Impact of off-farm income and paid taxes on the composition and volatility of incomes and wealth of dairy farmers in the Netherlands

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Abstract

This paper analyses the composition and volatility of the total income and wealth of dairy farmers and the importance and volatility of the different components contributing to the total income and wealth based on Dutch FADN data. The results confirm some existing findings on the stabilising impact of CAP subsidies and off-farm income on the total income. The paper extends the existing analysis by exploring the impact of taxes on income volatility and the important role of savings in stabilising consumption of farm households. In this paper we show that a broader perspective (including off-farm income and wealth effects) provide a more realistic picture of the income and wealth effects as experienced by farmers.

Keywords: Farm Income, Off-farm income, Paid taxes, Income Volatility

Introduction

Farmers' incomes show strong fluctuations over time due to fluctuations in prices and yields. Fluctuations in yields are caused by natural conditions such as drought, heavy rain, frost and animal diseases and such yield fluctuations lead to even stronger price fluctuations. Fluctuations in farmers' incomes is a theme of interest for policy makers. Recent discussions on the application of income stabilisation tools (IST) within the Common Agricultural Policy (for example Hungary, Italy, Spain and Germany) have increased the interest in the volatility of incomes of farmers (for example Liesivaara et al., 2012; Severini et al. 2018; Olivier et al., 2017). Due to data availability and political preferences the focus is often on the volatility of incomes from farming activities, including the (stabilising) impact of decoupled payments. It is however relevant to see how fluctuations in farm incomes are offset or amplified by fluctuations in other elements affecting the well-being of farmers, such as off-farm income, the payment of taxes and the wealth effects of an increase in land and quota values.

Income stabilisation tools, as recently introduced in the common agricultural policy, have received a lot of attention to address income volatility. Based on an analysis of Italian FADN data, Severini et al. (2019) conclude that the income stabilization tool would lead to a significant stabilization of farm incomes in Italian agriculture. The level of the contributions farmers pay affects the income stabilising effect of the IST. Lowering the subsidisation rate reduces the income stabilising effect of the IST. Furthermore the results show that also the way farmers pay is important in this regard: a flat rate approach is found to be less effective than a contribution proportional to the average farm income level in terms of income stabilisation. Other research shows that such tools stabilize farm-incomes and affects the income inequality within the farm population (Finger & El Benni, 2014a). The benefits from such a tool might be highly heterogeneous across farm types (El Benni et al. 2016) and indemnification patterns are highly dependent on the calculation of the reference income (Finger & El Benni, 2014b).

Besides the income stabilisation tool, the CAP has an impact on the level and volatility of farm incomes through subsidy payments. Bojnec and Fertő (2019) analyse the specific role of CAP payments in stabilising farm incomes in Hungary and Slovenia. They conclude that variability in farm income over time is high due to the high variability in the market revenue component. Subsidies mitigate instability in farm incomes because their variability is lower than that of market revenue income. While CAP subsidies thus represent a stable source of farm income, they have played a limited countercyclical role in stabilising total farm income: they are not raised in years with low incomes. Subsidies are not found to be targeted at the farms that face the highest level of income variability and thus may not be an efficient tool for stabilising farm income (Severini et al, 2016b).

Also at farm level, farmers can apply different strategies to reduce income volatility. Partly these are on-farm measures and partly off-farm. Diversification into different agricultural production activities is one of the most adopted risk management strategies (Asseldonk et al., 2016). Trestini et al. (2017) look at the impact of diversification on the income variability. The farm type with the lowest probability of income reduction is "mixed crops with livestock". Their results suggest that a significant reduction in income risk could be reached only at a high level of farm diversification, involving both crops and animal production.

Off-farm activities are relevant because a diversification of activities (inside the farm but especially outside the farm) is an important risk management strategy (van Asseldonk et al. 2017; de Mey et al., 2018). The focus in most of the studies in the EU is on farm business income (i.e. off-farm income is not considered) because of data availability constraints and the agricultural policy orientation of the analyses (Severini et al. (2016a)).Outside the EU there are some studies taking into account off-farm income. An example is an analyses developed in Switzerland where the national farm data network also collects data on off-farm incomes (El Benni et al., 2012; Finger and El Benni, 2014). A study for the USA shows that off-farm incomes stabilize the income of farm households (Mishra and Sandretto, 2002).

The studies that take off-farm income into account, use total (household) income as an indicator to judge if income is more stable due to these non-farm income sources. These studies often neglect the role of taxes. Taxes are – in Europe- often progressive and based on real income. That influences the volatility of net-income of some groups relative to others. Another important effect of taxes on volatility is, that the payment of taxes is often delayed a few years. That increases the volatility of cash net-income.

Net-Income is one aspect of the economic well-being of farmers. Wealth is the other. The reappraisal of assets, especially land, has a strong impact on the wealth of farmers. The (expected) increases in capital values due to revaluation can influence business strategies: some farmers are happy with renting or leasing land to increase their size and income due to efficiencies of scale. Others prefer to own their land and profit from price developments of the assets. Sometimes the increased value of assets is used as a collateral to for extra borrowing. This aspect of farmers' well-being is however much less investigated.

