Green Open Access Version of Paper for
Land Use Policy (accepted 10th October 2016)

The Commercialisation of Subsistence Farms: Evidence from the New Member States of the EU

Lena Fredriksson[1], Alastair Bailey[2], Sophia Davidova[3], Matthew Gorton[4,] and Diana Traikova[5]

[1] Swedish National Audit Office (Riksrevisionen), Stockholm, Sweden
lena.fredriksson@riksrevisionen.se

[2] School of Economics, Keynes College, University of Kent, Canterbury, Kent CT2 7NP, UK
A.Bailey@kent.ac.uk

[3] School of Economics, Keynes College, University of Kent, Canterbury, Kent CT2 7NP, UK
S.M.Davidova@kent.ac.uk

[4] Newcastle University Business School, 5 Barrack Road, Newcastle upon Tyne, NE1 4SE, UK matthew.gorton@ncl.ac.uk

[5] Leibniz Institute of Agricultural Development in Transition Economies (IAMO) Theodor-Lieser Str. 2, 06120 Halle (Saale), Germany, traikova@gmail.com

Acknowledgement
Survey research underpinning this paper was conducted as part of SCARLED, a research project supported by the EU's Sixth Framework Programme (Contract No 044201).

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Abstract

For selected regions of five EU Member States (Bulgaria, Hungary, Poland, Romania and Slovenia), this paper examines the determinants of the commercialisation of (semi)subsistence farms. While subsistence farming has become an important feature of the EU, there is a lack of evidence on its spatial distribution, importance and reasons for persistence. The analysis utilises cross-regional survey data and qualitative interviews. Results suggest the absence of a subsistence poverty trap driven by either farmer perceptions or transactions costs although capital endowment appears to play a significant part. On the other hand the degree of market engagement depends on access costs, which vary with location, households' productive assets, specialisation, and risk propensity. Implications for land use policy are discussed.

Key words:
Subsistence agriculture, small-scale farming, European Union, cross-regional comparison, quantitative and qualitative methods

1. Introduction

The regional landscape of the European Union (EU) changed dramatically during the early years of the 21st Century. Two waves of enlargement, first in 2004 and then in 2007, followed by the accession of Croatia in 2013 saw the Union grow from 15 to 28 member states and its geographic gravity moved eastward. In the process, the number of farmers in the EU more than doubled, increasing from 5.7 to 13.7 million, while the utilised agricultural land area (UAA) rose from 125 to 174 million hectares (Eurostat, 2014), a rise of 39 per cent. Overall, farms in the EU's New Member States (NMS) tend to be both smaller and less productive than in the EU-15, and a significant number of these farms do not market their output at all or only sell a small portion of it. For instance, in 2007, nearly three quarters (74 per cent) of farms in the NMS (5 million units), produced mainly for their own consumption (Eurostat, 2007). While subsistence farming has previously largely been perceived as a 'developing country problem', the expansion of the borders of the Union thus means that it is now an important feature of land use in the overall EU.

It is expected that low levels of market engagement lead to poor rates of regional economic growth (World Bank, 2007) and contribute to rural poverty. This has the potential to challenge the logic of the EU's Common Agricultural Policy (CAP), with its focus on supporting medium-sized, by international standards, commercially oriented family farms (Calus and Huylenbroeck, 2010). Action was taken in June 2013 to redesign parts of Pillar 1 of the CAP specifically to provide flat-rate aid to small-scale farmers. Facilitating the restructuring of farms with a low degree of market participation is also a policy objective of the 2014-2020 Rural Development Programmes within Pillar 2 of the CAP (for instance in the area of farm and business development).

Against this background, the objective of this study is to investigate the determinants of, and barriers to, the increased commercialisation of subsistence and semi-subsistence

farmers in three regions within each of five NMS (Bulgaria, Hungary, Poland, Romania and Slovenia). Collectively, in 2007, these five countries accounted for 53 per cent of the total number of farms in the EU-27 and 82 per cent of semi-subsistence farms (Eurostat, 2007).

These countries present a variety of land use policy contexts, having followed different paths of structural adjustment of agriculture and possess different degrees of rurality and dependence on farming. Swinnen et al. (2005) emphasise that, due to largely private agriculture before transition, structural reforms in Poland and Slovenia were less marked than in the other three countries, and therefore the farm size distribution in Poland and Slovenia is less polarised, in contrast to Bulgaria, Hungary and Romania. A cluster analysis of 22 EU Member States[1] with a special emphasis on predominantly rural areas and agriculture, placed these five countries in three different clusters (Tocco et al., 2012). Bulgaria, Hungary and Poland, together with some Southern EU-15, exhibit a relatively high share of population, employment and value added in predominantly rural areas with agriculture's share of total employment just below 9 per cent. Slovenia is in a cluster with even higher economic importance of rural areas but with a high level of education and training of rural labour, including farmers, which suggests that they may be more able to commercialise and respond to market signals. In another cluster, Romania presents the highest level of employment in agriculture but the farm labour force has a very low level of training and a high share of farm holders are 65 years of age or older. Throughout the region, the level of human capital in agricultural households, which is a significant determinant of farm decision making (Rizov, 2005) and has a positive effect on farm survival and growth (Rizov and Mathijs, 2003), is low. However, the effect of human capital depends strongly on the degree of market imperfections (Rizov and Swinnen, 2004).

[1] Cyprus, Malta, Luxemburg, Austria and Lithuania were not included due to missing data. At the time the research was carried out in 2012, Croatia was not an EU Member State.

To date, the analysis of subsistence farming in the NMS has been compromised by a lack of adequate data. These small yet numerous farms have been excluded from many official statistical surveys as they fall below the set size thresholds for data collection and, as a consequence, little is known about their asset holdings, market and production activity or indeed their attitudes and goals (Davidova et al., 2013). In order to define subsistence farming, this study follows Wharton (1969), who proposed a cut-off point differentiating semi-subsistence from commercial farming at 50% of output sold, a threshold which has been used widely in studies focused on small semi-subsistence farms. Throughout this paper, the terms subsistence and semi-subsistence farms are used interchangeably.

This paper takes an agricultural household perspective, noting that households can engage in multiple economic practices to create livelihoods. Particular strategies followed (practices) reflect both the social and economic networks in which households are embedded (Brown and Kulcsar, 2001) as well as preceptoral dispositions (Sitkin and Pablo, 1992). Farm households can be both producers and consumers of their agricultural output, so that conventional models of firm behaviour are inappropriate for understanding commercialisation decisions. Rather, an agricultural household faces three alternative market regimes for each good. These include a position as a net seller, a net buyer or self-sufficiency, thus not participating in the market. The basic proposition is that a household's choice of market regime (practice) will depend on the socio-economic networks in which it is embedded, reflecting varying nested geographies (Smith and Stenning, 2006), as well as internal household characteristics, both structural and preceptoral. The factors that may affect the market regime of a household can be classified, thus, into three broad categories: a/ locational; b/internal to the household; and c/ external to the household, mainly the market environment. This classification informs the empirical research.

