Where have all the farmers gone?

EU Accession and Structural Change in Bulgaria

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Paper prepared for presentation at the EAAE 2011 Congress
Change and Uncertainty
Challenges for Agriculture,
Food and Natural Resources

August 30 to September 2, 2011
ETH Zurich, Zurich, Switzerland

1 Introduction

The accession to the European Union (EU) has a large impact on structural change in the farming sector in the new member states, especially in the poorest countries, such as Bulgaria. At the eve of EU accession negotiations, agricultural production in Bulgaria was mainly concentrated in small, semi-subsistence farms. It was expected that a great part of these small farms are not able to adapt to the stringent food quality standards that the EU imposes. Particularly for the dairy sector these new requirements are expected to have an important impact on the sector as at the time of the negotiations still a large share of the raw milk did not met EU requirements.

Hence, it is expected that a further strengthening of food quality standards may have important negative welfare implications for the rural population as especially small and poor farmers, who are not able to make the necessary investments to upgrade their milk quality, will be excluded from the value chain. Several studies have confirmed that the introduction of standards can lead to the exclusion of small farmers in developing countries (e.g. Farina and Reardon, 2000; Dolan and Humphrey, 2001; Humphrey et al., 2004; Key and Runsten, 1999; Reardon et al., 2003; Weatherspoon et al., 2001, 2003).

At first sight, the first empirical evidence seems to confirm this hypothesis as in the past years, the agricultural sector in Bulgaria underwent a far-reaching structural change. While at the end of the nineties, agricultural employment was still increasing, there was a turning point in 2002 and by 2009, agricultural employment had decreased by 20% compared to 2003. A similar evolution is taking place in terms of the number of farms and especially in terms of the number of dairy farms. Since 2003, the number of farms in Bulgaria decreased by 26% in 2007, while the number of dairy farms decreased by 38%.

However, to our knowledge there is no study that analyses the determinants of this far-reaching structural change and more specifically the causal impact of increasing food quality standards. In this paper, we examine based on a panel study the main reasons for dairy farmers to stop delivering milk to a dairy processor in the period 2003-2009. This paper uses a unique dataset based on a panel survey of 296 households in the North and South Central Region of Bulgaria. All households supplied milk to a dairy processor in 2003. In 2009, the households were re-interviewed on their dairy activities and, in the case that they quit their activities, the reasons for quitting. Besides information on the dairy activities, the 2009 survey also collects detailed information on households' income. [1]

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[1] The conceptual framework that is used to analyse the drivers behind the decision to quit commercial dairy farming and the welfare implications of exiting is based on two strands in the literature.

First, this study draws upon a broad literature which analysed the determinants behind structural change in the agricultural sector (e.g. Barkley, 1990, Goetz and Debertin, 2001; Glauben et al., 2006; Breustedt and Glauben, 2007). One specific strand in the literature on structural change focused on the analysis of relationship between farm growth and farm size (Sumner and Leiby, 1987; Shapiro et al., 1987; Weiss, 1999; Rizov and Mathijs, 2004; Swinnen and Dries, 2004; Dolev and Kimhi, 2010). However, only few studies have analysed structural change in the new member states of the EU and none of them have attempted to analyse the implications of EU accession. In this perspective, this study is unique as it uses survey data from Bulgaria in the period 2003-2009, which includes EU accession.

Second, the study contributes to the debate on welfare implications of increasing food standards for poor, small farmers. In the early literature, there were several studies that confirmed the prediction that small and poor farmers are systematically excluded from the supply chain, which negatively affected their incomes (e.g. Dolan and Humphrey; 2001; Humphrey et al., 2004; Key and Runsten, 1999; Reardon et al., 2003; Weatherspoon et al., 2001; Weatherspoon and Reardon, 2003). In contrast, surveys in Eastern Europe find little evidence that small farmers have been excluded from supply chains (Dries and Swinnen, 2004; Dries et al., 2009). In the horticultural sector, Minten et al. (2009) and Maertens and Swinnen (2009) find that poor rural households experienced measurable gains from supplying high standards horticulture commodities to global retail chains.

In a more extended version of the paper, the conceptual framework is described in more detail.

