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NON-FARM INCOME DIVERSIFICATION OF RURAL FARM HOUSEHOLDS IN CENTRAL AND SOUTHEASTERN EUROPE: AN APPLICATION OF FUZZY SET THEORY

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Abstract
A fuzzy logic model for quantifying farm households' potential for non-farm income diversification is developed and applied to 1,077 farm households in Bulgaria, Hungary, Poland, Romania, and Slovenia. About three quarters of households have a diversification potential, but not all households use it. An analysis of diversification potential and diversification behaviour shows that there are seven household types in the sample. Not all development options, i.e. farm development, farm exit, or starting non-farm employment, are equally suitable for all households thus fine targeting of policy measures according to the household type could be important for policy makers.

Keywords: rural development, non-farm rural employment diversification, fuzzy logic, transition countries

JEL: C65, D33, J24, Q12

1 Introduction[1]

"Agriculture is no longer the backbone of the rural economy" (OECD, 2006: 37). With this heading, the OECD summarised the fact that in developed countries, agriculture plays no longer the major role in rural areas, neither in terms of production nor employment. This calls for developing alternative income sources and the European Union (EU) responded to this issue by launching special support measures in its rural development programme (Council Regulation (EC) No. 1698/2005).

Generally, farm households see the need for diversification and open up non-farm income sources. The OECD (2006: 13) put it this way: "in most cases direct income from farming is less than half of household income". However, non-farm diversification is still not widespread in the sense that in the year 2007, only about ten percent of agricultural holdings had another gainful activity[2] in the EU. Differences between the countries are striking (Eurostat, 2010a). While in Greece the share is lowest with only 1.5%, it is highest in Finland with 27.7%. A clear east-west and north-south divide can be made (Figure 1). Agricultural holdings in north-western countries are in general more diversified than their south-eastern counterparts. The picture also suggests that the differences may be to a large extent a transition issue, i.e. Bulgaria (2.1%), Hungary (5.1%), Poland (4.8%), and Slovenia (4.1%) have a below average share of diversified agricultural holdings. The share is significantly higher in Romania (15.7%).[3] Assuming that people act rationally, the reasons for these differences must be understood and addressed if a lively rural economy should be promoted.

Determinants that influence households' decision to embark on non-farm employment have been widely discussed in literature, e.g. Barrett et al. (2001), Buchenrieder (2005), Möllers (2006), Möllers et al. (2008a), and Reardon et al. (2007), and there is consensus that individual farm households have

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[2] "Other gainful activity is any activity other than one relating to farm work, including activities carried out on the holding itself (camping sites, accommodations for tourists, etc.) or that use its resources (machinery, etc.) or products (such as processing farm products, renewable energy production), and which have an economic impact on the holding. Other gainful activity is carried out by the holder, his/her family members, or one or more partners on a group holding." (Eurostat 2009a: 335).

[3] The high figure for Romania may be a statistical phenomenon due to the former insufficient administrative distinction between farmers and land owners. It is assumed that it will further decrease while the farm registration process succeeds in the next years. To give an example, the share of agricultural holdings with other gainful activities was 22.1% in 2005 and decreased to 15.7% in 2007 (Eurostat, 2010a). Both, the number of agricultural holdings but also the number of holdings with other gainful activities decreased from 2005 to 2007.

different potentials for non-farm income diversification. Although knowing farm households diversification potentials seems important for promoting structural change, no attempt has been made so far to summarise this potential in a single figure. This contribution aims at closing this research gap.