Barrett (2008) introduces the concept of a subsistence poverty trap in the case of sub-Saharan agriculture. This situation, he explains, can be generated by the presence of significant transactions costs which form barriers to market entry and a lack of finance, productive assets and technology that limit the scale of marketable surpluses. The data used in this study allow for the analysis of each of these factors. However, the work presented below permits us to also consider the impact of other latent factors in this problem. Potential latent factors which may influence the behaviour of householders could include, but are not limited to, entrepreneurial ability and motivation, perceptions of market risks or potential exploitation by traders, which might help trap households into subsistence livelihoods.

2. Material and Methods

2.1 Research Strategy

The research combines both quantitative and qualitative methods. The quantitative approach, applied to data from a bespoke survey across five NMS[2] captures the regional diversity that exists in rural areas in the region. At the first stage of the sampling procedure three NUTS3 regions[3] were selected depending on their level of economic development, and at the second stage, three villages were selected within each region again depending on their level of economic development.

The quantitative analysis may face the problem of sample selection bias. It is plausible that market participation as a seller is correlated with unobservable factors which also affect the decision of how much output to sell. The decision to engage in markets in the first place then may be considered as a self-selection problem. In other words, sellers may not form a random subgroup of the sampled population but differ systematically, in unobservable aspects,

[2] Data were collected through a primary survey within the EU FP6 programme "Structural Change in Agriculture and Rural Livelihoods" (SCARLED) project.

[3] NUTS stand for Nomenclature of Territorial Units for Statistics and is used by Eurostat and EU institutions. NUTS3 are regions with population between 150,000-800,000 for which Eurostat provides statistics comparable across the EU.

from those not participating in output markets. Heckman (1976) introduced a two-step process for data analysis to correct for sample-induced endogeneity. The first step utilises a probit model (Equation 2) to estimate the probability of an observation entering a sample, and the second stage uses Ordinary Least Squares (OLS) regression (Equation 1) to predict the dependent variable. To account for potential biases which may derive from non-randomness, this process uses Equation 2 (in conjunction with Equation 1) to create a selection parameter, the inverse Mills ratio (IMR). This selection parameter is included in Equation 1 to account for potential sample selection bias (Heckman, 1979). In this analysis, in the first step, the determinants of market participation are estimated alongside the associated Mills ratio. The second step estimates the determinants of the degree of market integration. This procedure, in addition to ensuring that estimates are consistent in the presence of self-selection, allows us to test an interesting proposition. The presence of a self-selection bias can suggest that there are latent barriers to market integration that hold farms into potentially low welfare subsistence behaviours. As such it allows us to test a special case of the subsistence poverty trap (Barrett, 2008) generated by household factors not captured in our data set. This can be labelled a perceptions driven subsistence poverty trap.

The qualitative part consists of a content analysis of material gathered from in-depth, semi-structured interviews with rural Bulgarian households selected from the survey sample. Interviews involved households in five of the surveyed villages in two NUTS3 regions. These households were revisited twice after the collection of data for the quantitative survey with visits occurring in 2010 and 2014 in order to investigate their plans for, and paths of, farm development. Emphasis was placed on commercialisation, and in some cases, disengagement from agriculture or lack of change. In each case, the factors determining these paths were investigated in detail, including household, village and regional opportunities for, and barriers to, commercialisation.

The combination of quantitative and qualitative research leverages their complementary strengths and offers greater insights than if each were applied individually (Venkatesh et al., 2013). In this case, the survey provides breadth and the basis for identifying the determinants of commercialisation, while the qualitative research generates insights into specific factors, such as the role of family dynamics, the complexity and essence of which are difficult to capture in survey research. Together the methods thus provide a better basis for drawing conclusions and policy recommendations.

2.2 Quantitative analysis

The decision to engage in output markets is assumed to follow a two-step approach. In the first stage, the household's decision of whether or not to participate in output markets as a seller is estimated by means of a probit model:

$$p = 1\left[z\gamma + \upsilon \geq 0\right] \tag{1}$$

Where p is the probability of being a seller, z is a vector of explanatory variables, γ is a vector of unknown parameters and υ is the error term. p equals 1 if the household sells output, and 0 otherwise.

The second stage 'degree of market integration equation', or in other words, how much output is sold, is represented by a linear regression model. It can be written as:

$$s = \beta x + u,\ E\left(u|x\right) = 0 \tag{2}$$

The Heckman model assumes that u and υ are normally distributed, with a mean of 0, and that they are correlated. Sample selection bias arises when u and υ are not independent of each other. From (2):

$$E(s|z,\upsilon) = \beta x + \rho\upsilon \quad (3)$$

Where ρ is the correlation with the error term of the propensity to be a seller, and unobserved determinants of the degree of market integration equation (υ). However, p is related to υ as represented by equation (1). Hence, equation (3) can be rewritten as:

$$E(s|z, p) = \rho E(\upsilon|z, p) \quad (4)$$

$E(s|z, p)$ mirrors the correlation between the unobserved error terms in both stages of the model. This equals the inverse Mills ratio λ (IMR) evaluated at the mean of z multiplied by its probit estimate γ; $\lambda(z\gamma)$, when p=1. Equation (4) can be then be rewritten as:

$$E(s|z, p = 1) = \beta x + \rho\lambda(z\gamma) \quad (5)$$

If $\rho \neq 0$ OLS estimates of β will be inconsistent unless the IMR is included as an explanatory variable in the regression. Conversely, if $\rho = 0$, OLS will yield consistent estimates. Conditional on the estimated value of ρ, the second stage of the model is estimated either using the Heckman approach of including λ within the behavioural equation for degree of market integration, or by a standard OLS linear regression. Explanatory variables for both stages were selected (Table 1) to represent locational characteristics, captured by country dummies, transaction costs proxies including village distance to urban centre, distance to sales point, village market, infrastructure and different marketing channels, household consumption characteristics and household production characteristics. As presented in Table 1, the group of proxies for transaction costs was extended for inclusion in the OLS regression with variables only relevant if the household engages in the market as a seller.

Table 1 about here

2.3 Qualitative analysis

The qualitative data analysis draws on interviews with ten Bulgarian households included in the SCARLED survey. Purposeful sampling was employed, selecting farm households that increased their share of output sold between 2003 and 2006 (the reference years for the SCARLED survey). This was consistent with the objective to better understand the process of commercialisation. The selected households were located in two different regions (one above and one below the national average for GDP per capita) and five different villages, with varying economic fortunes and typology (three lowland and two mountainous regions).