There are three main results. First, the survey results show that when asked about the main reasons for quitting, households mention ageing of the household and health problems, but not an increase in food quality regulation. Second, we found that an increase in off farm employment alternatives has contributed positively to the decrease in dairy deliveries. Third, we find no evidence of negative welfare effects associated when farmers stop their commercial dairy activities. Moreover, we can distinguish between three groups of households. The first group are the "commercial" farm households. These households, who increased their dairy farm size over the period 2003-2009, are the best off in terms of per capita income. In general, these households had more cows in 2003 and are younger. The second group of farm households are those that stopped their commercial dairy activities by 2009, mostly under impulse of increased off-farm employment alternatives or retirement. In terms of per capita they are worse off than the "commercial" dairy farmers, but better off than the third group (or the "semi-subsistence" farm households). This third group of households, who is the worst off in terms of per capita income, are those that did not have access to off-farm employment alternatives or pension payments and also did not manage to increase their dairy farm size. For these households selling their surplus milk production to a dairy processor can be considered as a form of "survival" agriculture.

2 Data

To identify the driving factors behind the massive outflow from dairy farming and the welfare implications of this exit decision for these farmers, we base our analysis on a panel survey of rural households in in the North and the South Central region of Bulgaria. The first round of the survey took place in 2003 (pre-EU accession), while the second round in 2009 (post EU-accession). In 2003, a total of 296 households that supplied milk to a dairy processor were surveyed. In 2009, the same households were visited and interviewed. From the 296 households that were interviewed in 2003, 101 households were still supplying milk to a dairy processor in 2009, while 124 households stopped supplying milk to a dairy processor. We were not be able to trace back 71 of the households interviewed in 2003. This corresponds to an attrition rate of 24%. This is relatively high, but given the age structure of the Bulgarian farm households not unsurprisingly. We asked neighbours and key informants in the villages whether they knew what happened to these households. Based on these interviews we found that the households members of the majority of these households either passed away or moved to household members in another village or city because they were too old or too ill to live alone (67%).

3 Evidence on exit and growth in commercial dairy farming and its welfare implications in the Bulgarian dairy sector

3.1 Exit from commercial dairy activities

Our survey evidence confirms the massive outflow from dairy farming that was already observed in the aggregate data. A total of 124 households (or 42% of the households interviewed in 2003) stopped delivering milk to a dairy processor by 2009.[2] The majority of these farmers stopped all dairy farming activities and only a minority of

[2] In reality, the total number of households that stopped delivering to a dairy processor is higher as we did not include the households which we were not able to trace back and stopped delivering to a dairy processor. In addition, to asking what happened to these households, we also asked the neighbours and village representatives what happened to the cows. According to these informants, 89% of the households that we were not able to trace back either sold (71%), slaughtered (11%) or gave away (7%) their cows. For 11% of the households that we were not able to trace back, the informants did not know what happen to the cows.

the farmers was still selling milk in the village and/or producing milk for own consumption (10 households). The main reason to stop their commercial dairy activities, was *"We are too old or we have health problems such that we are no longer able to keep cows or to produce milk on a commercial basis"* (64% of the households that stopped delivering to a dairy processor). The second most important reason was *"Other agricultural productions are more profitable"* (19%), while the third most important reason was *"We found other (non-farm) employment"* (14%). Only one household mentioned low milk quality as the main reason to stop delivering to a dairy processor.

There are substantial differences between households that stopped delivering to a dairy processor and those that did not stop delivering to a dairy processor. Table 1 gives an overview of the most important characteristics.

Table 1: Differences between farmers that stopped delivering milk to a dairy processor (EXIT) and those that are still delivering milk (SURVIVAL)

	EXIT	SURVIVAL	T test
Household characteristics related to non-agricultural income			
Household members in off-farm work in 2003	0.70	0.43	2.19**
Household members in off-farm work in 2009	0.91	0.45	3.71***
Number of pensioners in the household in 2003	1.46	1.14	2.67***
Number of pensioners in the household in 2009	1.28	1.09	1.75*
Milk quality characteristics			
Received quality premium in 2003	7%	8%	0.17
Milk was classified as non-standard milk in 2003	11%	8%	0.67
Milk price in 2003	0.29	0.28	1.12
Farm characteristics			
Number of cows in 2003	2.46	5.63	4.11***
Yield in 2003 (litre/ cow/ day)	11.43	11.50	0.14
Assistance program in 2003	3%	14%	2.95***
Land owned in 2003 (hectares)	3.00	3.91	1.78*
Income characteristics*			
Total income in 2009 (Leva/capita)	4990	5025	0.03
Agricultural income in 2009 (Leva/capita)	1056	2913	1.67*
Earned (non-farm) income in 2009 (Leva/capita)	1736	844	3.44***
Non-earned income in 2009 (Leva/capita)	2199	1268	2.49**

