indicates an individual's welfare (HILL, 2018). Looking at the income distribution of households over the last two decades, in many OECD member countries, including EU countries, the average income of farm households did not differ significantly from those of nonfarm households (HILL, 2012; DE FRAHAN et al., 2017; ROCCHI et al., 2020; MARINO et al., 2021). Additionally, evidence has been provided that farm income has played an increasingly minor role in determining farm households' well-being (THIELE, 1998; MISHRA et al., 2002). THIELE (1998) found that considering wealth improves farm households' economic status most significantly compared to other households with different professions (THIELE, 1998). Finally, farm households' net worth acts as a cushion for farm income risk, much as off-farm income does for households operating smaller farms (JONES et al., 2009). Wealth affects farm households' economic well-being by enabling farm households to secure credit, facilitate an intergenerational transfer, and smooth consumption expenditures in times of income shortfall (MISHRA and EL-OSTA, 2009). Estimates of the economic status that combine current income with net worth have not so far taken a significant part in the EU agricultural statistics.

3 Data and Method

3.1 The Income and Consumption Survey

This study uses data from the EVS, an official statistic on households' living conditions in Germany. The EVS provides statistical information on the provision of consumer goods, income, wealth and debts, and consumption expenditures of households[1] collected every five years (FDZ, 2018). Financial assets and real estate cover wealth. Tangible assets are provided only by the endowment of durable goods. Compared to other statistics on a household-level (cf. Socio-Economic Panel (SOEP), European Union Statistics on Income and Living Conditions (EU-SILC), Microcensus), the advantage of the EVS is that farm households are defined as an individual group. Due to the disaggregation level, we can explicitly assign income and wealth to farmers that allow us a comparative analysis of farm households' economic well-being with other groups. The sample consists of households with a monthly net household income of less than 18,000 EUR (FDZ, 2018). The absence of households with an exceptionally high income affects wealth distribution analysis since a vast proportion of wealth is assumed to be owned by households with a high income (PIKETTY, 2015; GRABKA and HALBMEIER, 2019). One limitation of the EVS is that it does not reflect the actual concentration of households' wealth

[1] A household is defined as a single person or a group of relatives or personally related (including non-family) persons who operate household earnings and expenditure jointly.

in Germany (FEDERAL STATISTICAL OFFICE BERLIN-BRANDENBURG, 2019). Compared to other official statistics (e.g., The PHF survey of the German Federal Bank, National Accounts), wealth and income from self-employment are underestimated using the EVS. This problem is related to determining revenues from self-employment, e.g., if business and household assets values or operating costs and private expenses cannot be separated by households (FDZ, 2018).

We use an 80%-subsample[2] of the EVS 2018 with a total sample of 42,226[3] households. As a quota sample, the EVS claims representativeness about three selected quota characteristics: household type, the profession of the main income recipient and net household income. A quota-controlled sampling procedure based on the Microcensus 2016 is set in place, i.e., these quota characteristics are specified for each federal state of Germany. The results are weighted (generalized regression estimation) using the Microcensus (FEDERAL STATISTICAL OFFICE BERLIN-BRANDENBURG, 2019). It is worth noting that respondents can decide for themselves whether or not to participate in the EVS. This procedure may lead to selection bias. Two aspects justify using a single year for the following analysis: first, wealth is not considered a quota-defined characteristic in the EVS. Second, farm households are relatively underrepresented in the EVS. Considering that respondents participate voluntarily, using multiple-year data to compare farm households' income over time may produce biased estimates of the targeted population. The small sample size does not represent the agricultural community's heterogeneity.

3.2 The Economic Well-being Indicator

We now proceed to the economic well-being approach of households developed by WEISBROD and HANSEN (1968). The approach combines both the flow concept of income and the stock wealth to reflect the potential spending power of a household (Equation 3.1).

$$Y_t^* = Y_t^{VE} + V_t^{VE} \times \frac{i_v}{1 - (1 + i_V)^{-n}} \quad (3.1)$$

Y_t^* = Economic well-being at the time of t
Y_t^{VE} = Disposable income per actual consumable unit at the time of t
V_t^{VE} = Net worth (financial assets and real estate) per actual consumable units at the time of t
i_v = Interest rate for the financial assets and the real estate
n = Life expectancy at the time of t