All ten households were interviewed in autumn 2010 and subsequently re-interviewed in autumn 2014. Re-interviewing occurred in order to understand household and farm dynamics and to compare the objectives and aspirations of households with the outcomes which emerged from the longitudinal study. These aspects are particularly difficult to capture within a cross-sectional survey conducted at one point in time since it is possible that respondents rationalise their situations ex-post. All interviews were recorded and transcribed verbatim to facilitate content analysis.

Data analysis followed the principles of Qualitative Content Analysis (QCA), drawing on in vivo coding of the interview transcripts and each household's initial survey responses (Bazeley and Jackson, 2013). The software package NVivo10 facilitated the application of QCA. At first, codes were treated as free nodes and then organised into trees (parent nodes) acting as connecting points for factors inhibiting / facilitating commercialisation. After classifying nodes into trees, pattern coding was undertaken (Miles and Huberman, 1994) to identify determinants of commercialisation (facilitators and barriers).

2.4 Survey Data

A network of SCARLED project participants undertook data collection, via face to face interviews, in selected representative regions and villages of the five NMS considered. The

survey sample included only households that engaged in agricultural production. The selection of survey regions and villages followed a two-stage sampling process. In the first stage, three NUTS3 level regions in each of the five surveyed countries were selected according to their degree of economic development: (i) lagging behind (ii) average and (iii) relatively prosperous, based upon GDP per capita data for the country from Eurostat. Since the study focuses on activity in rural areas, the regions of the capital and other large cities were excluded from the selection. In the second stage, three villages per selected region were chosen, again with a view to capture variations within the NUTS3 regions based on higher, average and lower prosperity in comparison to the regional mean. Table 2 details the selected regions and villages. Since Poland reclassified substantially NUTS3 regions, the selection of regions was based on characteristics at a lower level – the so-called 'Poviat' (Table 3). Households in selected villages were chosen randomly.

Tables 2 and 3 about here

The regions selected for the survey have varying land use patterns stemming from different topographies and agricultural and non-agricultural economic potential. For example, in Hungary, the Northern Great Plain, where Hajdú-Bihar is located, has an extensive and long tradition of, often export oriented, agri-food production. In Bulgaria, some villages are located not far from the port of Burgas on the Black Sea coast, where there are opportunities for commuting and generation of non-farm incomes. In Poland, one of the selected Poviat, Świdnicki, is situated in the south part of Dolnośląskie Voivodeship with around 15 per cent of its area designated as of high natural value, i.e. scenic parks and nature reserves. Agriculture in Timis in Romania is of central importance for the economy both in terms of employment and its contribution to GDP.

The survey questionnaire elicited information pertaining to location and accessibility, household demographics, time-allocation, incomes and sources of income, factors of production, asset endowment, agricultural output and variable inputs (in quantities and value), marketing channels used, and quantities of farm inputs and outputs traded. Answers to qualitative statements, many of which required a response to 5-point Likert scales, gathered information regarding respondents' attitude to farming and propensity for risk. After cleaning the data, the useable sample consisted of 820 observations. Table 4 presents descriptive statistics, according to the share of output sold.

Table 4 about here

The sample mean of 52.8 per cent of output sold is very close to the threshold of 50 per cent used to differentiate farms as either subsistence or commercial. Table 4 indicates that Bulgaria and Romania have a lower mean share of output sold in comparison to the sample average, at 42.1 and 38.1 per cent, respectively. In contrast, Hungary has the highest mean sales of all survey countries (74.6 per cent). Overall, 8.0 per cent of the survey sample sold no output. Since this variable is a share, observations must naturally lie in the zero-unity interval and will not be distributed as a normal variable. The standard deviation of such a variable must lie between zero and 0.5. In the care of Hungary, the interval of mean plus and minus the standard deviation includes values greater than 100 per cent and indicates that the distribution is negatively skewed. Consideration of the histograms for the distribution of share of output sold, confirms that the majority of farms in the Hungarian sample sell over 75 per cent of their produce. However, there remain a smaller number of farms which are semi-subsistence operations and a significant number of these farms sell a very small share of their output. Hungary appears to be the extreme case where the majority of sample farms behave in a relatively commercial manner but these farms sit alongside a not insignificant number of

subsistence and semi-subsistence farms. It is also clear that the Slovenian sample exhibits a similar, if less pronounced, polarised bi-modal pattern to the distribution of share of output sold. The sample of Romanian farms appears to be unimodal and centred close to the mean while the distributions for Poland and Bulgaria appear to have a significant 'subsistence' spike with the mass of observations distributed around the mean and mode.

3. Results of Econometric Analysis

Table 5 records the summary statistics of the Heckman two-step estimation. The p-value for the IMR (Mill's lambda) is 0.180, implying that the model does not suffer from sample selection bias.

Table 5 about here

This result has significant implications for the perceptions variant of the poverty trap hypothesis advanced by Barrett (2008). The rejection of sample selection bias suggests that there appear to be no latent, or unobservable, factors that condemn particular farms, or the households who rely on them, to be primarily subsistence producers. This indicates that market integration appears to be better explained by the observable characteristics of the household (both structural and preceptoral), the farm itself and its geographical setting alongside those transactions cost indicators included in the model. It is clear from an inspection of the frequency distribution of the share of output sold that there is a cluster of farms which undertake no sales. The result of the Heckman analysis suggests that this observed subsistence behaviour is most likely a consequence of household endowments of productive assets, technology and transactions costs. Each of these issues is the focus of the next part of the analysis.

Table 6 presents the first stage probit estimations. First, considering locational characteristics, only the coefficient for Slovenia is statistically significant at the 1 per cent level

and is negative. Since this result appeared counter-intuitive, a Chi^2-test for the joint removal of country dummies was performed (Appendix A1). This test lends some support for the a priori expectations that country-specific factors influence household decisions of whether or not to sell output.

The group of other variables included as proxies for location are not found to present a significant impact on the propensity to participate in output markets. The test that the selected variables are jointly significant provided further corroboration of this. Considering the context, the surveyed households are all located in, or close to, rural villages in Central and Eastern European countries where the practice of selling surplus production by the side of the road and / or informally within villages is widespread. Thus, it is plausible that market participation, even if only on a small-scale or infrequently, is an option available to all irrespective of village location or other characteristics as, for example, infrastructure. Location may still impact on the share of output sold for households participating in the market as sellers, and this is considered in the second stage of analysis.

Table 6 about here

Considering household consumption characteristics, the propensity to be a seller decreases with the dependency ratio and suggests that subsistence production becomes a higher priority when the number of consumers per worker in a household is higher. A priori, we might expect that the presence of off-farm income to reduce the need to hold back farm products for subsistence consumption. This assumption appears to be supported in these estimates at the 90 per cent level of confidence. However, it should be noted that by adopting a 95 per cent level of confidence it is not possible to distinguish a positive relationship between the presence of an off-farm income source and the share of farm output sold. This suggests that, for some farms,

off-farm income may permit households to enjoy the products of their farm themselves, as such the phenomena of hobby farming may be present in this data.