* All income characteristics are calculate based on the household survey. They are expressed as in leva per capita and in order to calculate the household size we used the OECD-modified equivalence scale. This scale, first proposed by Haagenars *et al.* (1994), assigns a value of 1 to the household head, of 0,5 to each additional adult member and of 0,3 to each child (under the age of 15).
Source: Authors' calculations based on the dairy household survey sample

First, we find that in 2003, 0.70 individuals in the exiting households and 0.43 individuals in the households that are still active in commercial dairy farming in 2009, are working off farm. In 2009, the average number of individuals working off farm in existing households has increased to 0.91 individual per household and to on average 0.45 individuals in the households that are still delivering to a dairy processor in 2009. Similar, we find that in households that stopped delivering to a dairy processor, there are on average 1.28 pensioners in 2009, while in households that are still delivering milk there are on average 1.10 pensioners in 2009.

Second, we considered three indicators for milk quality in 2003:[3] the percentage of farmers that received a quality premium for their milk in 2003, the percentage of farmers that delivered milk below the minimum standard to the dairy in 2003 and the milk price in 2003. However, for none of these indicators we find a significant difference between households that stopped delivering to a dairy processor and households that are still delivering to a dairy processor.

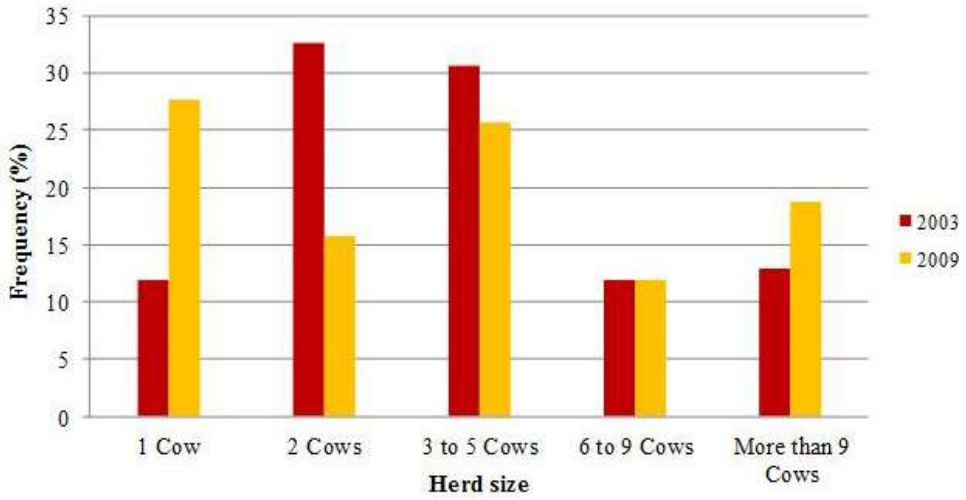
These findings seem to suggest that the main drivers behind farm exit from commercial dairy farming (milk deliveries to a dairy processor) are the ageing of the farm population and the growth of employment alternatives. Unlike what is often cited in the public opinion, we did not find qualitative evidence that quality requirements have played an major role in the decision of the farmer to stop delivering to a dairy processor.

3.2 Growth of the remaining commercial dairy farms

Our survey data showed that 101 dairy households (or 34% of the 2003 household sample) are still delivering to a dairy processor in 2009. In terms of farm growth, we find that 39 households increased their farm size, while 37 households decreased their farm size and 25 households did not change their farm size over the period 2003-2009.

This resulted in a substantial change in the size distribution of the surviving farms (Figure 1). Similar to previous research on the dairy sector in different countries, we find evidence of that the dairy sector is moving towards a bimodal farm structure, with small part-time farmers who sell their surplus production on the one hand and large full-time farmers on the other hand.[4] However, while in numbers of farms the smallest farms have significant growth rates, in terms of livestock the most important growth occurred in the group of farms with more than 9 cows.[5]

Figure 1: Evolution of the farm distribution of the households that still have commercial dairy activities in 2009



Source: Authors' calculations based on the dairy household survey sample

[3] In the 2003 survey, we included very detailed questions on the quality of the milk that the farmer delivers to the processor. However, the quality of these data is relatively poor as many farmers were not aware of how they scored on the main quality indicators. Therefore, we use three proxy variables to control for the milk quality of the farm households in 2003.