According to Equation 3.1, the economic well-being (Y_t^*) at a certain point in time t is composed of the addition of the current disposable income (Y_t^{VE}) and an income equivalent of the present value of net worth (V_t^{VE}) evaluated at time t. The disposable income (Y_t^{VE}) is the gross income from gainful employment, income from assets and public and non-public transfer payments, income from subleasing or sale of goods, and refunds minus liabilities, such as compulsory contributions and taxes. Net worth is calculated using financial assets and real estate. Financial assets are calculated from several entries for savings, building loan contracts, and insurances minus obligations as a borrower, such as consumer credits (FDZ, 2018). The surveyed household member estimates real estate as a market value, which could have been achieved on January 1st of the respective year (DESTATIS, 2018b). The basic value of properties is inquired to check the market value's plausibility and estimate the actual achievable purchasing price (KOTT and BEHRENDS, 2009). V_t^{VE} is then multiplied by a distribution factor ($\frac{i_v}{1 - (1 + i_V)^{-n}}$) to split the net worth evenly over the remaining lifetime of a household[4] (DESTATIS, 2020). The underlying assumption is that a household's net worth, including the return of interest (DESTATIS, 2019), is depleted at the end of a person's life. At this point, the limitation of the approach emerges to the extent that it neglects the possibilities of inheritances and donations, which, if they exist, make a considerable contribution to wealth formation (THIELE, 1998; KOHLI et al., 2006). Consequently, this approach does not reflect the actual but rather a possible spending power of a household (WEISBROD and HANSEN, 1968; THIELE, 1998).

Finally, we use the OECD equivalence scale to consider that each household type in the population is assigned a value in proportion to its needs. We adjust the households' income and the income-equivalent of the net worth to the household's size and its members'

[2] Due to the data privacy of the participants given by the Federal Statistical Office.

[3] The number represents a quota sample of 0.2% based of the Microcensus. That is the number of the total sample without applying a multidimensional outlier detection method.

[4] We assume a life expectancy of 80 years of each household.

Table 1. Descriptive statistics of household characteristics of each household type in 2018

Household characteristics/ household types	Sample size	Average household size (persons/ household)	Average age (in years)	Highest level of education (modus)	Employment (persons/ household)
Farmers	68	3.33	52.42[b]	Apprenticeship	1.96
Self-employed	1,172	2.38	50.97[b]	College	1.56[c]
Civil servants	3,632	2.45[a]	40.71	College	1.61[c]
Workers/Employees	20,889	2.24	44.28	Apprenticeship	1.49
Unemployed persons	1,211	1.62	48.78	Apprenticeship	0.05[c]
Pensioners/Retirees	13,094	1.54	72.42	Apprenticeship	0.05[c]
Total	40,066	2.01	53.63[b]	Apprenticeship	1.50[d]

[a] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the difference of the average household size of self-employed (standard error (se) = 0.0372; confidence interval (ci) = 2.4595-2.2925) and civil servants (se = 0.0215; ci = 2.4986 -2.4024) is not significant. The differences of the average household size of all other household types are statistically significant.

[b] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the average age of farm households (se = 1.2347; ci = 49.5859-55.2479) and self-employed (se = 0.3130; ci = 50.2639-51.6688) and the total sample (se = 0.0838; ci = 53.4394-53.8150) are not significant.

[c] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the employment of self-employed (se = 0.0174; ci = 1.5166-1.5945) and civil servants (se = 0.0101; ci = 1.5834-1.6285) is not significant. The difference between unemployed persons (se = 0.0067; ci = 0.0368-0.0680) and pensioners/retirees (se = 0.0023; ci = 0.0491-0.0594) is not significant.

[d] Only employed household types such as farmers, self-employed, civil servants, and workers/employees are included in the total number.

Source: FDZ (2018), own calculation

age. The first person of the household is weighted by 1 and the other adults (aged 14 and above) by 0.5. Children under the age of 14 are weighted by 0.3 because they consume less. Thus, the underlying assumption is that relatively high savings emerge through joint housekeeping by several persons (OECD, 2013).