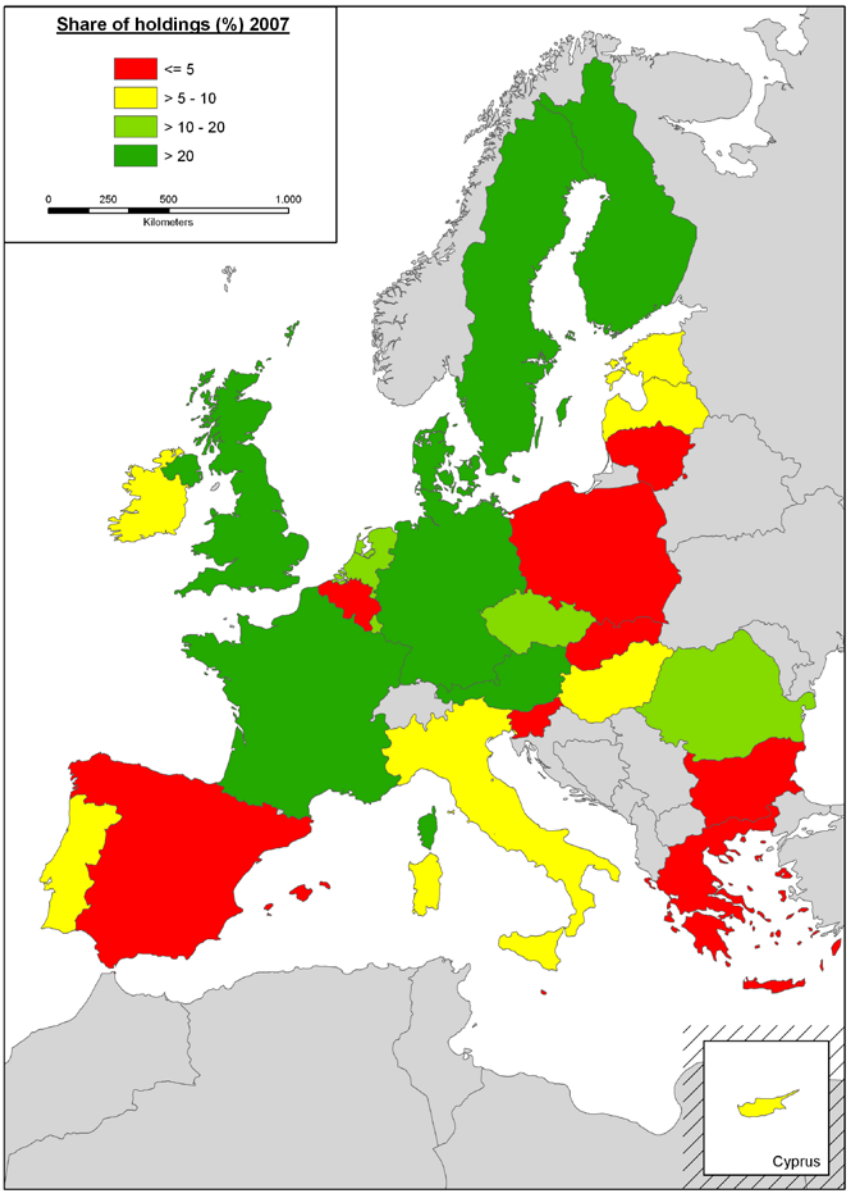

Figure 1. Share of agricultural holdings with other gainful activities in year 2007 (Eurostat, 2010a).

This paper is structured as follows: Chapter 2 presents the integrated framework for analysing non-farm rural employment diversification by Möllers (2006). Chapter 3 proposes a fuzzy logic model to be used to quantify farm household's potential for non-farm income diversification. It starts with an introduction of fuzzy set theory, then it presents the fuzzy logic model and describes the data. Results are presented in Chapter 4; Chapter 5 concludes.

2 Theoretical framework

Non-farm rural employment is discussed in the theoretical context of the sustainable livelihood framework (SLF) and the so called demand-pull and distress-push concept (Barrett et al., 2001; Buchenrieder, 2005; Efstratoglou, 1990). While the SLF theoretically describes employment activities and vulnerability management strategies, the demand-pull and distress-push concept, originally introduced by Lee (1966), is used to explain labour shifting processes from the agricultural sector to

the rural non-farm sector. As neither approach explains the actual decision made by a household to diversify, Möllers (2006) complemented the SLF and the demand-pull and distress-push concept by integrating the theory of planned behaviour (Ajzen 1985, 1991, 2002). This theory assumes that human behaviour is guided by attitudes, norms, and what an individual beliefs about how easy or difficult it will be to perform a particular behaviour.