[4] In fact, the existing evidence is mixed. Some authors, such as Weiss (1999) and Dries and Swinnen (2004,) provide evidence of an evolution towards a bimodal farm structure in respectively the Austria livestock and the Polish dairy sector. However, others, such as Sumner and Wolf (2001) have analysed the US farm distribution and found no evidence that US dairy farm distribution is bimodal.

[5] In a more extended version of the paper, there is a figure to illustrate this.

There are substantial differences between the farm that managed to increase their farm size and those that did not change or even decreased their farm size. These differences are summarized in Table 2.

In general, we find that farm households which increased their farm size are on average larger and younger households. In addition, we find that it were mainly the households which already had more cows in 2003 that managed to grow, but more interestingly is the impact that farm assistance programs seem to have on farm growth. While only 5% of the households that did not increase their farm size received at least one farm assistance program, 28% of the households that increased their farm size received at least one assistance program from the dairy processor. In the recent years, the importance of assistance programs offered by the dairy processor increased for both groups and in 2009, 15% of the households that did not increase their farm size received and 46% of the households that increased their farm size at least one assistance program from the dairy processor in the period 2003-2009.

Table 2 Differences between surviving farmers that increased their farm size in the period 2003-2009 (POS_GROW) and those who did not (NO_POS_GROW)

	POS_ GROW	NO_POS_ GROW	T test
Household characteristics related to non-agricultural income			
Household members in off-farm work in 2003	0.41	0.45	0.26
Household members in off-farm work in 2009	0.56	0.37	1.28
Number of pensioners in the household in 2003	0.87	1.31	2.43**
Number of pensioners in the household in 2009	0.80	1.29	3.08***
Milk quality characteristics			
Received quality premium in 2003	10%	6%	0.68
Milk was classified as non-standard milk in 2003	10%	6%	0.68
Milk price in 2003	0.29	0.29	0.29
Farm characteristics			
Number of cows in 2003	7.69	4.26	2.10**
Yield in 2003 (litre/ cow/ day)	11.16	11.71	0.78
Assistance program in 2003	28%	5%	3.47***
Land owned in 2003 (hectares)	3.54	2.65	1.00
Income characteristics*			
Total income in 2009 (Leva/capita)	6794	3731	2.32**
Agricultural income in 2009 (Leva/capita)	4861	1422	2.54***
Earned (non-farm) income in 2009 (Leva/capita)	968	810	0.59
Non-earned income in 2009 (Leva/capita)	966	1499	2.21**

* All income characteristics are calculate based on the household survey. They are expressed as in leva per capita and in order to calculate the household size we used the OECD-modified equivalence scale. This scale, first proposed by Haagenars *et al.* (1994), assigns a value of 1 to the household head, of 0,5 to each additional adult member and of 0,3 to each child (under the age of 15).
Source: Authors' calculations based on the dairy household survey sample

3.3 Welfare implications of the exit from commercial dairy farming

Several studies have argument that the emergence and rapid spread of increasing food standards in transition and developing countries pushes a large share of farmers and in particular poor, small farmers, out of the market as food-processing companies prefer to contract with larger and wealthier farmers, who are more able to make the necessary investments to upgrade the quality of their produce (see among others, Farina and Reardon, 2000; Humphrey *et al.*, 2004; Key and Runsten, 1999; Reardon *et al*., 2003).

In this perspective, it is expected that there would be negative welfare implications for the farmers that stopped their commercial dairy farming activities under impulse of more stringent food standards due to EU accession. However, based on our household survey results we did not find a significant difference between the 2009 per capita income of farm households that exited (4990 leva/capita) and those that have commercial dairy farming activities (5025 leva/capita) (Table 1).[6] When breaking the total income in different components we find large differences between the two groups of households in 2009. Agricultural income of those who exited (1056 leva/ capita) is significantly lower than the agricultural income of those that are still delivering to a dairy processor (2913 leva/ capita). On the other hand, the per capita earned non-farm income and non-earned income of those that stopped delivering to a dairy processor is significantly higher than for those that are still delivering to a dairy processor.