In this paper we will address some of these less investigated issues. We will analyse the composition and volatility of the total income and wealth of dairy farmers and the importance and volatility of the different components contributing to the total income and wealth based on Dutch FADN data. The Dutch FADN contains a broader set of data, allowing a more in-depth analysis of the different income components.

Method and data

In this study we use data on specialised dairy farmers from the Dutch FADN. The Dutch FADN has a broader focus than the EU-FADN and collects not only data on the financial economic performance, but also a broader set of data on the sustainability performance of farms, including environmental variables such as mineral balances, pesticides use, use of antibiotics and energy use. Furthermore information on additional socio-economic variables such as off-farm income, paid taxes and innovation are collected. In the analyses described in this paper these additional economic variables are used.

Data from the period 2001 till the most recently available data of 2017 is used. An unbalanced panel of dairy farms is constructed that consists of a minimum number of observations of 130 and a maximum of 178 observations per year. This is a sub-selection of the dairy farms in the Dutch FADN for which the financial information is judged to be complete by the data collector. Dutch FADN collects off-farm income data, but to ensure the representativity of the EU FADN sample, a farmer is not excluded from the sample if he/she is not willing to share the off-farm income information. Off-farm income consists of the income outside the farm from the farmer and its' spouse, assuming that the non-farm income of children who (still) live at home is used for their own personal expenses and savings, and not in financing the farm, nor reducing the need to use the farm income for household expenditure. However, this can be a questionable assumption if that child is the potential successor on the family farm (Poppe and Vrolijk, 2019).

Based on this unbalanced dataset, indicators for the different income components are calculated (such as income from farming activities, subsidies, different off-farm income sources as well as net-worth (own capital). Volatility is described based on the coefficient of variation. The coefficient of variation is a standardised measure of dispersion.

Farmers are generally more concerned with movements of farm income on the left side of the distribution (Horcher, 2005). However, indexes considering both sides of the distribution could perform equally well when the distribution of income over time is symmetric. Thus, the use of one type of variability index or the other should be chosen on the basis of the specific situation under study (Severini et. al, 2016a). As we are interested in the overall income volatility and the contribution of its' components there is not an apparent and relevant advantage to account only for down-side risk. Down side is explicitly addressed in this paper by comparing income levels (and the contribution of different income components) with an externally defined poverty threshold.

The coefficient of variation is often expressed as a percentage, and is defined as the ratio of the standard deviation to the mean (or its' absolute value). The median is used to describe the central tendency. Medians have the advantage that they are less sensitive to outliers or extreme values in the data set than average values.

Results

A first assessment of the volatility of incomes and its' components can be made based on published group results. For the Netherlands, average group results are published on agrofoodportal.com. Looking at the published group results from 2005 till 2017 some preliminary conclusions can be drawn. Dairy farmers show a continuous increase in the scale of production during the analysed period. Average farm size (total output) in the panel increases from 190 kEuro in 2005 till 450 kEuro in 2017. Output volatility of dairy farms is rather low with a coefficient of variation of less than 10% (detrended, also in the subsequent CV). Farm income shows a much higher volatility of almost 50%. Direct payments are a stable factor in the farm income with a volatility of 9%. Volatility of total family income (including farm income) is with 36% substantial lower showing that volatility of family income is reduced by off-farm income. Looking at the components in non-farm income the income from labour is the most important (43% of off-farm income), followed by social security payments like child allowances (40%) and income from non-farm assets (16%). Off-farm labour is the most stable income component with a volatility of less than 10%. The volatility of income from assets (48%) and social security payments (25%) are much higher indicating that farm income is mainly stabilised by off-farm labour.

These numbers are based on an analysis of group results. Different authors (Vrolijk and Poppe, 2007; Coble et. al, 2007; Severini et al. 2016a) show that volatility at farm level is underestimated by analysis at a higher level of aggregation. Therefore the further results in this paper will be based on analyses of the volatility at farm level during the years that the farm took part in the panel.

Table 1 gives some descriptive statistics of the total income and the composition of the income for each of the analysed year. Farm income (without subsidies) clearly fluctuate between years. 2007 and 2017 were very good years for dairy farms with average incomes from farming of 58 and 81 thousand euro. 2009 was an extremely bad year with an average loss of 31 thousand euro. The average subsidies as received by dairy farmers reflect changes in the common agricultural policy. Off farm labour income adds on average between 4 to 7 thousand euros to the total income of dairy farmers. Off farm labour income is the most substantial income source in all years, followed by social security payments. Revenues from private assets and received interest payments contribute to a lesser extent to the total income. The composition of the total income is graphically illustrated in figure 1.