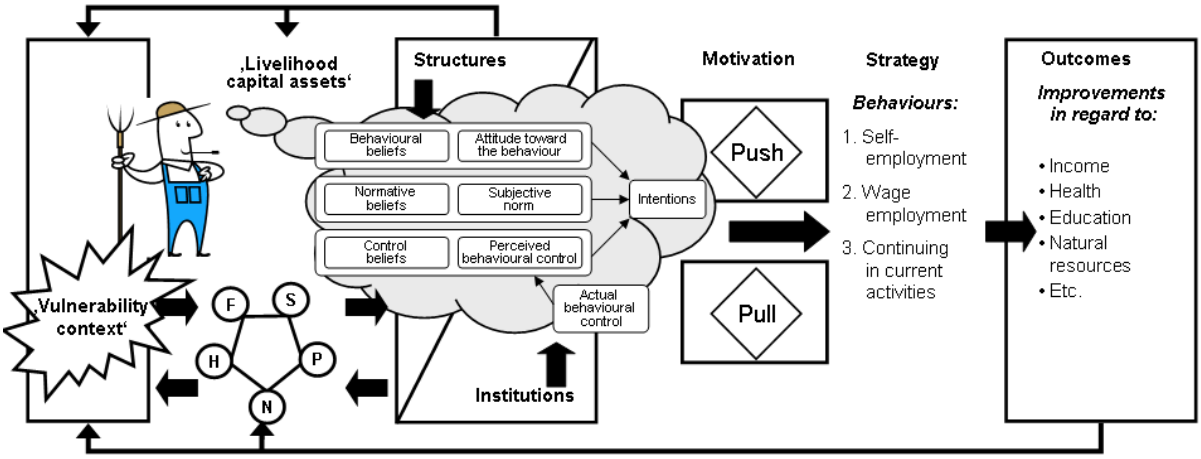

Figure 2. Integrated framework according to Möllers (2006: 78).

Obviously, households whose livelihood asset pentagon is better endowed can more easily take up more lucrative employments than the others. They react to demand-pull factors and benefit from favourable age, education, skills, and motivation. Whereas pull-factors facilitate diversification processes, but are normally not sufficient to initiate them, push-factors could be seen as the essential driving force of diversification. Those who follow distress-push forces typically end up in poorly paid employment situations (Möllers and Buchenrieder, 2005; Möllers, 2006; Reardon et al., 2007). These outcomes as well as the societal structures and institutions can have positive or negative impacts on the livelihood and future strategies illustrated by feedback loops in the integrated framework. Ajzen's theory of planned behaviour (Aizen, 1985, 1991, 2002) complements the complex environment in which diversification decisions are made by socio-psychological factors that determine human behaviour. As a general rule, the more favourable the attitudes and norms, and the greater the perceived behavioural control, the stronger is a person's intention to embark in non-farm income diversification.

3 Modelling farm household potential for non-farm income diversification

A number of empirical studies have dealt with factors promoting employment diversification in Eastern Europe (for instance Buchenrieder et al., 2004; Chaplin et al., 2007; Lerman et al., 2008; Möllers, 2006; Möllers et al., 2008b). These studies used state of the art econometric approaches, such as cluster analysis, logistic regression model, or correlation analysis. These econometric models assume precise knowledge of the living circumstances of the respondents. However, everyone who has ever done empirical work knows that the information collected in structured questionnaires is often imperfect. Notwithstanding the imperfection of the information, the collected data are used in econometric and simulation models as precise data. For the lack of better analytical methods, these approaches gained good results. A methodology, however, that considers the imperfection and vagueness of information in the estimation routine is appealing. Such a methodology is known as fuzzy logic. This contribution therefore applies fuzzy logic as an analytical tool for survey data.

Fuzzy logic is a relatively unknown methodology in agricultural economics. Therefore, the chapter starts with a short introduction into fuzzy logic before it presents the model for quantifying

farm household's potential for non-farm income diversification. The chapter ends with a description of the data base.