Several other household and production characteristics appear to be statistically associated with the propensity to sell output. Notably these include the endowment of productive assets including livestock, and capital equipment both owned by the household and that owned by others are estimated to have significant positive effects on the probability to engage in output markets. Interestingly though the area of cultivated land does not. This perhaps demonstrates that farms at the extreme end of subsistence behaviour are unable to fully utilise the land they hold possibly due to limited access to other capital assets.

It would appear that those households led by female heads may be less likely to market their output but this holds only at the 90 per cent rather than 95 per cent level of confidence. In addition, the results suggest that farmers' attitude toward general risk is significantly correlated with market participation at the lower, 90 per cent, level of confidence but this significance disappears at the 95 per cent level. This lends some support to the expectation that households who are willing or able to bear some risk have a higher probability of being market engaged. Reassuringly, households headed by operators who state that generating cash income is an important objective for their farming activities, are more likely to participate in output markets as sellers. It is possible that agreement with this statement is simply an expression of ex-post justification of the household's current activities, but it may also be the case that attitudes and objectives matter for the decision to sell output.

The second stage models the degree of market integration using the share of output sold as the dependent variable (Table 7). Since selectivity appears to be absent from the data set, the inverse Mills ratio (IMR) is excluded. The reported coefficient of determination, the R^2, for this regression may appear to be low, suggesting that the equation explains just 37 per cent of the variation in the sample data. Such low values of R^2 are not uncommon in cross-sectional

data that do not contain common, time series, trends and as Cramer (1987) and others note, the use of R^2 or adjusted R^2 to assess regression performance is an unwise pastime.

Table 7 about here

The significance of country dummies in the model suggests that there are unobserved country characteristics which affect commercialisation. Such factors might, for example, relate to government policies, labour market characteristics and level of social transfers, topographical and agro-ecological differences, as well as prices in agricultural input and output markets. Considering the magnitudes of the country dummy coefficients, such characteristics appear to have a substantial impact on the share of output sold, notably in the case of Hungary but also for Slovenia and Poland.

Inadequate market and transport infrastructure affects negatively the share of output sold. It is surprising that the distance to sales point affects positively the proportion of output sold, but although significant, the magnitude of the coefficient is rather small. It is notable also that distance to the nearest urban centre and the presence of a local village market appear to have no significant effect on the proportion of output sold since these factors would also be expected to influence the transport and transactions costs of accessing a market. At the household specific level, the results in Table 7 suggest that those farms who sell produce under contract sell a greater share of their output. Since contracts are recognised to reduce transactions costs which could otherwise contribute to the subsistence poverty trap, this result deserves mention. On the other hand, the estimated coefficients for the number of buyers and the use of co-operatives are insignificantly different from zero in these results.

The coefficients of age and age squared of the head of the household are significantly different from zero at a 90% level of confidence and they possess opposing signs. This is

expected as the degree of market integration increases with age and, what is commonly ascribed to, experience but only up to a certain point (the estimated turning point is around 50 years of age) when it starts to decrease. This result potentially underlines the importance of the life cycle for understanding patterns of commercialisation. However, caution is required in making this inference because the estimated coefficients of both age and age squared are indistinguishable from zero at the 95 per cent level of confidence.

Unsurprisingly, the size of a household's portfolio of productive assets, land and livestock, has a positive effect on the degree of commercialisation. However, the ownership of land and the dispersion of land parcels, an often discussed facet of the study region (Hartvigsen, 2014), appears to have little impact of the degree of market engagement of households. As expected, farms which produce a wider variety of outputs appear to sell a smaller share of their output. Subsistence orientated households must produce a wider range of products to satisfy household consumption bundle preferences and allocating small land holdings to more products could lead to smaller residual marketable surpluses for each product. Just as importantly, there are likely to be benefits from specialisation, including economies of scale that may further promote an increase in the share of output sold.

A reliance on the use of the production technology 'farming with other people's equipment' is statistically significant and is different from farming manually, and its effect is relatively large as we would expect. The technology coefficient, for farming with 'own equipment' is, however, insignificantly different from zero. It is plausible that the range and quality of machinery small-scale farmers can afford, or effectively employ as single owners, is insufficient to increase productivity in a way that significantly increases commercialisation. By pooling productive assets, farmers could gain access to a wider range of machinery of higher quality boosting their productivity and aiding commercialisation. The proportional transactions

costs indicator, i.e. the contract use, has a highly significant and positive effect on the degree of market participation.

Lastly, the results in Table 7 also suggest that the attitude of a farm household head to the presence of general risks has a particularly large and positive effect on the proportion of output sent to market. While this attribute of the farmer was estimated to have no impact on the probability of market engagement (Table 6), these results suggest that it is those farmers most comfortable with taking risks who engage more fully in markets. These results could suggest that, while risk aversion has little impact on the decision to sell some product, the risk-averse farmer is far less likely to place their trust in the ability of the market to provide an acceptable return on their output and to supply food for household consumption at acceptable prices resulting in a retention of semi-subsistence behaviour for the risk-averse.

4. Qualitative Findings and Discussion

So far, we consider the determinants of market involvement and degree of commercialisation. However, the literature on small-scale farming envisages three mutually exclusive trajectories: commercialisation, status quo or exit from agriculture. Typically exit from agriculture is regarded as a one-off, permanent process with households electing to quit farming. Those who remain typically plan to steadily increase the size and commercial focus of their operations to enhance income and welfare (Foltz, 2004), and some succeed. These assumptions, based on generalised trends witnessed in conventional agri-food systems in Western Europe and North America (Eurostat, 2012), reflect the declining number of farms, and increased specialisation and commercialisation of those that remain. However, none of the interviewed households fits neatly such a pattern suggesting that a more nuanced perspective is required.

Table 8 describes the interviewed households, each of which is summarised in terms of trends for the years 2003-2006 and their situation when re-interviewed in 2010 and 2014. To preserve the anonymity of each household, interviewees are allocated a number, from 1 to 10. The common feature of Cases 1 through to 8 is that they increased their share of output sold between 2003 and 2006. By 2010, Cases 8, 9 and 10 had disengaged from agriculture. Re-interviews in 2014 revealed, however, that Case 9 re-entered agricultural production as a survival strategy while Cases 8 and 10 avoided returning to cultivation but both retained ownership of their land. Case 1 reduced the scope of his farming operations to concentrate on almond production. Case 6 by 2014 produced only for household purposes while Cases 3 and 4 downsized their herds in response to adverse market conditions.