Table 1: Composition of total income, farm income and off-farm income in Euro on Dutch specialised dairy farms (2001 – 2017)

	On Farm		**Off-farm**						**Total**	
Year	Farm income without sub-sidies	Sub-sidies	Off farm labour income	Revenues private assets	Received interest	Other off farm income	Disability insurance payments	Other social security payments	Total income	Number of obser-vations
2001	47751	3616	3795	-398	419	101	1124	2760	59170	142
2002	32385	4991	4092	-974	609	445	1128	2793	45469	146
2003	32181	4614	4513	1620	636	111	1208	5028	49910	144
2004	33176	10814	5227	1800	574	61	1417	3916	56985	148
2005	34890	16746	5357	3039	443	41	1336	3854	65706	142
2006	26918	24010	6242	3879	440	36	1299	5210	68033	137
2007	58041	24316	6728	485	1016	-39	1384	5277	97207	144
2008	35399	24435	6949	-2842	1161	-60	1265	4927	71235	139
2009	-30824	24659	6870	5828	803	55	1528	5886	14804	136
2010	19608	23951	6344	2943	642	82	2078	5353	60999	136
2011	37187	23347	6486	-112	457	248	755	6328	74695	137
2012	11971	23517	6452	2681	570	6	903	4212	50312	130
2013	40684	24298	6400	2449	704	-16	897	3220	78636	177
2014	45023	23864	5308	2803	497	157	1027	4427	83106	173
2015	14343	21995	5220	1704	444	236	686	4006	48633	178
2016	1744	22643	5833	1938	317	31	976	2984	36466	173
2017	80965	22651	6583	739	215	103	952	1671	113879	161

Source: Dutch FADN, own calculations

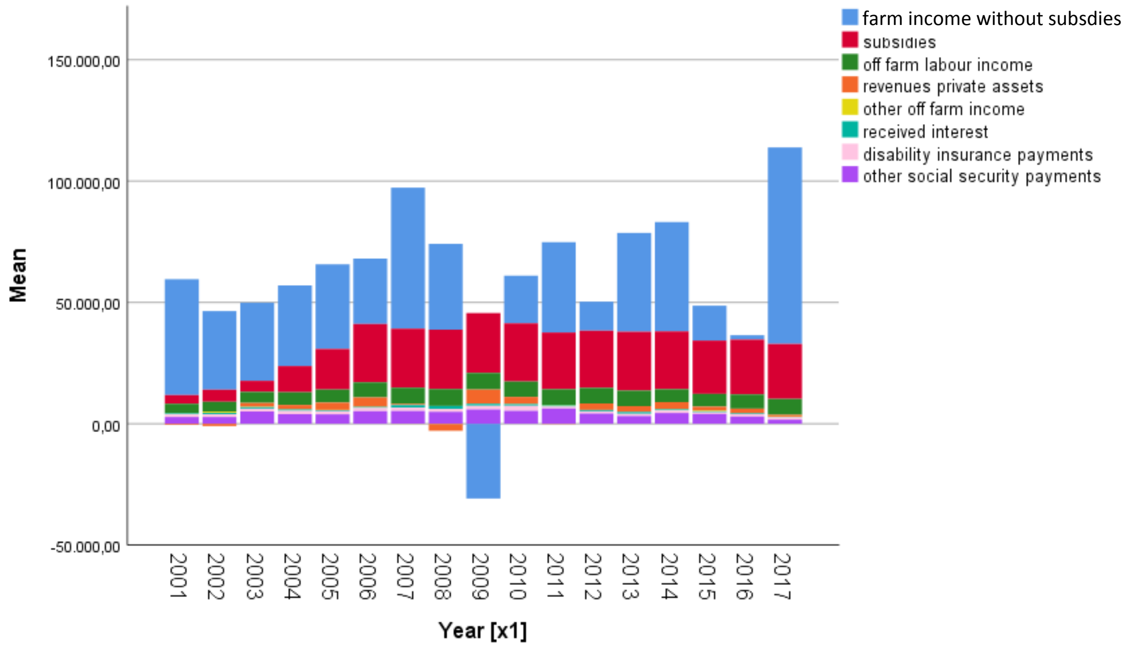

Figure 1: Composition of total income (2001-2017)

Group averages as given in table 1 and figure 1 however ignore large differences between individual farms. Figure 2 shows that development of mean incomes hide the large differences between farms within one year. The left panel illustrates the income distribution per year. The upper limit of the line illustrates the 75th percentile and the lower limit the 25th percentile. In the year 2017 the median income was around 89 thousand euro's, but 25% of the farms achieved total income levels of more than 146 thousand euros and 25% of the farms achieved income levels lower than 49 thousand euros. In the year 2016, with a median total income level of 27 thousand euros, almost 25% of the farms achieved negative total income levels. Although the range of income levels have increased slowly during time, large ranges in the total income levels can be observed for all years.

The right panel of figure 2 shows the distribution of the yearly change at farm level. The yearly change at farm level is relevant because this is the change the individual farmer is confronted with. Also this distribution shows large differences. In 2009 (a bad year for dairy farmers) the median decrease of total income was 47 thousand euros. 25% of the farms managed to limit this change to a maximum of 24 thousand euros, but 25% of the farms were confronted with a yearly change of more than 89 thousand euros.