4 Results

4.1 Disposable Income and Net Wealth of Households in Germany

We start our analysis by exploring the level of disposable income per month and the net wealth of farm and nonfarm households. We use the main income recipient profession to distinguish among household types and disregard the profession of other employed household members. Based on the EVS 2018, we use the lowest disaggregation level for household types in the analysis: farmers, self-employed, civil servants, workers/employees, unemployed and pensioners/retirees.[5] By comparing unemployed households and pensioners/retirees with employed households, there is a close link between the demographic characteristics of a household, such as size and composition of a household, age structures, level of education or employment opportunities, and the distribution of households' income (BRANDOLINI and D'ALESSIO, 2001). Before analyzing the level of disposable income and net wealth[6] (BILLOR et al., 2000), we first look into the household characteristics' descriptive statistics (Table 1).

Farm households are on average significantly more extensive and older than other employed household types. Regarding the level of education, self-employed and civil servants tend to have the highest level of education. Farm households draw their income from approximately two household members. Compared to other employed household types, more household members of farm households contribute to the household income. We use confidence intervals to test the significance of the differences in the household characteristics of all household types. In doing so, the number of observations is explicitly included in the calculation of confidence intervals. The margin errors are more significant for farm households due to the small sample size indicating wider confidence intervals. As a result, the confidence interval estimates for farmers are less precise.

[5] Other household types such as students, pupils and "other" were excluded from the sample because of the considerable small sample size and the vague differentiation of potential employment characteristics such as social security or tax contributions.

[6] To identify outliers, we used the Blocked Adaptive Computationally efficient Outlier Nominators (BACON) algorithm. With a parameter of 5% (p = 0.05), a subset of 842 observations was detected as outliers, representing 2.06% of the total sample.

Table 2. Descriptive statistics of disposable income (in EUR) per consumption unit in Germany in 2018 by household types

Household types	Sample size	Mean	Median[a]	Min	Max	Standard deviation	Gini-coefficient
Farmers	68	2,479.98[b]	2,319.31[c]	793.33	8,056	1,185.34	0.23[d]
Self-employed	1,172	2,725.41	2,340.45[c]	-643.33	9,316.33	1,671.81	0.32
Civil servants	3,632	3,302.93	3,176	623	9,058	1,231.07	0.20[d]
Workers/Employees	20,889	2,648.52	2,404	-165.11	9,222.67	1,219.04	0.24[d]
Unemployed persons	1,211	1,073.87	928.33	-166.67	7,985.33	575.17	0.20[d]
Pensioners/Retirees	13,094	2,126.06	1,899.11[c]	-2,658.33	9,195.78	1,092.11	0.27[d]
Total	40,066	2,444.06[b]	2,203.67	-2,658.33	9,195.78	1,258.77	0.27[d]

[a] According to Kruskal-Wallis-Test, the differences of the median among all household types are statistically significant at 5% level (chi-squared = 5,884.77 with 5 d.f., p = 0.0001).

[b] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the difference of the mean income of farmers (se = 143.74; ci = 2,150.39-2,809.57) and the total sample (se = 6.29; ci = 2,429.97-2,458.16) is not significant. The differences of the mean income of self-employed, civil servants, workers/employees, unemployed persons and pensioners/retirees to the total sample are significant.

[c] Following the Dunn-Bonferroni-Test (reject H_0 if p = P(Z <= |z|) <= alpha/2), the differences of median income of farmers to self-employed (z = -1.64; p = 0.0502) and pensioners/retirees (z = 0.71; p = 0.2383) are not significantly at 5% level.

[d] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the Gini-coefficient of farmers (standard error (se) = 0.0281; confidence interval (ci) = 0.1698-0.2959) to civil servants (se = 0.0038; ci = 0.1961-0.2131), workers/employees (se = 0.0014; ci = 0.2415-0.2477), unemployed persons (se = 0.0101; ci = 0.1794-0.2246), pensioners/retirees (se = 0.0019; ci = 0.2613-0.2697) and the total sample (se = 0.0011; ci= 0.2706-0.2756) are not significant. The differences between civil servants and unemployed persons are also not significant.

Source: FDZ (2018), own calculations

Table 2 illustrates the findings of the income distribution for each household type and the total sample[7] (ROYSTON, 1991). Appendix A confirms that the disposable income is not normally distributed for each household type and the total sample.