3.1 Fuzzy sets – The theory for processing imperfect information

In 1965, Lofti A. Zadeh published his seminal article "Fuzzy sets" and subsequently became the father of the fuzzy set theory. This theory opened the opportunity to include imperfect information into precise data processing routines. To make it clear, it is not the methodology that is fuzzy but the data that is processed. The methodology itself is rooted in non-fuzzy mathematics.

Three kinds of imperfection are distinguished: (i) vagueness, (ii) imprecision, and (iii) uncertainty (Kruse et al., 1995). Information is vague when it could be interpreted from different people or in varying contexts in different ways. Linguistic statements like "The street is good." or "He has a high income." are vague data. Information that cannot be observed with user-defined accuracy is called imprecise. Income data is the most prominent example for this kind of imperfection in empirical research in economics. Uncertain information is either subject to random events, like lottery results, or it is caused by subjective appraisement. For instance, answers given by the respondent about absent household members are uncertain information based on subjective appraisement.

Whatever the kind of imperfection is, all imperfect information share the characteristic that they cannot be rated as true or false but as partially true and partially false. Classical set theory, as opposed to fuzzy set theory, allows only for true or false statements and operates with so-called **crisp sets**, e.g. a household has a potential for non-farm diversification or not. In crisp set theory this means that a household is to 100% a member in the subset "yes" or "no". Although this approach is sufficient in most applications, empirical experience shows that these extremes border a wide grey zone. This grey zone is what is meant with imperfect information. Picturing this grey zone asks for sets to which a datum is only to a certain degree a member, e.g. a household can have to 80% a non-farm income diversification potential and to 20% not. This results in what is called **fuzzy sets**, i.e. the household is to 80% a member in the fuzzy subset "yes" and to 20% in the fuzzy subset "no".

Defining for each variable in the model the fuzzy subsets and the degree of membership to which a specific datum is a member in the single fuzzy subsets results in so-called **membership functions**. This is the most challenging task in developing a fuzzy model and expert knowledge is at the core of it. In the calculation routine, the fuzzy subsets are combined according to **rules**. While the rules are subject to expert knowledge, the actual combination algorithms are well defined mathematical procedures that result in a so-called fuzzy output set or a crisp value. Fuzzy output sets are summarised in an additional procedure to a crisp value. Again, the algorithms are well defined mathematics. Detailed information about fuzzy sets, membership functions, and rules are found in fuzzyTECH (2007), Kruse et al. (1995), Sivanandam et al. (2007), and Smithson and Verkuilen (2006)

Today, fuzzy logic is omnipresent in daily life. Sivanandam et al. (2007) quote many applications of fuzzy logic. Most prominent are the industrial and control applications but fuzzy logic also encroached upon expert systems. Smithson and Verkuilen (2006) give an overview of fuzzy logic applications in social sciences. However, it is nearly unknown in agricultural economics. Thus, a review of topical journals[4] showed that there is no article that applied fuzzy logic methodology. So far, only three dissertation theses (Blair, 2007; Bosma, 2007; Reys, 2003) use fuzzy logic in agricultural economics. Reys (2003) applies a fuzzy linear programming model to maximise income of peasant households in Brazil. He considers in his work various income activities including non-farm employment. Nevertheless, non-farm income diversification is not the focus of his thesis but the development of farming systems that allow sustainable use of resources within an ecologically sensitive area. Bosma (2007) implemented a fuzzy inference system to simulate the production decision of Vietnamese peasant households for various agricultural products. Non-farm income sources are not considered in his model. Blair (2007) constructs a fuzzy indicator for assessing poverty of farming families in Guyana and develops a fuzzy linear programming model for simulating the impact of different farming based development strategies on family's income. Although non-farm

[4] The review was done in Journal of Agricultural Economics, European Review of Agricultural Economics, American Journal of Agricultural Economics, Agricultural Economics, Australian Journal of Agricultural Economics, Post-Communist Economies, Review of Agricultural Economics, and Canadian Journal of Agricultural Economics up to year 2009.

income was considered an income activity in the model, it was not subject to optimisation. Having said this, it could be concluded that no fuzzy model that simulates the household potential for non-farm income diversification is known.