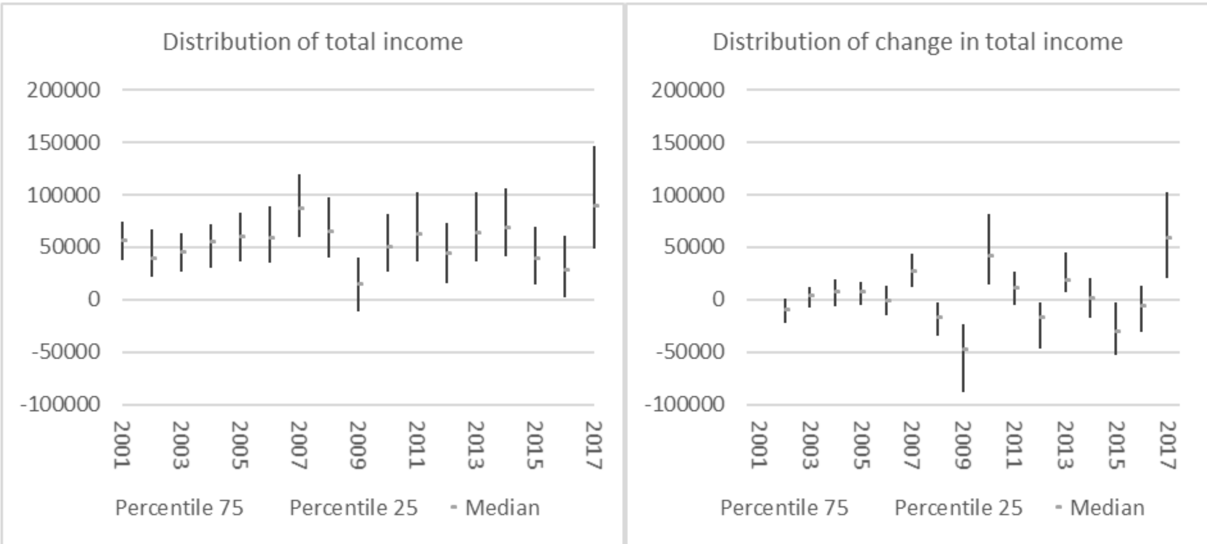

Figure 2: Distribution of total income and distribution of change in total income (compared to previous year) Source: Dutch FADN, own calculations

The two panels of figure 2 clearly illustrate that there is large dispersion of economic results of dairy farmers. Median or average income levels hide a lot of the dynamics in the income situation of farmers. Even in relatively good years a substantial group of farms achieve low income levels and in bad years a group of farms is still able to achieve positive income levels. Also in the yearly changes large differences can be observed. Although this picture gives an understanding of the differences in income levels and income changes from year to year it does not address the issue of volatility of income as experienced by a farmer during a range of years.

Table 2 addresses this volatility at farm level. The volatility (coefficient of variation) is calculated at individual farm level and then the median of the individual coefficients of variation is used to describe the volatility of a group of farms. Table 2 describes the volatility of different income components for the total group and the 3 different size classes. Looking at the individual income components subsidies are the most stable income source. Revenues from other assets, received interests and other farm income sources have a high median value of the coefficient of variation. How the volatility of the individual income components affect the volatility of the aggregate incomes (income from farming, off farm income and total income) depends on the correlation between these income sources. So, although the coefficient of variation of the off-farm income is comparable or even higher than the volatility of the income from farming the addition of off-farm income does result in a lower volatility of total income. Looking at the volatility across different size classes, the conclusion can be drawn that smaller farms experience less volatility than larger farms.

Table 2: Volatility (median of coefficient of variation) of income and of different income components on Dutch specialised dairy farms; (weighted)

	Median of coefficient of variation			
	Total	Size class small	Size class medium	Size class large
Income of farming, of which:	0.62	0.55	0.64	0.72
• Farming activities	0.86	0.79	0.92	1.16
• Subsidies	0.31	0.39	0.19	0.11
Off farm income, of which:	0.66	0.59	0.76	0.98
• Labour income	0.81	0.75	0.82	1.12
• Revenues from other assets (excl. interest)	2.26	2.26	2.65	1.77
• Received interest	1.40	1.10	1.72	1.73
• Other off farm income sources	2.65	2.65	2.84	2.83
• Disability payments	1.73	1.73	2.00	1.45
• Other social security payments	0.95	0.77	1.14	1.28
Total income	0.47	0.42	0.53	0.66

Source: Dutch FADN, own calculations

Another way of analysing the impact of the different income components is to see whether the relative position in the income distribution is affected by the different income sources. Table 3 shows the stability of the income distribution for three different income components (1) income from farming activities without subsidies, (2) income from farming activities (i.e. including subsidies) and (3) total income (off-farm plus farming). Concerning income from farming activities (excluding subsidies) for example 57.4 percent of the dairy farms which belong to the lowest quintile in year t-1, still belong to the lowest quintile in year t. 25.8% move up one quintile and 2.9% move up to the highest quintile (Table 3a). Looking at the best performing farms in year t-1 the table shows that 32.5% percent drop back to a less performing quintile, 2.8% of the farms drop back to the lowest quintile.