Results presented in Table 2 show that farm households have the lowest average income per month across all employed household types. There is a significant discrepancy between the mean and median income of all household types. The mean income is noticeably higher than the median income, which indicates a strong positive asymmetry of the distribution. The distribution implies that many households have low incomes and comparably few households have high incomes (FDZ, 2018). This result is comparable with other official statistics (DESTATIS, 2018b). The median income, being a more adequate measure of the average level of a household's income (GRABKA and GOEBEL, 2018), shows that farm households have an income significantly above the total sample's median income. Compared to the mean income, farmers' median income is not significantly different for self-employed and pensioners/retirees. According to the household characteristics (Table 1), the income per household member is lower for farm households than for the other employed household types. Household income is relatively equally distributed within all household types, except for self-employed.

Table 3 presents the distribution of households' wealth, indicating considerable differences in the distribution of net wealth across the household types. Appendix B confirms that the net wealth is not normally distributed for each household type and the total sample.

Farm households have the highest amount of net wealth, which is dominated by real estate. The mean wealth is significantly higher than the median wealth, which points to a positive asymmetry (right-skewed) of the distribution, i.e., only a few households dispose of high net wealth and many households dispose of a low(er) net wealth (FDZ, 2018). This result corresponds with other statistics on the distribution of wealth in Germany (DIW, 2019). The Gini coefficients for net wealth are higher than the disposable income indicating a higher concentration of wealth across the household types. Table 4 depicts the correlation between disposable income and net wealth.

[7] The absence of homoscedasticity (Levene Test: Income (F = 171.83, df = (5, 40,060), p = 0.0000); Wealth (F = 373.67, df = (5, 40,060), p = 0.0000)) and normal distribution: Pr(Skewness) = 0.0000 and Pr(Kurtosis) = 0.0000 at 5% significance level for both income and wealth) of the data does not allow the analysis of variance.

Table 3. Descriptive statistics of net wealth (in EUR) per consumption unit in Germany in 2018 by household types

Household types	Sample size	Mean	Median[a]	Net Wealth		Standard deviation	Gini-coefficient
				Financial assets (%)	Real estate (%)		
Farmers	68	226,740.2	195,835.7	27.95	72.05	203,210.3	0.46[c]
Self-employed	1,172	174,147.7	109,059	36.48	63.52	197,095.7	0.53[c]
Civil servants	3,632	113,055.5	66,055.34	35.68	64.32	140,006.5	0.55[c]
Workers/Employees	20,889	88,109.19	36,524.16	38.09	61.91	126,671.5	0.59[c]
Unemployed persons	1,211	16,420.11	0	39.85	60.15	60,596.99	0.79
Pensioners/Retirees	13,094	127,535.6	66,666.66	32.85	67.15	159,094.5	0.56[c]
Total	40,066	103,655.9[b]	42,593.89	35.75	64.25	144,526.1	0.59[c]

[a] According to Kruskal-Wallis-Test, the differences of the median among the household types are statistically significant at 5% level (chi-squared = 2,202.88 with 5 d.f., p = 0.0001). Following the Dunn-Bonferroni-Test (reject H_0 if p = P(Z <= |z|) <= alpha/2), the differences in the median wealth of all household types are significant.

[b] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the difference of the mean wealth of all household types to the total sample (se = 722.04; ci = 102,037.5-105,274.4) are significant.

[c] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the Gini coefficient of farmers (standard error (se) = 0.4150; confidence interval (ci) = 0.3661-0.5522) to self-employed (se = 0.0089; ci = 0.5146-0.5544), civil servants (se = 0.0071; ci = 0.5363-0.5682) are not significant at 5% level. The differences of self-employed, civil servants, and pensioners/retirees (se = 0.0032; ci = 0.5534-0.5678) are not significant. The difference of civil servants and pensioners/retirees are not significant as well as the differences of workers/employees (se = 0.0026; ci = 0.5865-0.5980) and the total sample (se = 0.0019; ci = 0.5844-0.5929).