3.2 The model architecture

On the basis of the integrated framework (Figure 2), key factors of non-farm rural employment diversification are identified: (i) need for diversification, (ii) internal conditions, (iii) external conditions, and (iv) attitudes. These four factors can be determined by ten variables (Figure 3). Thus, a positive analytical approach is applied because the focus is at "what is" and not at "what ought to be".[5] The diversification potential is expressed in a straight-forward index using structured survey data. Household's diversification potential may be high or low but the analytical approach does not results in a judgement whether this is good or bad thing.

The **need for diversification** is defined as the economic pressure that a household faces. It is closely linked to the so called distress-push conditions. In the model, it depends on two key indicators: (i) the income that a household can achieve from farming and (ii) the number of household members that have to be supported from this income. Thus, the rationale is that households with a high agricultural income and few dependent household members feel less pressure to diversify. As a proxy for the agricultural income that the household could earn, the farm size is used in the model. The farm size - measured in available hectares of land - stands for natural assets in the SLF. The second variable that determines the need for diversification in the model is the dependency ratio. It is assumed that it is not primarily the number of household members that pushes a household into non-farm diversification but the relation of dependent household members to economically active ones. Economically active persons could migrate and sustain themselves but especially children and sometimes pensioners do not have this opportunity and must be supported by the economically active household members. The dependency ratio is reflects human capital in the asset pentagon.

Farm size is an often discussed variable in the non-farm rural employment literature. Reardon et al. (2007) reviewed various studies and concluded that the effect of farm size is ambiguous in the way that households operating larger farms may be more able to start-up non-farm activities but may be less interested in it due to a lower need for diversification. Csaki and Lerman (2002) found a strong negative correlation between farm size and non-farm income and conclude, that households with a significant share of non-farm income in household income own on average less than 4 ha land. This is also supported by the findings of Chaplin et al. (2007) and Möllers (2006), who state that non-farm diversifiers have smaller farms. The dependency ratio is less frequently used than the number of household members, economically active household members, and dependent household members. Möllers (2006) used the dependency ratio to explain diversification behaviour but did not find a significant effect. Chaplin et al. (2007) found that households with more children are more likely to diversify their income sources, and Möllers et al. (2008b) found that the number of household members is positively correlated to non-farm income.

Internal conditions describe the actual ability of a household to diversify. They work as a switch in the demand-pull and distress-push concept because they determine whether a household could grab favourable opportunities to earn a higher income or whether the family will stay in low income activities. Without doubt, elderly people do not tend to alter their living situation. But even if they should have the wish to find a job, they will usually find themselves confronted with labour market constraints. But age is not the only limiting variable; also people with a low education may find it difficult to get a waged job or to start their own business because they lack the needed skills. Labour capacity is also representative for human capital. Last but not least, the labour capacity of a household determines its ability to earn additional income. Wage-employment in rural regions sometimes implies commuting long distances and also self-employment normally goes along with a considerable work-load, exceeding an eight-hour day. Whether it is a waged job or a self-employed non-farm activity, long absence from the family is usually the result. Households with small children or elderly people in

[5] The New Palgrave (1987) sees the main distinction between positive and normative economics in two questions whereby the question "What is?" refers to positive economics while the question "What ought to be?" signifies normative economics.

need of care must thus have at least two economically active persons to spare labour capacity for non-farm diversification. In the model, the variables age, education, and labour capacity determine the internal conditions of a household to diversify.

The high importance of education is confirmed by many studies. For instance Chaplin et al. (2004), Ellis (1998), Möllers (2006), and Reardon et al. (2007) see positive effects of education on households' diversification behaviour. Chaplin et al. (2007) state that non-farm diversifier households are headed by younger people. Reardon et al. (2007) see a high importance of household labour capacity for non-farm employment.