Table 3a: Stability of income distribution (income from farming excl. subsidies)

	Income from farming activities (without subsidies)				
	1	2	3	4	5
1	57.4%	25.8%	9.6%	4.3%	2.9%
2	25.1%	36.1%	24.7%	11.3%	2.7%
3	11.2%	24.2%	36.1%	21.9%	6.6%
4	4.1%	11.5%	24.1%	40.6%	19.7%
5	2.8%	3.8%	5.8%	20.2%	67.5%

Source: Dutch FADN, own calculations

Including subsidies in the farm income hardly changes the stability of the income distribution (see table 3b). The number of farms that stay in the same income class increases slightly (with an exception of the lowest income class). Although the subsidies affect the variability of the income at farm level it does not distort the relative position in the income distribution.

Table 3b: Stability of income distribution (income from farming incl. subsidies)

Income from farming incl. subsidies					
	1	2	3	4	5
1	55.9%	27.5%	9.3%	4.7%	2.5%
2	25.8%	38.1%	23.3%	10.9%	1.8%
3	8.3%	23.5%	40.3%	21.2%	6.7%
4	5.8%	11.6%	22.4%	43.0%	17.2%
5	3.4%	2.5%	3.8%	20.1%	70.1%

Source: Dutch FADN, own calculations

Including also off-farm income only marginally changes the stability of the income distribution (see table 3c). The number of farms that stay in the same income class decreases slightly (with an exception of the 2nd income class). Although the off-farm income affects the variability of the income at farm level it only marginally changes the relative position in the income distribution.

Table 3c: Stability of income distribution (total income)

Total income					
	1	2	3	4	5
1	54.30%	26.80%	9.50%	4.80%	4.50%
2	22.40%	41.10%	23.50%	11.10%	1.80%
3	11.10%	23.00%	38.30%	22.20%	5.40%
4	7.40%	8.90%	24.60%	37.80%	21.30%
5	4.40%	1.70%	5.30%	23.00%	65.70%

Source: Dutch FADN, own calculations

Having analysed the volatility of total income, the question is how income taxes affect volatility. Dutch income tax is progressive, with marginal rates up to 50%. However, entrepreneurs have some options to reduce taxes, including averaging their incomes over three years which reduces marginal rates if income is not very stable. Taxes are accounted at cash-basis, as it is hard to estimate how much taxes will be paid in future years given current income.

Table 4 starts where table 2 stopped, total income. Volatility of personal taxes is high compared to the all income components. The disposable income shows a higher volatility than the total income. This can be explained by the lagged effect of tax payments and the relatively low amounts of paid taxes. Larger farms show a lower volatility in paid taxes.

Table 4 also shows the lowest volatility in consumption. This low level of volatility of consumption can be observed in all size classes. This means that farm households maintain their consumption levels at a stable level during low and high income years. This is partly done by saving in good years and un-saving in bad years. This results in a high volatility in savings. The highest volatility of savings can be observed among the small farms.

Table 4: Volatility of disposable income and taxes (weighted)

	Median of coefficient of variation			
Variable	Total	Size class small	Size class medium	Size class large
Total income	0.47	0.42	0.53	0.66
Personal taxes	1.91	2.15	1.73	1.57
Disposable income	0.52	0.48	0.55	0.75
Consumption	0.20	0.20	0.20	0.19
Savings	1.53	1.76	1.30	1.26

Source: Dutch FADN, own calculations

Table 5 further analyses the impact of taxes on disposable incomes and the link between stable consumption levels and changes in savings. Although personal taxes do not result in a lower volatility of disposable income it does have a clear effect on disposable income levels over time. Low incomes in 2009 leads to lower tax payments in 2010 and 2011 (see table 5). Also the rather stable consumption levels are confirmed by table 5. In low income years 2009 and to a lesser extent 2016 negative savings are used to maintain consumption levels.

Table 5: Impact of taxes on disposable incomes (weighted)

Year	Total income	3 year average	Personal taxes	Disposable income	Personal consumption	Savings
2001	59170		2104	57066	31221	25845
2002	45469		1850	43619	32837	10782
2003	49910	52053	1807	48103	36754	11349
2004	56985	51214	-2474	59460	36581	22879
2005	65706	59112	1066	64639	39206	25433
2006	68033	64152	1227	66806	41228	25578
2007	97207	76869	6733	90475	43446	47029
2008	71235	76213	5133	66102	48947	17155
2009	14804	59140	5481	9324	48135	-38812
2010	60999	47815	1186	59814	47946	11868
2011	74695	50584	1673	73022	48096	24926
2012	50312	62808	5201	45111	47195	-2084
2013	78636	69560	4267	74369	50973	23396
2014	83106	70958	7806	75300	45272	30028
2015	48633	69132	6299	42334	40585	1749
2016	36466	53804	5798	30668	43732	-13064
2017	113879	67770	4581	109298	54224	55074

Source: Dutch FADN, own calculations

Although income volatility is linked with upside swings as well as with downward swings in income levels, governments care especially about down size risks and farmers that are faced with an income that is below a certain minimum level, e.g. the minimum standard of living or poverty threshold. Table 6 shows the number of farms that have a total farm income below that poverty threshold in a certain year.