Source: FDZ (2018), own calculations

Table 4. Spearman's rank correlation coefficient for the disposable income and the net wealth

	Rho p-value[a]	Strength of correlation[b]
Farmers	0.39 0.0010	Weak positive
Self-employed	0.50 0.0000	Moderate positive
Civil servants	0.49 0.0000	Moderate positive
Workers/ Employees	0.56 0.0000	Moderate positive
Unemployed persons	0.32 0.0000	Weak positive
Pensioners/ Retirees	0.66 0.0000	Moderate positive
Total	0.56 0.0000	Moderate positive

[a] The Spearman's rank correlation coefficient rho is significant in all cases at 5% level.

[b] Categories of correlation are adapted from DANCEY and REIDY (2007).

Source: FDZ (2018), own calculations

Spearman's rank correlation is significant in all cases and both variables are positively correlated. This correlation is weak or moderately positive and the highest value has been found for pensioners/retirees. Overall, the results show considerable differences in the distribution of disposable income and net wealth across all household types. For employed household types, farm households have the lowest average disposable income and the highest net wealth. In contrast, the other employed household types are characterized by high(er) average income and lower net wealth levels. Unemployed households such as unemployed persons have on average the lowest disposable income and net wealth. In contrast, pensioners/retirees have a low average income and a relatively high net wealth.

4.2 The Economic Well-being of Households in Germany

In the following section, both disposable income and net wealth are combined to one indicator to investigate the level and the distribution of households' economic well-being (Table 5).

Farm households have the lowest average economic well-being across the employed households.

Table 5. Descriptive statistics of economic well-being (in EUR) per consumption unit in Germany in 2018 by household types

Household types	Sample size	Mean	Median[a]	Min	Max	Standard deviation	Gini-coefficient
Farmers	68	2,590.03	2,237.2c	250.57	7,703.63	1,386.44	0.28[d]
Self-employed	1,172	3,075.86	2,495.80[c]	-564.87	41,026.25	2,536.39	0.36[d]
Civil servants	3,632	3,321.29	3,139.36	731.38	11,066.02	1,334.70	0.22[d]
Workers/Employees	20,889	2,679.50	2,388.87[c]	-167.53	11,042.37	1,302.69	0.25[d]
Unemployed persons	1,211	1,089.75	931.51	-128.45	9,236.57	639.51	0.21[d]
Pensioners/Retirees	13,094	5,556.10	2,751.57	-2,665.73	77,128.34	8,090.34	0.56
Total	40,066	3,565.77[b]	2,422.54	-2,665.73	77,128.34	4,900.08	0.44

[a] According to Kruskal-Wallis-Test, the differences of the median among all household types are statistically significant at 5% level (chi-squared = 3,802.27 with 5 d.f., p = 0.0001).

[b] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the mean well-being of all household types to the total sample (se = 24.48; ci = 3,510.90-3,620.65) are significant.

[c] Following the Dunn-Bonferroni-Test (reject H_0 if p = P(Z <= |z|) <= alpha/2), the differences of the median well-being of farmers to self-employed (z = -1.80; p = 0.0358), and workers/employees (z = -1.85; p = 0.0321) are not significant. The difference of self-employed and workers/employees (z = -0.04; p = 0.4984) is also not significant at 5% level.

[d] Following the confidence interval at 97.5% level (Bonferroni correction: alpha/2 = 2.5%), the differences of the Gini-coefficient of farmers (standard error (se) = 0.0248; confidence interval (ci) = 0.2226-0.3339) to self-employed (se = 0.0125; ci = 0.3326-0.3891), civil servants (se = 0.0039; ci = 0.2083-0.2256), workers/employees (se = 0.0014; ci = 0.2511-0.2576) and unemployed persons (se = 0.0108; ci = 0.1905-0.2389) are not significant. The differences of civil servants and unemployed persons are statistically not significant.