Table 8 about here

The qualitative research indicates that some households that exited farming returned following the loss of non-agricultural jobs or the death of the main income earner (Cases 3 and 9). The fragility of non-farm labour markets, both at home and abroad, and the meagreness of pensions often necessitated re-engagement in agriculture with small-scale farming representing an enduring survival strategy in rural areas that remain poor and with insecure off-farm employment opportunities (Cases 5 and 7).

Increased commercialisation, reported in the survey over the period 2003-2007, was halted due to family dynamics such as age and health problems (Cases 5 and 6), death of a partner (Cases 7 and 10) and children leaving the family home (Case 6). While the literature on the development of family farm businesses acknowledges the importance of age and health (Gasson and Errington, 1993), interviews highlighted the complex impacts that divorce (Case 7) and death (Cases 7 and 10) have on farming and commercialisation decisions. For instance,

Case 10 recounted in 2014 how she sold the family tractor to fund her husband's medical treatment and visit him in hospital.

All sales are to domestic, principally local buyers albeit some households engage in various marketing arrangements which differ in terms of their degree of formality. Possession of a formal contract ensures that dairy farmers have a market for their milk and do not run the risk of excess spoilage. Based on interviews in 2014, Cases 2, 3 and 4 all sell their milk through formal contracts. In addition, having a good relationship with the contracted buyer can have further advantages, facilitating access to inputs and technical advice. However, relying on a contract creates problems if the buyer abuses its market position. This is suspected by Case 4 and his fellow sheep farmers who claimed that they are not always paid the agreed price, but one 20-30 per cent lower. However, since eligibility for subsidies is dependent on holding a formal contract they find it necessary to maintain these perceived unsatisfactory relationships. In addition, in the absence of cooling facilities, selling larger quantities of milk is likely to be problematic without a contract.

In addition to formal arrangements, informal (oral) contracts also appear to favour commercialisation. Cases 1 and 6 both established informal contracts which highly depend upon trust. In the former, the contract is with a large buyer who is also a long-term friend and for Case 6 the decisive factors for his informal contracts all relate to his asset base. First, he owns a car and a trailer which allows him to travel to the wholesale market, where he established contact with the wholesale buyers he now sells to at the farm-gate. Second, his land assets are sufficiently large to generate regular quantities of good quality produce. However, for others operating on a smaller scale, even informal contracts are often infeasible. Consequently, these producers face high relative transactions costs.

Ownership of farm capital (resource endowment) typically remains weak. For instance Case 7 owns no machinery, or draft animals, and states this as the reason why she only

cultivates her kitchen garden and rents out other plots. In the absence of owned machines, there is still the option to pay for machinery services. However, Case 10 explains that paying for machinery services is uncommon in the mountainous area where she lives, claiming that paying for such services fails to make financial sense. Still, one option to access machinery is to collaborate and pool machines. However, none of the respondents were involved in such collaboration, nor did they mention this as a possible means to increase output with a view to higher levels of market integration. While the quantitative analysis thus establishes a positive relationship between use of others' equipment and commercialisation, sharing machinery is not always realised or perceived as a possible strategy. Analyses of successful machinery rings and other forms of local co-operative management of assets highlights the importance of a well-respected and trusted local initiator, presence of a transparent management structure, effective sanctions against opportunistic behaviour, and structure for conflict resolution (Díaz-Pichardo et al., 2012; Gorton et al., 2009; Kutter et al., 2011). The most successful machinery rings in Europe incorporate additional services such as labour recruitment and supply, advice on grants and CAP payments as well as bookkeeping (Flanigan, 2012).

Increased market integration often requires investments in farm machinery and other agricultural equipment, land, livestock and farm buildings. Consequently, a lack of capital to undertake necessary investments constitutes an obstacle for expansion. For example, Case 1 argued in 2010 that he could increase his commercial operations if he could invest in newer and more powerful machinery, and adequate farm buildings for storage. Case 5 also mentioned the need for adequate outbuildings, claiming that expansion would be impractical without investing in cow sheds to accommodate increased numbers of livestock. However, weak local purchasing power and low profitability (Cases 4 and 5) limit opportunities for the expansion of commercial farming operations. Most households grow similar crops or keep livestock (chickens, pigs, sheep in mountainous villages) as their neighbours, reducing opportunities for

sale or differentiation. Only Case 1 by planting almond trees has sought to enter a new, niche market. Generally, investment in agricultural activities has been very limited due to a lack of own resources, personal circumstances and an inability to identify opportunities that would generate sufficient returns to justify obtaining bank loans. Even where farmers are willing to seek external credit, the poor profitability of small-scale farming (especially livestock) limits its feasibility. While CAP payments, do facilitate the purchase of some tradable inputs, such as fodder, they are insufficient to fund investment to upscale operations.

The out-migration of young people, to Bulgarian cities and abroad, is evidenced in Cases 1, 5, 6, and 10. In some cases, migrant children return regularly to the farm household to offer their labour (unpaid) or financially support their parents; in other cases relationships are now distant. As younger adults leave, real purchasing power in the villages dwindles, negatively affecting the opportunities for sales and/or for development of non-farm businesses depending on the local demand. As elderly farmers give up keeping milking cows, the viability of village milk collecting stations also declines (Cases 2 and 3).

The initial literature on post-socialist farming in Central and Eastern Europe emphasised the importance of secure property rights as a facilitator for the growth of family farms (Feder and Nishio, 1998) with international agencies financing land registration programmes. Interviewees highlighted the problems that can emerge from contested property rights, for example poor maintenance of common grazing lands and the difficulty of claiming area support payments where ownership is unclear (Case 3). However, a much wider set of security concerns affect commercialisation decisions. For instance, Case 9 recounted how the family stopped cultivating their plots because of the theft of their crops and a neighbour's guard dogs roaming freely over their land. Case 1 detailed that he benefited from his land being enclosed within that of one large landholder, as the latter's guards inadvertently protected the former's almond garden. Land fragmentation also makes guarding crops and livestock against

theft more difficult, as well as making farming more time-consuming, and generates higher costs for travelling to and from plots and for transporting produce (Case 6). While titled ownership of land is thus important, a wider set of personal and farm security issues also matter for commercialisation.

None of the households interviewed received any support under Measure 141 which was specifically targeted at semi-subsistence farmers and available in Bulgaria during the 2007-2013 programming period. Cases 1 to 4 received CAP payments in 2014 (mix of area payments and animal per head subsidies). These were used to buy agricultural inputs (fodder, fertilisers and chemicals) rather than finance investment. Case 6 previously received area payments which were used to buy firewood. Those most financially constrained had not received any support because their farms were too small or they lacked the required knowledge to apply (Cases 5, 7 and 10). Even those displaying the most entrepreneurial outlook (Case 1) required help to apply for funds from a friend in the municipality office. Cases 2 and 3 recounted that claims for area payments had been partially rejected or fines imposed because plots overlapped in the state cadastral computer system, with competing claims to land remaining unresolved. None of the interviewees perceived that current agricultural policy and support measures, as they experienced them, aided their commercialisation.