Table 6 shows large differences between year in percentage of farms achieving the poverty threshold. The percentage of farms above the threshold varies between 43% in the low income year 2016 till more than 90% in the high income year 2007. Taking into account the number of entrepreneurs involved in one farm the percentage of farms where the total income per entrepreneur is higher than the poverty threshold is substantial lower. This varies from 30% in 2009 till 88% in 2007. For larger farms most farms are above the poverty threshold. The highest share of below poverty farms can be found at the smallest farms.

Table 6: Percentage of farms and entrepreneurs with income levels above poverty threshold (2001-2017), weighted observations.

	Total income > poverty threshold				**Total income per entrepreneur > poverty threshold**			
Year	Total	Small farm	Medium farm	Large farms	Total	Small farm	Medium farm	Large farms
2001	85.1%	81.2%	99.8%	100.0%	68.9%	62.7%	91.3%	100.0%
2002	74.9%	70.7%	88.8%	99.4%	57.3%	51.0%	78.0%	99.4%
2003	78.1%	73.8%	90.8%	100.0%	60.6%	54.5%	78.8%	89.0%
2004	84.8%	82.0%	93.0%	91.0%	67.3%	63.0%	79.5%	82.1%
2005	85.9%	83.4%	92.2%	100.0%	70.5%	67.7%	76.6%	100.0%
2006	84.5%	81.3%	91.7%	100.0%	72.5%	67.8%	82.6%	100.0%
2007	91.1%	88.4%	96.9%	100.0%	88.0%	83.9%	96.9%	100.0%
2008	84.9%	83.7%	86.8%	91.4%	75.2%	72.4%	80.3%	81.4%
2009	43.8%	44.3%	42.6%	47.2%	30.0%	28.6%	30.8%	44.7%
2010	75.8%	75.2%	74.8%	89.4%	65.3%	65.0%	63.4%	83.5%
2011	82.2%	79.4%	85.2%	88.6%	72.0%	68.2%	75.0%	88.3%
2012	64.5%	61.9%	66.2%	75.1%	55.9%	52.5%	58.2%	69.7%
2013	80.5%	71.8%	85.9%	82.5%	67.3%	54.3%	73.8%	77.5%
2014	77.2%	74.8%	77.9%	80.3%	66.9%	62.2%	67.5%	76.5%
2015	63.5%	51.8%	68.7%	70.3%	47.2%	34.2%	51.4%	60.4%
2016	50.7%	33.8%	54.3%	57.6%	39.7%	26.2%	42.5%	45.5%
2017	87.4%	79.7%	86.8%	95.5%	76.6%	62.1%	75.9%	90.7%

Source: Dutch FADN, own calculations

Table 6 only illustrates the percentage of farms and entrepreneurs achieving the poverty thresholds, it does not address the contribution of different income components. Table 7 further explores the contribution of subsidies and off-farm income in achieving the poverty thresholds. The results show that the impact of subsidies depends on the level of incomes during a specific year. In general it increases the percentage of farms achieving the poverty threshold with 5 to 20 percentage points. Exception are the low income years (2007 and 2016) where subsidy payment have a significant impact on assuring farmers to achieve the poverty thresholds. The impact of subsidies has increased during time due to the increase in subsidy levels as changes in the CAP have been implemented.

Off-farm income sources also increase the percentage of farms above the poverty thresholds substantially. 5 up till 15 (in the year 2009) percentage points of farms achieve the poverty threshold due to the inclusion of off-farm income.

In this table 6 the impact of subsidies and off-farm income on achieving the poverty threshold have been analysed in this specific order. First including the off-farm income and subsequently the subsidies would lower the actual impact of subsidies on achieving poverty levels.

Table 7: Percentage of farms and entrepreneurs achieving poverty thresholds, with and without subsidies and off farm income (2001-2017) (weighted observations)

	Per farm			**Per entrepreneur**		
Year	Farm income without subsidies	Farm income	Total income	Farm income without subsidies	Farm income	Total income
2001	75.1%	79.6%	85.1%	57.9%	61.4%	68.9%
2002	58.6%	62.5%	74.9%	40.2%	45.3%	57.3%
2003	60.0%	66.2%	78.1%	39.5%	44.5%	60.6%
2004	58.1%	71.5%	84.8%	40.1%	51.4%	67.3%
2005	60.5%	75.2%	85.9%	39.7%	56.8%	70.5%
2006	50.6%	73.1%	84.5%	36.4%	58.8%	72.5%
2007	76.3%	86.0%	91.1%	61.4%	75.9%	88.0%
2008	57.8%	74.6%	84.9%	40.3%	60.9%	75.2%
2009	12.1%	28.3%	43.8%	8.6%	17.5%	30.0%
2010	47.6%	66.6%	75.8%	35.4%	52.0%	65.3%
2011	57.1%	73.9%	82.2%	43.0%	61.5%	72.0%
2012	38.2%	53.8%	64.5%	25.9%	45.7%	55.9%
2013	59.1%	72.6%	80.5%	45.8%	58.4%	67.3%
2014	58.9%	71.3%	77.2%	45.7%	58.8%	66.9%
2015	35.8%	52.6%	63.5%	22.9%	38.1%	47.2%
2016	29.0%	45.0%	50.7%	19.1%	33.3%	39.7%
2017	72.1%	81.9%	87.4%	61.3%	72.8%	76.6%

Source: Dutch FADN, own calculations

Finally, we will look at the impact of capital formation on the wealth of farmers. Farmers are said to live poor and die rich. For a policy debate on the need for governments to intervene in a sector with low incomes or (low) incomes with high volatility, it is relevant how much assets the farms in need have. Especially if farms have low incomes due to risk taking in farm enlargement or investing in the hope to realise capital gains on assets. This analysis is relevant with an eye to means-testing, as in other social security systems.