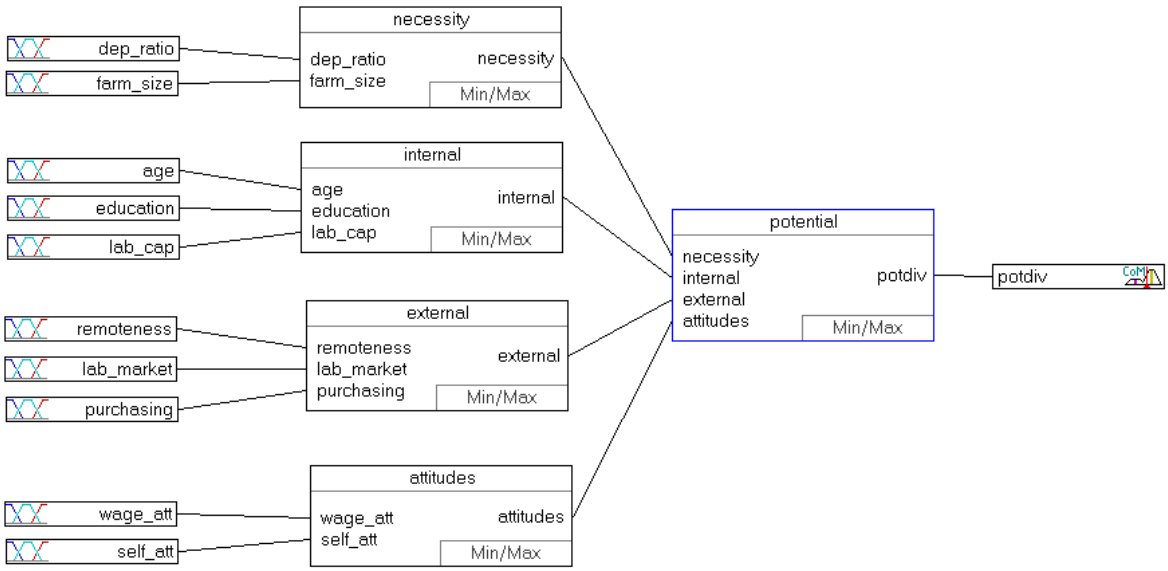

Figure 3. Architecture of the fuzzy logic model.

Source: Model's graphical representation taken from the software fuzzyTECH.
Notes:
age: age
attitudes: attitudes towards non-farm income diversification
dep_ratio: dependency ratio
education: education
external: external conditions
farm_size: farm size
internal: internal conditions
lab_cap: household's labour capacity
lab_market: labour market conditions
necessity: need for diversification
potential: household's potential for non-farm income diversification
purchasing: regional purchasing power
remoteness: remoteness
self_att: attitudes towards self-employed income activities
wage_att: attitudes towards wage employment

The **external conditions** refer to the economic environment of a household and the possibilities they offer to diversify. This factor is determined by variables that define whether the household is in a demand-pull situation or not. The key question in terms of external conditions is whether there is demand for paid labour or products that could be offered by a family business in the respective region. Thus, it touches three areas: first, the rural labour market which is part of the institutional framework under which a household operates, second, local demand, and third, the remoteness of a location. The latter is often characterised by an unfavourable basic infrastructure, part of the physical assets in the SLF. Citizens of remote areas face greater difficulties to find waged employment even if they are willing to commute. For self-employed activities there may be, on the one side, only limited market capacities and, on the other side, it may be difficult to attract skilled employees. Besides the

remoteness of the village, the labour market situation is used as an indicator for wage job opportunities in the model. The local demand for additional products or services from profit-oriented businesses will be approximated by the regional purchasing power. This is in line with Reardon et al. (2007) who stress the high importance of regional economic growth for the demand for labour and creating consumption. They also found that returns from non-farm activities are highest near towns.