5. Conclusion

This paper draws on both an econometric analysis of a bespoke farm household survey covering selected regions and villages in five EU NMSs, and a content analysis of two waves of semi-structured interviews of a sub-sample of households. This twin approach helps us to draw some informative and nuanced conclusions regarding the factors which promote and constrain commercialisation.

Survey results suggest that farmers who sell a large share of their output and those who produce mostly to satisfy their own household needs appear to be drawn from the same

distribution. The results suggest that the endowment of farm assets and having fewer mouths to feed increases the likelihood that a farm household will engage in output markets. In addition, having a male household head, and an off-farm income stream both appear to promote market engagement but here we are less confident in the strength of this association. In this case, the qualitative analysis helps us to understand that female household heads can be very outward looking by necessity of their family situation while the market for off-farm labour remains fragile in many of these study regions which muddies the relationship between motivation and behaviour. For some, farming to maintain the capital asset of, or the food security provided by, one's land may out-weigh pressures to commercialise or to exit agriculture.

Importantly, the lack of statistical significance in the probit regression of the IMR from the Heckman procedure suggests that the latent perceptions of farmers including for example their entrepreneurial ability and motivation, perceptions of market risks and potential exploitation by traders do not influence the decision of whether or not to enter output markets. We framed this concept as a perceptions variant of the subsistence poverty trap hypothesis of Barrett (2008). Reassuringly for the future of these households, such a concept was not supported in this particular study case. In keeping with Barrett's (2008) subsistence poverty trap hypothesis, our results suggest that those farmers who lack productive capital in the form of livestock and other productive equipment are far less likely to engage in output markets but there is a lack of evidence that transactions costs played a significant part in that trap. By implication, households currently engaged in subsistence behaviour are unlikely to be doing so because their views and understanding generate a local optimum in their welfare function. They may find it possible to increase their market engagement when their endowment of, or access to, capital assets improves and when external factors change.

The degree of market engagement, i.e. households' share of own output sold is related to: location, and in particular the level of market and physical infrastructure, the age of the head of the household, the land area available to the household, access to shared farm equipment and the household head possessing a positive attitude toward risk. Those farms which produce a greater range of outputs appear to sell a smaller share of their output.

The results suggest that a significant number of semi-subsistence farms could develop strategies to increase their degree of market engagement and, potentially, lift themselves out of relative poverty. Without the need for additional capital or developments in the land market, arrangements to promote the development of local machinery sharing rings appear to be promising. However, in mountainous areas, in particular, small-scale farmers are reluctant to cooperate. An increase in output specialisation may open the possibility to sell produce on contract with the potential gains that could come from such an arrangement. Where land is available and land markets operate, this strategy could become the springboard for farm expansion.

The qualitative analysis suggests that many of problems faced by small-scale, semi-subsistence farmers stem from underdevelopment (e.g. lack of jobs, weak local purchasing power) and in many regards are more social than agricultural. The rural-urban income/wage gap and the disparity with wages in the established EU-15 Member States drives the out-migration of young people and decreases further purchasing power in the local economy. Consistent with multiplier models (Le Gallo and Kamarianakis, 2011) out-migration and the declining, ageing population that remains make the rural market even smaller and the larger urban one even bigger. This hampers the commercialisation of small-scale farmers who do not have means to transport their produce to urban markets. While cooperatives in theory may boost substantially commercialisation of semi-subsistence farmers (FAO, 2014), the results suggest this has not been the case for the NMS sample (Table 7).

Finally, implications for development theory can be noted. Movement out of agriculture altogether is often portrayed as a 'one shot' decision. However, such a smooth trend assumes stable and growing demand for off-farm employment and activities. As highlighted by the dynamics of the interviewed households, in rural areas characterised by weak off-farm labour markets, non-agricultural activities are precarious and, consequently, frequent exit and re-entry to agriculture is not uncommon. Secondly, the commercialisation decisions of small-scale farms can only be explained by considering family dynamics and cohort life cycles. While survey work can identify some relevant family related determinants (age, dependency ratio), qualitative research enriches the analysis by uncovering the myriad ways in which family dynamics (feuds, divorce, mourning after death of a loved one) impinge on farm business decisions. This supports the choice of a mixed methodology for analysing the determinants of, and barriers to, the increased commercialisation of small and semi-subsistence farms.

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Table 1: Selected variables for quantitative analysis

	1st stage	2nd stage
Locational characteristics*		
Hungary	x	x
Poland	x	x
Romania	x	x
Slovenia	x	x
Household consumption characteristics (z_c)		
Dependency ratio	x	x
Household off-farm time-allocation share (%)	x	x
Household production characteristics (z_q)		
Age of household head	x	x
Age squared of household head	x	x
Gender of household head (Binary)	x	x
Education level household head		x
Cultivated land area (ha)	x	x
Cultivated land area rented in (%)		x
Land dispersion		x
Livestock units (LSUs)	x	x
Crop range		x
Farming technology** (Categorical)		
- Own equipment	x	x
- Others equipment	x	x
General risk attitude (Categorical)	x	x
Farming with household labour only (Categorical)		x
Aim: To generate cash income (Likert-scale)***	x	
Transaction costs		
Village distance to urban centre (km)	x	x
Village market (binary)***	x	
Infrastructure (Likert-scale)	x	x
Distance to sales point (km)		x
Selling on contract (Binary)		x
Selling through a cooperative (Binary)		x
Total number of buyers		x
Household external labour market characteristics (z_l)		
Village unemployment rate (%)	x	x

* Bulgaria is the base country

** Manual farming technology is the base category

*** Variables included in the selection equation and excluded from the outcome equation

Source: SCARLED data set

Table 2: Regions and villages selected for the survey

Country	NUTS3 region	Village	Village population
Bulgaria			
	Prosperous	Ekzarh Antimovo	925
	Burgas	Krumovo gradishte	327
		Nevestino	378
	Lagging behind	Kostandovo	4104
	Pazardzhik	Dorkovo	2679
		Gelemenovo	679
	Average	Morava	936
	Veliko Tarnovo	Karaisen	976
		Nedan	1240
Hungary			
	Prosperous	Kaskantyú	1002
	Bács-Kiskun	Érsekcsanád	2804
		Fülöpháza	841
	Lagging behind	Hortobágy	1470
	Hajdú-Bihar	Bagamér	522
		Nagyhegyes	2714
	Average	Kaposfő	1637
	Somogy	Szenna	772
		Bőszénfa	2540
Romania			
	Prosperous	Dudestii Noi	3032
	Timis	Giarmata	6733
		Satchinez	4900
	Lagging behind	Breasta	4085
	Dolj	Celaru	4443
		Sopot	1580
	Average	Suncuius	3187
	Bihor	Sacadat	1776
		Ciumeghiu	4530
Slovenia			
	Prosperous	Šmartno pri Litiji	5498
	Osrednjeslovenska	Dobrova - Polhov Gradec	7573
		Medvode	15963
	Lagging behind	Cerkvenjak	2058
	Podravska	Markovci	3989
		Ruše	7163
	Average	Cerknica	11387
	Notranjsko-kraska	Ilirska Bistrica	13719
		Loška dolina	3866

Source: SCARLED database.