Interestingly, we find that the per capita income of those that stopped their commercial dairy farming is higher than the per capita income of those that are still delivering to a dairy processor, but did not managed to increase their farm size (3731 leva/capita) (Table 3). This suggests that the households that are the worst off are in fact the households that continued to deliver their surplus production to a dairy processor, but were not able or did not have the intention to increase their farm size (and often even decreased their farm size).

Table 3: Differences in income of the three groups of farmers*

	EXIT	POS_ GROW	NO_POS_ GROW	P-value of H_a**
Income in 2009 (leva/capita)		6794	3731	0.01***
Income in 2009 (leva/capita)	4990	6794		0.09*
Income in 2009 (leva/capita)	4990		3731	0.08*

*The different groups of households are EXIT (= households that stopped their commercial dairy activities in 2009), POS_GROW (= households that increased their commercial dairy activities in 2009 compared to 2003) and NO_GROW (= households that still had commercial dairy activities in 2009, but did not increase their activities in 2009 compared to 2003).

** We test as the H_0-hypothesis that the difference between the highest income and the lowest income is zero. The H_a hypothesis for which we present the p-value says that the difference is larger than 0.

Source: Authors' calculations based on the dairy household survey sample

In fact, we can distinguish between three groups of households. The first group are the "commercial" farm households. These households, who increased their dairy farm size over the period 2003-2009, are the best off in terms of per capita income. In general, these households had larger farm size in 2003 and are younger. The second group of farm households are those that stopped their commercial dairy activities by 2009, mostly under impulse of increased off-farm employment alternatives or retirement. In terms of per capita they are worse off than the "commercial" dairy farmers, but better off than the third group (or the "semi-subsistence" farm households). This third group of households, who is the worst of in terms of per capita income, are those that did not have access to off-farm employment alternatives or pension payments and also did not manage to increase their dairy farm size. For these households selling their surplus milk production to a dairy processor can be considered as a form of "survival" agriculture.

[6] The total income in 2009 is calculated as the sum of sales from agricultural products (sheep milk, goat milk, cow milk, livestock, livestock products and crops); income from subsidies (milk subsidies, single area payments, rural development subsidies); non-farm income (wage employment and self-employment) and non-earned income (renting out machinery, remittances and social payments (pensions, unemployment benefits and child allowances)), minus costs associated with agricultural production (veterinary costs, fertilizer, fodder, hired labour, …).

4 Empirical analysis

4.1 Model specification

First, in order to estimate the impact of the driver behind the decision to stop delivering to a dairy processor, we will estimate a heckman model based on Weiss (1999), Dries and Swinnen (2004) and Foltz (2005):[7]

$$\Pr(SURVIVAL_{it} = 1) = F(W_{it-1}, X_{it-1}, Y_{it}, Z_{it-1}) + \varepsilon_{it} \quad (1)$$

$$GROWTH_{it} = F(W_{it-1}, X_{it-1}, Y_{it}, Z_{it-1}) + u_{it}$$

where $SURVIVAL_{it}$ is a dummy variable that takes a value of 1 when the household is still delivering to a dairy processor in 2009 and 0 otherwise. In order to avoid endogeneity problems, we include for several characteristics lagged independent variables. W_{it-1} is a vector of variables related to non-agricultural income in 2003. X_{it-1} is a vector of variables related to milk quality in 2003. Y_{it} is a vector of control variables related to household characteristics in 2009 and Z_{it-1} is a vector of control variables related to farm characteristics in 2003.

4.2 Variables

The vector W_{it-1} includes the number of household members that are working off-farm in 2003 (*Off2003*) and the number of household members that are a pensioner in 2003 (*Pens2003*). It is expected that households with more access to off-employment (higher *Off2003*) and access to pensions (higher *Pens2003*) use this income as a stepping-stone to leave the agricultural sector (Weiss, 1999). However, on the other hand off-farm employment and income from pensions may offer farmers an extra source of income to invest in their dairy activities (Hertz, 2009).