Concerning capital formation, the analysis shows that over the analysed period the values of tradable dairy quota have evaporated with the abandoning of the quota system (see table 8). Land values have increased considerably, partly as the rent is now not translated anymore in quota prices but in land prices. Land, being also a financial asset, has become much more valuable in recent years due to the decline in interest rates as managed down by the ECB. The increase in values have been used by (some) farmers to enlarge their farms with the help of outside capital: on average the solvability decreased from 79% in 2001 till around 70% in 2017.

Table 8: Development of capital formation and solvability (2001-2017), weighted observations.

Year	Three year average income	Solvability	Own capital	Intangible assets	Fixed tangible assets
2001		79	1408948	782877	1067998
2002		77	1415536	872755	1068638
2003	52053	75	1428203	911484	1096353
2004	51214	74	1426032	965627	1099071
2005	59112	73	1524616	1033423	1198735
2006	64152	71	1456255	807673	1289658
2007	76869	71	1474370	588969	1394372
2008	76213	71	1580237	638957	1509978
2009	59140	71	1785213	659961	1837952
2010	47815	72	1926573	594614	1996950
2011	50584	72	1900515	487495	1960298
2012	62808	71	1936848	348280	2123223
2013	69560	73	2172986	413345	2362970
2014	70958	69	2021619	129135	2464656
2015	69132	67	1950653	27443	2496046
2016	53804	67	2076033	34154	2663059
2017	67770	70	2338172	27191	2875270

Source: Dutch FADN, own calculations

Table 9 shows a positive link between own assets and the 3 year total income average. 26% of the farms belong to the group with low incomes and low assets (the lowest two quintiles of 3 year income and the lowest two quintiles of total own assets). Another 14% has a relatively low income (quintiles 1 and 2) but a more favourable net worth (median or highest quintiles). On the high income side, 8% of the farms have a high income (quintiles 4 and 5) and low own assets (quintiles 1 and 2). 32% of the farms belong to the high income farms (quintiles 4 and 5) with a favourable net worth (median or highest quintiles). These figures are relevant in designing policy instruments for safety-nets as farmers with a low income but a high level of own capital have more options to get out of poverty or at least survive some bad years.

Table 9: link between 3 year income quintiles and total own assets quintiles (2001-2017), weighted observations.

Quintiles of 3 year average total income	Quintiles of total own assets				
	1	2	3	4	5
1	8.50%	4.28%	3.12%	3.12%	0.98%
2	7.62%	5.82%	3.78%	2.06%	0.72%
3	3.74%	7.06%	5.12%	3.08%	1.00%
4	3.24%	3.92%	5.06%	4.08%	3.70%
5	0.18%	0.70%	3.40%	5.64%	10.10%

Source: Dutch FADN, own calculations

Discussion

Farm income has always been a central element in the CAP. In the last years policy makers have become more interested in volatility of incomes and methods to stabilise these incomes (income stabilisation tools, safety nets etc.). In this paper we show that a broader perspective (including off-farm income and wealth effects) provide a more realistic picture of the income and wealth effects as experienced by farmers. Although these analyses cannot be conducted for all member states, due to a lack of data, policy makers should be aware of these results.

It is very likely (given economic theory and empirical results) that farmers take off-farm income, taxes and wealth effects into account in their farm strategies and risk management. This means that if policy makers care for (low) income situations or want to provide a safety net, they have more options than influencing farm prices or provide a stabilising direct payment. Promoting off-farm income, social security and options in tax-law (like averaging incomes to reduce marginal rates, or set up a special savings account with non-taxed income for leaner times) are alternatives.

The results also show that subsidy payments could be more targeted if the main objective is to achieve an acceptable standard of living. In the current situation only a limited number of farmers pass the poverty threshold due to the payment of subsidies. Within the group of low income farms there is still a sub-group with a low income situation in combination with a more vulnerable own asset situation that requires special attention.

Designing policy instruments also require a longer time perspective. The analysis show that farmers are well able to maintain their consumption levels with savings in good years and un-saving in more challenging years. Real problems occur with persistent low income levels.

Policy makers should also not overestimate the income volatility issue by looking only to farm income. The fact that data sets are far from perfect should be an incentive to improve data collection (see for example Poppe and Vrolijk, 2018), and not lead to incomplete policy analysis. That could trigger policies that are inefficient and give wrong signals to farmers. Farming is a risky business, but in situations with efficient capital markets, farm-friendly tax regimes and risk-management by households that involves non-farm activities and income, farm households have several tools to cope with price and yield risks. Policy evaluations should take all these aspects into account.