Source: FDZ (2018), own calculations

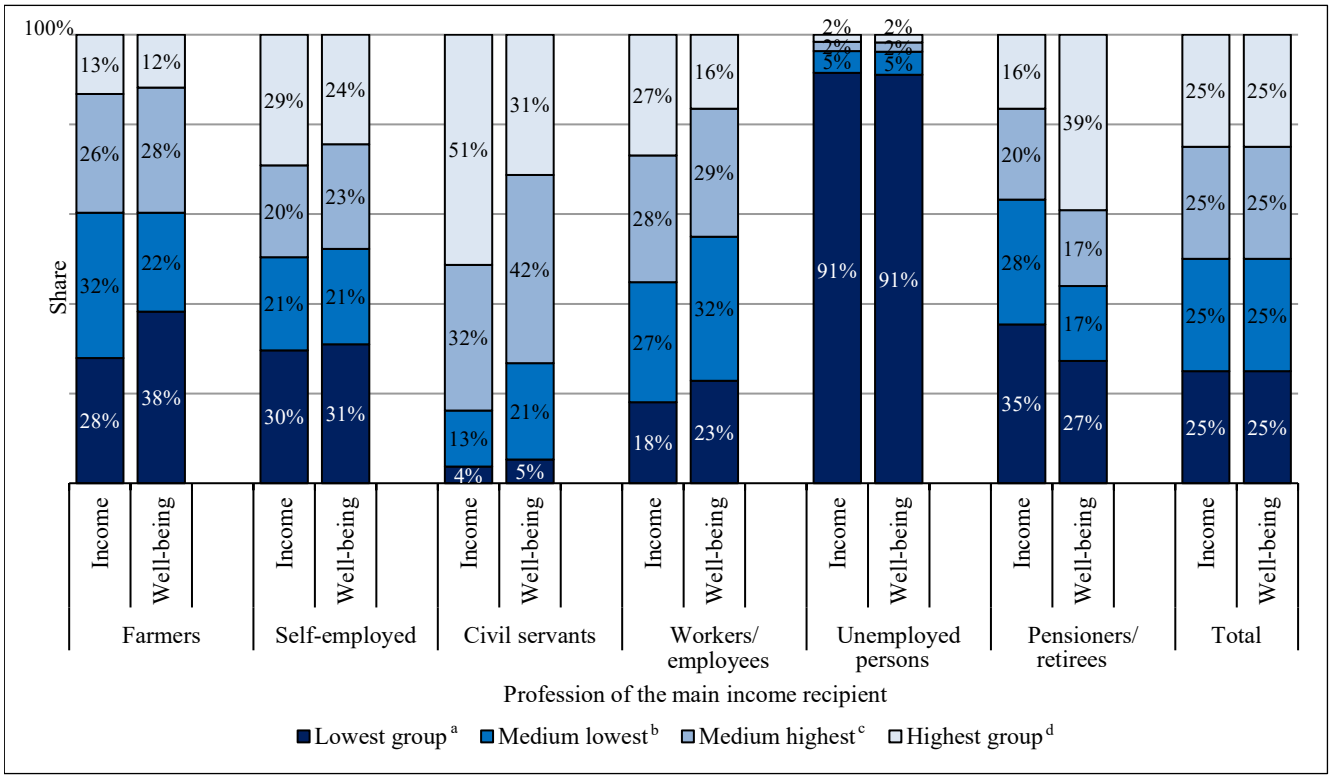
The mean and median well-being of farm households are significantly below the mean, and the median observed for the total sample. The Gini-coefficients indicate that income and wealth are more equally distributed among farmers, self-employed, civil servants, workers/employees and unemployed persons than for pensioners/retirees. Income and well-being quartiles are created based on the total sample to investigate the economic well-being distribution across all household types in more detail. We calculate the ranges of households' income and economic well-being to determine the lowest to the highest group (Figure 3). We then assigned each household type to the ranges. Income quartiles are used as a reference to explicitly show the effect of wealth on the households' economic status. Figure 3 illustrates the percentage share of all household types in the income and economic well-being groups from the lowest to the highest.

The results indicate that more farm households are ranked in the lowest group considering the economic well-being compared to the disposable income. This trend relatively appears for all employed household types, while the opposite trend occurs for unemployed households. In contrast, considering the economic well-being shows fewer households of civil servants, workers/employees and self-employed are ranked in the highest group. It appears that considerably more pensioners/retirees are ranked in the highest group for unemployed households, and unemployed persons remain unaltered. The results indicate that civil servants and pensioners/retirees have the highest spending power related to their economic well-being, followed by self-employed and workers/employees. Farm households' economic well-being is relatively low, and farmers would be better off when we assess their economic status based on the household income. Overall, wealth affects the standard of living of households differently. It is unclear whether farmers' economic well-being is more affected by their wealth than other household types due to the small sample size of farm households compared to the total sample.