The vector X_{it-1} includes variables related to the quality of the milk produced in 2003. The first variable is *QualityPrem2003*, a dummy variable that takes a value of 1 if the household received a quality premium in 2003 and 0 otherwise. The second variable is *NonStandard2003*, a dummy variable that takes a value of 1 if the household delivered milk below the minimum standard to the dairy in 2003 and 0 otherwise. Finally, we also include the price (in leva/litre) that farmers received for their milk at the time of the interview in 2003 (*Price2003*) under the assumption that milk quality and price are positively correlated. In case that increasing food quality standards are one of the most important drivers of the recent structuring in the Bulgarian dairy sector, we expect that variables which indicate a higher milk quality have a positive impact on farm survival.

The vector $Y_{i,t}$ includes *HHsize2009*, which is the OECD-modified household size in 2009 and is expected to have a negative impact on farm survival and farm growth. *Avage2009 is* the average age of the household members in 2009. This variable may capture two effects: as a proxy for experience one should expect a positive effect on growth. However, younger people are typically more dynamic and entrepreneurial and therefore age may have a negative impact on growth. *EduHead2009* is the number of years of education that the household head had in 2009 and is expected to have a positive effect on survival and growth. *ChangeHH* is a dummy variable that takes a value of 1 if the household head changed in the period 2003-2009. Similar to *AvAge2009*, we expect that there may be two opposing effects. On the one hand, a new farm household head is less experienced in making decisions and one might expect a negative effect on farm growth,

[7] Similar to the cited studies we use a two-step method as suggested by Heckman to control for sample attrition bias (Heckman, 1979). Using this methodology, one first estimates a probit model on farm survival from which ones obtains the inverse Mill's Ratio, which allows to control for sample attrition bias in the least squares regression for the surviving farms.

but, on the other hand, it can lead to a change in the management, which may have a positive effect on farm growth.

Finally, we also include the vector Z_{it-1}, which includes the farm size variables. *Cows2003* is the natural logarithm of the number of cows in 2003 and to capture potential non-linear of the relationship between initial farm size and farm growth, we also include *Cows2003SQ*, the squared value of Cows2003, and *Cows2003CU*, the cubic value of Cows2003. *Yield2003* is the 2003 yield (in litre per cow) and is expected to have a positive effect on farm survival and farm growth. *Program2003* is a dummy variable that takes a value of one if the household received at least one assistance program from the dairy and zero otherwise. Case studies and interviews indicated that vertical integration strategies, such as assistance programs, have led to improved access to finance, inputs and technology for farmers, improved product quality, agricultural output and productivity (see among others Gow et al., 2000; Dries and Swinnen, 2004; Van Herck *et al*., 2011). Therefore we expected a positive impact of assistance programs on farm survival and farm growth. *Owned2003* is the size of the agricultural land that the household owned in 2003 (in hectares). We expect that owning more agricultural land has a negative impact on dairy farm survival because of two possible reasons. First, in case the land was rented out farm households that own more land have a higher non-earned income. Second, having more owned land may allow the household to switch more rapidly between different types of agricultural production.

4.3 Results

The results of the two-step heckman model, used to estimate the econometrical model described by (1), are presented in Table 4. For each model specification, the first column shows the results of the survival equation (or the first equation of model (1)), while the second column gives the results of the growth equation (or the second equation of model (2)). [8]

The estimated coefficient for *Off2003* and *Pens2003* are found to be significant for the survival model, but not for the farm growth model. These results imply that farm households with more access to off-farm employment alternatives and non-pensions are more likely to leave the agricultural sector. This confirms earlier results by Weiss (1999) and Dries and Swinnen (2004), who also find a significant negative relationship between off-farm employment and farm survival. These findings suggest that increased off farm employment alternatives are a stepping-stone out of the agricultural sector.

Interestingly, we did not find a significant impact of the quality variables on farm survival nor farm growth in any of our model specification. This suggest that, in contradiction to the public opinion, increasing food quality standards have not been one of the main drivers behind structural change in the Bulgarian dairy sector and that, like already indicated, the development of off-farm employment alternatives was by far more important for the recent far-reaching structural change.

Assistance programs (*Program2003*) that dairy companies provide for their supplying farms are also found to have a highly significant positive impact on farm growth. This suggest that in the period 2003-2009 farm assistance programs provided by the dairy processors, in combination with general improvements in the Bulgarian (rural) credit market, have a significant positive impact on farm investments and farm growth by mitigating farmers' credit constraints.

[8] As robustness check, we also estimated alternative model specifications to test for the correlation between the quality variables. However, due to size limitations these results are not reported in this version of the paper, but can be found in a more extended version of the paper.