Even if the household feels the need to earn additional income, the internal conditions are favourable, and the external conditions make diversification possible, the decision about what is actually done depends to a high degree on what is called socio-psychological factors. Is farm work seen as promising or do young people generally strive for white-collar jobs? Is there a culture of entrepreneurship or is it rather the civil servant with a pension who is the role model? What says the old patriarch when his daughter migrates to the big city? This is a large field and it is not the focus of this model to be exhaustive in the used variables. However, it is assumed that the factors that are described in the integrated framework, i.e. attitudes, norms and subjective control, play an important role. In the model the factor **attitudes** is included. Due to the fact that the attitudes towards self-employment may be diametric to the ones towards waged employment, both attitudes are used as variables.

Using socio-psychological variables in explaining economic phenomena is still rare. Among the pioneers, Davidova et al. (2009), Gorton et al. (2008), and Möllers (2006) may be termed. Möllers (2006) applied in her work comparable attitude variables. She found for instance that a positive attitude towards waged employment influences the intention to give up farming in Macedonia.

All four factors in their various combinations determine the potential that a household has for the diversification of its income activities. The model from Figure 3 was implemented in fuzzyTECH. For a detailed technical description including model's verification and validation see Fritzsch et al. (2010).

3.3 Data

The diversification potential is assessed for farm households in Bulgaria, Hungary, Poland, Romania, and Slovenia. Data were taken from household surveys and interviews with village officers as well as from Eurostat. A detailed description of the sampling method is given in Buchenrieder et al. (2007). All data refer to year 2006. After excluding records with missing data, the final sample included 1,077 farm households: 223 Bulgarian, 218 Hungarian, 199 Polish, 224 Romanian, and 213 Slovenian households.

The dependency ratio was measured as the share of persons older than 64 years and younger than 20 years as a proportion of the household members between 20-64 years old (economically active age). The authors follow with this the definition the view of EC (2009). Households without economically active members, i.e. pensioner households, were assigned the value 3.0 to keep them in the sample. The median dependency ratio is lowest in Hungary (0.25) and highest in Slovenia (0.67). In all surveyed countries, households with no dependent members and pensioner households were involved in the survey thus all countries cover the range of 0.0 to 3.0 for the dependency ratio.

The farm size was measured in total available area of agricultural land, which includes permanent fallow land. The median farm size ranges between 2.61 ha in Bulgaria and 8 ha in Slovenia. Notwithstanding that the farms in the sample were rather small, also households operating large-scaled agricultural enterprises were involved. The largest farms were reported for Bulgaria (3,800 ha), Romania (350 ha), and Hungary (335 ha). In non-fuzzy econometrical models, those households would be outliers and had to be excluded from analysis. Keeping them in the sample could affect results in two directions. They could determine the model results when being significant or they could increase the model error so that there will be no significant variable at all. Fuzzy inference systems are insensitive to outliers, i.e. the farms are labelled as "large".

The age of the household members and its effect on diversification required particular attention. Common sense requires a figure that excludes household members that are not of an economically active age. Thus, for households with members in the economically active age, the average household age was calculated excluding children younger than 20 years and pensioners older than 64 years. For households consisting exclusively of pensioners, their average age was entered in the model. The median age is between 41 years in Poland and Slovenia and 46 years in Romania. In each survey

country, very "young" and very "old households" are part of the sample. The youngest household was interviewed in Bulgaria (22 years) and the oldest in Hungary (91 years).

Education refers to the highest level of education that a household member has attained. The median educational level is "finished secondary school" in Hungary and Slovenia and "finished high school" in the other three countries. More than one fifth of Bulgarian and Romanian households have at least one member with a university degree whereas in Poland no household member with a university degree was reported. Households without formal schooling were only interviewed in Bulgaria (three households).

Labour capacity was measured in person equivalents, that is the sum of all household members of an economically active age plus the number of pensioners up to 69 years old multiplied with 0.5 plus the number of pensioners between 70 and 74 years old multiplied with 0.25 to account for their reduced but still existent labour capacity. The authors are with their view in accordance with Harsche (2007) who stresses that due to limited income alternatives, elderly household members contribute to the operation of the farm thus increasing household labour capacity. Median labour capacity ranges from two person equivalents in Bulgaria, Hungary, and Romania to three person equivalents in Slovenia. In all countries, households without calculated labour capacity were observed but there are also a few households with plenty of available labour, i.e. the maximum observed labour capacity was between six person equivalents in Hungary and Romania and eight person equivalents in Poland.