5 Discussion and Conclusion

The objective of this paper was to analyze the economic well-being of farm households in Germany based on the EVS 2018. We combined the disposable income and net wealth of financial assets and real estate of farm and nonfarm households to an economic well-being indicator. First, we analyzed the effect of net wealth on economic well-being by using various inequality measures. Second, we examined the database's quality to evaluate farm households' economic well-being considering the second objective of the CAP.

Figure 3. Household types (in %) in income and well-being quartiles



[a] Income (≤ 1,752.89 EUR) or well-being (≤ 1,870.49 EUR)
[b] Income (> 1,752.89 EUR and ≤ 2,435 EUR) or well-being (> 1,870.49 EUR and ≤ 2,698.67 EUR)
[c] Income (> 2,435 EUR and ≤ 3,321.11 EUR) or well-being (> 2,698.67 EUR and ≤ 3,945.30 EUR)
[d] Income (> 3,321.11 EUR) or well-being (> 3,945.30 EUR)

Source: FDZ (2018), own calculations

The results demonstrate that farm households are a group of low-income and high-wealth. The income available to farm households can support a standard of living equal to that of nonfarm (employed) households. Taking the net wealth into account, results reveal that economic well-being is affected differently across the household types. Our findings are in line with other previous studies within an agricultural context to farmers' income and wealth inside and outside the EU (THIELE, 1998; MISHRA et al., 2002; JONES et al., 2009; MARINO et al., 2021). When assessing farmers' standard of living, we conclude that wealth should be taken into account because it affects the households' economic status.

Using the EVS to examine farmers' economic well-being presents some limitations due to the data's quality. More explicitly, the limitation of the findings is related to the reliability and validity of the results as the analysis refers to one-year data and a small number of observations of farm households. The problem with single-year data refers to the income volatility of income generated by agricultural activities. As comprehensive data across Europe at NUTS 2 level confirms, the agricultural entrepreneurial income per unpaid annual work unit is highly volatile across years (EUROSTAT, 2018b). It should be noted that the disposable income of farm households, which consists of agricultural entrepreneurial income and income from other sources referring to a single year, does not fully reflect farmers' income from self-employment in agriculture. Another important factor is that the income of farm households includes existing agricultural support payments. Removing these payments would have offsetting effects on input prices and factor markets, most notably land rents. We should bear in mind that income comparisons of farm and nonfarm households consider farm income support.

When analyzing the economic well-being of farm households requires considering the households' income and wealth and the farm itself because both are closely related to each other. We should be aware of the limitations of viewing households' wealth to assess their economic well-being. For instance, evaluating farm investments in assets only provides information on the values of agricultural assets. It does not allow to derive conclusions about the standard of living of

farmers directly. The underlying assumption is that the gross capital formation depends on the share and degree of specialization and farm size. Those investments may vary from farm to farm, and even farms with high farm investments could have low income. Using the EVS data is lacking on farm characteristics which limit our conclusion of farmers' well-being. Finally, the main limitation of the EVS is the sample size of farm households. With 68 farm households, a quantitative comparison between the agricultural and other sectors is not possible because those farms do not represent farm structures' heterogeneity. There is currently a lack of statistical data and evidence on a national level and on a European level to assess farm households' standard of living. This is cause for some concern because lacking statistical data means that we miss relevant information being able to derive agricultural policy implications from achieving the second objective of the CAP.

In the context of the CAP, income support is channeled through decoupled direct payments paid to all farm households irrespective of whether farming is a secondary source of income or not. It effectively over-compensates those farm families whose income level consists of a high amount of off-farm income (MARINO et al., 2021). However, providing improved statistical data on farmers' economic well-being would allow us to differentiate between the poor and the non-poor. Improving data would make it difficult to justify the current level of direct payments to support farmers' incomes in the future. Also, it would be hard to justify shifting CAP money from farm families who are mainly dependent on farming to households in which income from farming is only a minor part of their total household income. We can conclude that improving data availability at the household level is an important goal for the future to assess the CAP's treaty objective. Ensuring a fair standard of living for farmers requires evidence that income support is effectively targeted to those in need.