In addition, we find an important negative impact of having more owned land on farm survival, which suggests that households with more owned land in 2003 have more non-earned, rental income and/ or could more rapidly switch to another agricultural production (e.g. crop farming). These two effects facilitated their exit from dairy farming.

Finally, we find a significant positive coefficient of *Cows2003* on farm survival, indicating that in general larger farmers were more likely to survive the period 2003-2009 and the associated farm restructuring process. In addition, we also find a significant coefficient on the three farm size variables when analysing farm growth. First, we find a negative impact of *Cows2003* on farm growth, which is inconsistent with the prediction of Gibrat's law that firm growth is independent on the initial firm size, but consistent with previous findings by Weiss (1999) and Dries and Swinnen (2004). Second, the significant coefficient on *Cows2003SQ* and *Cows2003CU* indicate evidence of non-linear relationship between farm size and farm growth. Based on the coefficients, we can estimate the turning points at a herd size of 3 cows (minimum) and 12 cows (maximum). This confirms our earlier findings that some of the farmers in the medium group have reduced their farm size and became semi-subsistence farmers, while others have increased their farm size substantially and became "commercial" farmers (section 4.2).

Table 4: Heckman regression results

	Survival		**Growth**	
	Coeff.	**|z-value|**	**Coeff.**	**|z-value|**
Off2003	-0.438	-3.29***	-0.038	-0.22
Pens2003	-0.275	-1.79*	-0.066	-0.60
Milk quality				
QualityPrem2003	0.039	0.09	0.222	0.90
NonStandard2003	-0.048	-0.13	0.345	1.33
Price2003	5.966	1.47	-1.147	-0.47
Household characteristics				
HHsize2009	0.384	2.34**	0.185	1.50
AvAge2009	0.008	0.67	0.003	0.36
EduHead2009	0.069	1.56	0.026	0.71
ChangeHH	-0.669	-1.60	0.009	0.02
Farm characteristics				
Cows2003	0.680	3.77***	-1.161	-2.45**
Cows2003SQ	-	-	0.740	2.24**
Cows2003CU	-	-	-0.135	-1.95*
Yield2003			0.001	0.06
Assistance2003	-0.036	-1.15	0.604	2.25**
LandOwned2003	-0.113	-2.73***	-0.032	-0.68
Constant	-10.46	-5.78***	1.778	1.08
Rho	-0.12 (0.87)			
Observations	224			

* significant at 10%; ** significant at 5%; *** significant at 1%
All regression results include village dummies.
Source: Authors' calculations based on the dairy household survey sample

5 Conclusion

The accession to the European Union (EU) led to dramatic changes in agricultural employment in the new member states and several studies indicate that the introduction of stringent requirements related to food quality was the main reason for the dramatic decline

in the number of farmers. This is expected to have important welfare implications for the rural population as especially small, poor farmers, who are not able to make the necessary investments, would be excluded from the value chain.

In this paper uses a unique dataset based on a panel survey of 296 dairy producing and supplying households in the North and South Central Region of Bulgaria to analyse the driver behind the far-reaching restructuring in the period 2003-2009 and more specifically, it analyses the impact of increasing food quality standards, which have been implemented at the eve of EU accession. In addition to this, the paper also documents the welfare implications of the restructuring process. There are three main results.

First, the survey results show that when asked about the main reasons for quitting, households mention ageing of the household and health problems, but not an increase in food quality and regulation. Second, we found that an increase in off farm employment alternatives has contributed positively to the decrease in dairy deliveries. Third, we find no evidence of negative welfare effects associated when farmers stop their commercial dairy activities. Moreover, we can distinguish between three groups of households. The first group are the "commercial" farm households. These households, who increased their dairy farm size over the period 2003-2009, are the best off in terms of per capita income. In general, these households had larger farm size in 2003 and are younger. The second group of farm households are those that stopped their commercial dairy activities by 2009, mostly under impulse of increased off-farm employment alternatives or retirement. In terms of per capita they are worse off than the "commercial" dairy farmers, but better off than the third group (or the "semi-subsistence" farm households). This third group of households, who is the worst of in terms of per capita income, are those that did not have access to off-farm employment alternatives or pension payments and also did not manage to increase their dairy farm size. For these households selling their surplus milk production to a dairy processor can be considered as a form of "survival" agriculture.

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