Table 3: Regions and villages sampled in Poland

Poviat	Village
Prosperous	
Sierpecki	Białyszewo
Inowrocławski	Sławsk Wielki
Sochaczewski	Chrzczany
Average	
Rzeszowski	Bzianka
Bielski	Andryjanki
Świdnicki	Witoszów Dolny
Lagging behind	
Jasielski	Wróblowa
Wysokomazowiecki	Święck Wielki
Wyszkowski	Ulasek

Source: SCARLED database.

Table 4: Sample descriptive statistics according to the share of output sold in 2007 (%)

Share of output sold	Sample total	Bulgaria	Hungary	Poland	Romania	Slovenia
Number of observations	820	186	124	170	179	161
Minimum	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	100.0	100.0	100.0	100.0	94.4	100.0
Mean	**52.8**	**42.1**	**74.6**	**59.6**	**38.1**	**57.7**
Mean Std. Error	1.1	2.1	3.2	2.1	1.6	2.8
Std. Deviation	32.0	29.2	35.2	26.9	21.6	34.9
Skewness	-0.12	0.02	-1.24	-0.52	0.51	-0.45
Skewness Std. Error	0.09	0.18	0.22	0.19	0.18	0.19

Source: SCARLED database.

Table 5: Summary statistics of Heckman two-step estimation

Heckman selection model - two-step estimates	Number of obs	=	820
(regression model with sample selection)	Censored obs	=	66
	Uncensored obs	=	754
	Wald chi2(27)	=	446.15
	Prob > chi2	=	0.0000

		Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Mills							
	lambda	-8.224	6.129	-1.340	**0.180**	-20.236	3.789
	rho	-0.356					
	sigma	23.092					
	lambda	-8.224	6.129				

Table 6: Probit results

Probit regression	Number of obs	=	820
	LR chi2(19)	=	305.12
	Prob > chi2	=	0.0000
Log likelihood = -77.004933	Pseudo R2	=	0.6646

Seller=1, 0 otherwise	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Locational characteristics						
Hungary	-0.629	0.387	-1.620	0.105	-1.388	0.130
Poland	0.218	0.401	0.540	0.587	-0.568	1.003
Romania	-0.229	0.572	-0.400	0.688	-1.350	0.891
Slovenia	**-1.124**	0.425	-2.650	0.008	-1.957	-0.292
Village distance to urban centre (km)	0.010	0.023	0.430	0.670	-0.036	0.056
Village market	0.233	0.295	0.790	0.429	-0.345	0.812
Infrastructure	0.121	0.097	1.240	0.214	-0.070	0.311
Village unemployment rate (%)	-0.003	0.010	-0.330	0.740	-0.023	0.016
Household consumption characteristics (z_c)						
Dependency ratio*	**-0.267**	0.113	-2.360	0.018	-0.488	-0.046
Household off-farm share (%)	**0.021**	0.011	1.900	0.057	-0.001	0.042
Household production characteristics (z_q)						
Age household head	0.024	0.060	0.390	0.693	-0.094	0.141
Age^2 household head	0.000	0.001	-0.340	0.732	-0.001	0.001
Female household head	**-0.540**	0.300	-1.800	0.072	-1.128	0.049
Cultivated land area (ha)*	0.147	0.135	1.090	0.276	-0.117	0.411
Livestock units*	**0.934**	0.226	4.130	0.000	0.490	1.377
Own equipment	**1.616**	0.389	4.150	0.000	0.854	2.379
Others equipment	**0.813**	0.327	2.490	0.013	0.173	1.454
General risk attitude	**0.341**	0.188	1.810	0.070	-0.028	0.711
Generate cash income	**0.692**	0.096	7.220	0.000	0.505	0.880
Constant	-2.540	1.731	-1.470	0.142	-5.934	0.853

Measures of Fit for probit:	
McKelvey & Zavoina's R2:	0.848
Cases correctly classified:	96.71%

Coefficients in Bold only are significantly different from zero at >95% level of confidence
Coefficients in Bold Italic are significantly different from zero at >90% level of confidence
* Variables adjusted by square root transformation to approximate a normal distribution.

Table 7: OLS estimation result: modelling the share of output sold in 2007(%)

Source	SS	df	MS	Number of obs	=	754
				F(27, 726)	=	16.21
Model	240945.4	27	8923.902	Prob > F	=	0.000
Residual	399558.8	726	550.3564	R-squared	=	0.376
				Adj R-squared	=	0.353
Total	640504.1	753	850.6031	Root MSE	=	23.460

Share of output sold (%)	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Locational characteristics						
Hungary	**26.910**	3.805	7.070	0.000	19.440	34.380
Poland	**8.246**	3.347	2.460	0.014	1.675	14.816
Romania	-5.537	3.615	-1.530	0.126	-12.635	1.561
Slovenia	**12.452**	3.777	3.300	0.001	5.037	19.867
Village distance to urban centre (km)	0.209	0.135	1.550	0.122	-0.056	0.475
Village market	-2.790	2.172	-1.280	0.199	-7.053	1.473
Distance to sales point (km)	**0.103**	0.046	2.240	0.026	0.012	0.193
Infrastructure	**-1.964**	0.766	-2.560	0.011	-3.468	-0.460
Village unemployment rate (%)	-0.064	0.088	-0.720	0.473	-0.237	0.110
Household consumption characteristics (z_c)						
Dependency ratio*	0.019	0.800	0.020	0.981	-1.552	1.590
Household off-farm share (%)	-0.027	0.076	-0.360	0.720	-0.177	0.122
Household production characteristics (z_q)						
Age household head	**0.773**	0.458	1.690	0.092	-0.127	1.673
Age^2 household head	**-0.008**	0.004	-1.840	0.066	-0.016	0.001
Education level household head	-0.510	1.183	-0.430	0.666	-2.832	1.812
Female	-0.612	2.445	-0.250	0.802	-5.412	4.188
Cultivated land area (ha)*	**2.323**	0.718	3.240	0.001	0.913	3.732
Livestock units*	0.810	0.549	1.480	0.141	-0.268	1.888
Cultivated land area rented in (%)	0.033	0.041	0.800	0.421	-0.047	0.113
Land dispersion (ha/km)	0.016	0.017	0.950	0.342	-0.018	0.050
Crop range	**-1.745**	0.570	-3.060	0.002	-2.864	-0.626
Own equipment	5.137	3.754	1.370	0.172	-2.234	12.508
Others equipment	**7.724**	3.751	2.060	0.040	0.359	15.089
Farming with household labour only	1.157	2.424	0.480	0.633	-3.602	5.916
General risk attitude	**6.154**	1.270	4.850	0.000	3.662	8.646
Transactions costs (t_f^s, t_p^s)						
Total number of buyers	0.001	0.008	0.110	0.913	-0.016	0.017
Selling on contract	**12.439**	2.503	4.970	0.000	7.525	17.353
Selling through a cooperative	-1.290	2.625	-0.490	0.623	-6.443	3.863
Constant	30.302	13.872	2.180	0.029	3.068	57.536
Adjusted R2:	0.353					
BIC':	-176.923					

Emboldened variables are statistically significant at the 10% level or below. * Variables adjusted by square root transformation to approximate a normal distribution.