References

Asseldonk, M van, Tzouramani, I., Ge, L. and Vrolijk, H. (2016) Adoption of risk management strategies in European agriculture, Studies in Agricultural Economics 118 (3), 154-162.

Bojnec Š., Fertő I. (2019): Do CAP subsidies stabilise farm income in Hungary and Slovenia? Agric. Econ. – Czech, 65: 103-111.

Coble, K.H., Dismukes, R. and Thomas, S. (2007). Policy Implications of Crop Yield and Revenue Variability at Differing Levels of Disaggregation. Paper presented at the American Agricultural Economics Association Annual Meeting, Portland, Oregon, July 29-August 1, 2007.

El Benni, N., Finger, R. and Mann, S. (2012). Effects of agricultural policy reforms and farm characteristics on income risks in Swiss agriculture. Agricultural Finance Review 72(3): 301-324.

El Benni, N. and Finger, R. (2013). Gross revenue risk in Swiss dairy farming. Journal of Dairy Science 96: 936-948.

El Benni, N., Finger, R., & Meuwissen, M. (2016). Potential effects of the income stabilisation tool (IST) in Swissagriculture. European Review of Agricultural Economics, 43(3), 475–502.

Finger, R., & El Benni, N. (2014a). A note on the effects of the Income Stabilisation Tool on income inequality in agriculture. Journal of Agricultural Economics, 65(3), 739–745.

Finger, R., & El Benni, N. (2014b). Alternative specifications of reference income levels in the income stabilization tool.In C. Zopounidis, N. Kalogeras, K. Mattas, G. Dijk, & G. Baourakis (Eds.), Agricultural cooperative managementand policy (pp. 65–85). Springer.

Horcher, K.A. (2005). Essentials of financial risk management. John Wiley & Sons.

Liesivaara, P., Myyräae, S., & Jaakkola, A. (2012). *Feasibility of the Income Stabilisation Tool in Finland*. Paper prepared for the 123rd EAAE Seminar Price Volatility and Farm Income Stabilisation, 23–24 February. Dublin, Ireland.

Mishra, A. K, & Sandretto, C. L. (2002). Stability of Farm Income and the Role of Nonfarm Income in U.S. Agriculture. Review of agricultural economics, 24, 208.

Olivier, C. ; Cronin, Evelien ; Jongeneel, R.A. ; Asseldonk, M.A.P.M. van; Bergevoet, R.H.M. ; Cordier, Jean ; Gielen-Meuwissen, M.P.M (2017); Study on risk management in EU agriculture : final report; European Commission - ISBN 9789279655791 - 302 p.

Poppe, K.J. and L.C. Zachariasse (1987) Income disparities among farm households and agricultural policy; in: Y. Leon et L. Mahe (ed) Income disparities among farm households and agricultural policy, Kiel, 1987.

Poppe K.J. and H.C.J. Vrolijk (2018), Micro data: a critical source for policy evaluation, Eurochoices, 17(1).

Poppe, K.J and H.C.J. Vrolijk (2019), How to measure farm income in the era of complex farms, 171th EAAE Seminar 'Measuring and evaluating farm income and well-being of farm families in Europe - Towards a shared and broader approach for analysis and policy design?', 5th – 6th September 2019, Taenikon, Switzerland.

Severini, S., A. Tantari Di and G. Tommaso (2016a) The instability of farm income. Empirical evidences on aggregation bias and heterogeneity among farm groups. Bio-based and Applied Economics. 5. 63-81. 10.13128/BAE-16367.

Severini S., Tantari A., Di Tommaso G. (2016b): Do CAP direct payments stabilise farm income? Empirical evidences from a constant sample of Italian farms. Agricultural and Food Economics, 4: 1–17.

Severini, S, L Biagini, R Finger (2018) Modeling agricultural risk management policies–The implementation of the Income Stabilization Tool in Italy, Journal of Policy Modeling, 2018

Trestini, S., E. Giampietri and V. Boatto (2017). Toward the implementation of the Income Stabilization Tool: an analysis of factors affecting the probability of farm income losses in Italy. New Medit. 16. 24-30.

Yann de Mey Erwin Wauters Dierk Schmid Markus Lips Mark Vancauteren Steven Van Passell (2016) Farm household risk balancing: empirical evidence from Switzerland, European Review of Agricultural Economics, Volume 43, Issue 4, 1 September 2016, Pages 637–662.

Vrolijk, H.C.J., C.J.A.M. Bont, H.B van der Veen, J.H. Wisman and K.J. Poppe (2009) Volatility of farm incomes, prices and yields in the European Union.

Vrolijk, H.C.J. and K.J. Poppe (2008), Income volatility and income crises in the European Union, in: M.P.M. Meuwissen, M.A.P.M. van Asseldonk and R.B.M. Huirne (eds.), Income Stabilisation in European Agriculture, Design and economic impact of risk management tools, Wageningen Academic Publishers, Wageningen.

Weersink, A. and K. Poon (2011) Factors affecting variability in farm and off-farm income. Agricultural Finance Review. 71. 379-397.