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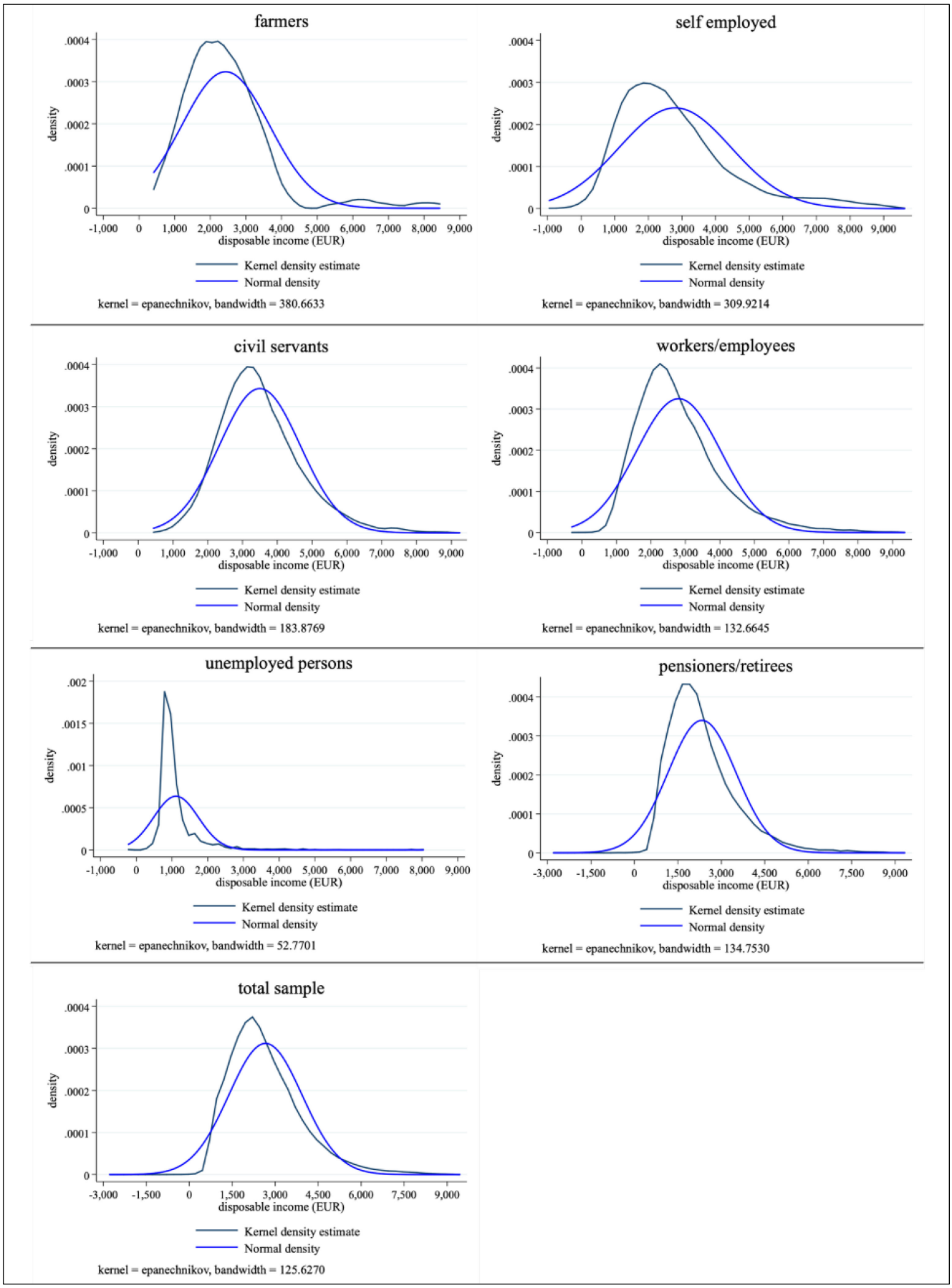
Appendix A. Kernel density estimations of net wealth for household types and the total sample



Appendix B. Kernel density estimations of net wealth for household types and the total sample