- Others equipment	F (1, 726)	4.24	0.0399
Joint removal of own and others equipment	F (2, 726)	2.17	0.1144
Joint removal of all production characteristics (z_q):			
- Excluding risk attitudes	F (8, 726)	3.24	0.0012
- Including risk attitudes	F (9, 727)	5.86	0.0000

Table 8: Overview of Bulgarian Household Interviews and Dynamics

Case No.	Household composition ages in 2006	Commercialisation characteristics in survey (2003 & 2006)	2010 Interviews	2014 Interviews	Receive CAP support in 2014	Factors affecting commercialisation
1	Husband and wife (both 58)	40% sold in 2003; 60% sold in 2006. 4.8 ha in 2003; 20 ha in 2006, 5 plots.	25-30 ha (12 ha rented). Wheat and sunflower. Exited livestock production.	8.2 ha owned land now farmed. Stopped renting in land.3.7 ha given over to almonds. Sell 80% of production.	Yes – area payments	Big land owner, within which almond garden lies, helps deter crime. Lack knowledge of funding schemes.
2	Husband (43), wife (39), sons 10 & 18	70% sold in 2003; 90% sold in 2006. Full time dairy farmers. 0.25 ha in 2003; 5.15 ha in 2006.	26.2 ha. Extra land rented to meet fodder needs. Bought second farm in neighbouring village.	20 milking cows. Now farm 17 ha as rental contract terminated. Sell 100% of milk. Bought combine & tractor, offers services. Does not want to expand farm.	Yes-payment per head but not pasture after fine	Cash payments by buyer help finance land purchase. Village milk collecting point end due dwindling numbers who keep cows.
3	Wife (46), Husband (52), their sons (26 & 28), Father (75)	70% sold in 2003; 80% sold in 2006. Sheep. 3.85 ha, 1 plot.	Remain 3.85 ha. Invest in cooling tank and buy milk from neighbouring farms.	Remain 3.85 ha. Husband sheep farmer (but herd decrease due to illness) and wife worked as a teacher, helping farm before and after work. Now no bus and applying for pension.	Yes – payment per head and pastures	Lack of public transport to access work. Problems with overlapping ownership of pastures. Elderly population unable to keep cows and village milk collecting dwindle.
4	Husband (40), Wife (38), Son (20) and daughters (16 & 18)	60% sold in 2003; 80% sold in 2006. Sheep. 1 ha, 1 plot.	Flock rose from 70-80 sheep to 180 but growth limited by by high fodder prices, low output prices and unreliable payments	Flock of 150 sheep. Sell 80% of production. Barely profitable given fodder prices. Continues due to lack of other options.	Yes – payment per head	Local sales limited as most households keep cows. Profitability insufficient for investment and to buy land to produce own fodder.
5	Wife (52), Husband (50), Mother (72)	50% sold in 2003; 70% sold in 2006. 0.7 ha, 2 plots. 1 cow and vegetables.	80% sold (attributed to better milk quality from improved feed). Informal sales to households. Ill health of husband and wife limit activities.	70-80% of milk sold. Now 1 ha of land (gained though inheritance) and 2 cows. Vegetables all consumed in household. Received some benefits from the Labour Office. Knits slippers. Husband alcoholic.	No	Low output prices. Cannot plant fodder as no one to plough (male relatives work abroad). Health condition limits expansion. Too small-scale to be eligible for subsidies.
6	Husband (65), Wife (63), Daughter (42), Son (38)	40% sold in 2003, 50% in 2006. Vegetables and livestock. 3 ha, 1 plot.	Switch from commercial to subsistence due to age (both now pensioners) and adult sons left household.	Husband 73 years of age. Rents out land. Some chickens and kitchen garden vegetables. Too small scale now to trade. Trying to sell tractor.	No (but did previously for area payment, until renting out)	Health problems. Son and daughter live in city but visit and assist weekends. Declining village population.
7	Wife (64), Son, Son's wife, child (toddler)	50% sold in 2003, 70% in 2006. Fodder plus cow and donkey. 1 plot 0.25 ha	Husband died. Animals lost in flood. Cultivates house garden – 70% sold.	Wife now 71 years old. Still cultivates smallholding with 70% sold (tomatoes side of road). No subsidies. Sales vital to supplement pension.	No	Age. Family problems (son divorced and died in car crash). Paperwork perceived as too much to claim subsidies.
8	Husband (59), Wife (56), Son (33), his wife (24) and their child (3)	80% sold in 2003; 90% sold in 2006. 6 ha, 2 plots.	Ceased farming but kept land as financial security. Owns businesses.	Owns 3 ha, not always cultivates. Kitchen garden for tomatoes etc. Owns other non-ag businesses, growth limited by lack of qualified workers.	No	Wishes to keep connection with farming and land, but lacks concrete future plans for farm.
9	Wife (50), Husband (54)	Exited. Rented out 60% of land, 40% unused.	Wife and husband work full-time off-farm, although minor subsistence production (potatoes & chickens)	Re-enter agriculture in 2012 (lambs, pigs) mainly for own consumption. Husband died. Slowly abandon plots. Cultivate kitchen garden and sells beans.	No (did until death of husband)	Son in law is major of the village and provides knowledge and assistance. Problems of access to plots & theft of crop.
10	Wife (52), Husband (58), son (20)	Exited. Rented out 60% of land, 40% unused.	Wife works off-farm (library), husband worked in Portugal and then returned (unemployed)	Wife is still a librarian. Husband died. Sold tractor to finance trips to hospital & husband's treatment. Rents out land without payment or goods in kind.	No	Health problems. Lacks machinery, confidence and know how to farm.

Appendix A1. Chi^2-test for joint significance of country dummies

Independent Variable(s)	d.f	Chi^2 statistic	Prob > Chi^2
Joint removal of Country Dummies	4	11.65	0.0202