The remoteness of the villages was measured as the distance in kilometres to the next big urban centre. This information was taken from the interviews of village officers. The remoteness of the surveyed households in the countries varies. The widest ranges were observed in Poland (8-75 km) and Bulgaria (10-78 km) while Slovenian households have only 4-22 km to the next big urban centre. Hungarian (8-33 km) and Romanian households (10-30 km) are in between.

Household members older than 19 years were asked for an assessment of the local labour market. The question was how they rated their chance of finding a job in the local labour market. For each household, the maximum rating of all answers was entered in the calculation. With the exception of Slovenia, households assess the labour market situation in their region rather pessimistic. While in Slovenia nearly half of the households see good chances to find a job, the picture reverses in the other countries in which one third of households in Poland to more than half of the households in Romania rate their chances to find a job as rather bad.

The regional (NUTS 3[6] regions) purchasing power was measured relative to the country average. Figures were taken from Eurostat (2009b). Sampling methodology predetermined this variable by selecting survey regions according to their degree of economic development: (i) lagging behind, (ii) average and (iii) prosperous, corresponding to a GDP per capita below, average and higher than the national average. Thus, values for this variable range between approximately 70-160% of national purchasing power for the households in Poland, Romania, and Slovenia. In Bulgaria, the range is narrower with approximately 70-100% of national purchasing power while regional differences in economic development are not well represented in the Hungarian survey sample. Hungarian households are located in regions with purchasing power of approximately 60-70% of national average.

The attitudes towards waged employment and self-employment were assessed among all household members older than 19 years and the maximum rating was included in the model. In general, households have more positive attitudes towards waged jobs than towards self-employed activities. Nevertheless, country specific differences for wage and self-employment can be observed. The share of households having positive attitudes towards wage employment ranges between 66% in Hungary and 79% in Bulgaria while negative attitudes reported only 3% of Polish up to 14% of Romanian households. Fifty-four percent of Bulgarian households report a positive attitude towards self-employment but this share decreases to 22% of households in Poland. Negative attitudes towards

[6] "The nomenclature of territorial units for statistics, abbreviated as NUTS (from the French 'Nomenclature des Unités territoriales statistiques') is a geographical nomenclature subdividing the territory of the European Union into regions at three different levels (NUTS 1, 2 and 3, respectively, moving from larger to smaller territorial units). Above NUTS 1 is the 'national' level of the Member State. NUTS areas aim to provide a single and coherent territorial breakdown for the compilation of EU regional statistics. The current version of NUTS (2006) subdivides the territory of the European Union and its 27 Member States into 97 NUTS 1 regions, 271 NUTS 2 regions and 1303 NUTS 3 regions." (Eurostat, 2010b).

self-employment were reported by 27% of households in Bulgaria going up to 33% of households in Romania.

4 Results

The results of the fuzzy logic model (Figure 3) reveal that three quarters of the households have a potential for diversification (Table 1). Table 1 compares this diversification potential with observed diversification behaviour: in general, not all households with a diversification potential actually use it. In addition, country specific differences are evident. The diversification potential is above average in Poland, Romania, and Slovenia but below average in Bulgaria and Hungary. Especially Hungary is different from the other four countries because there seems to be more diversified farm households than the potential indicates.

Table 1. Number and percentage of households with non-farm diversification potential.

Country	Number of households	Households with non-farm diversification potential		Actually diversified households	
		N	%	N	%
Bulgaria	223	146	65.5	140	62.8
Hungary	218	135	61.9	144	66.1
Poland	199	163	81.9	125	62.8
Romania	224	190	84.8	149	66.5
Slovenia	213	187	87.8	165	77.5
Total	**1,077**	**821**	**76.2**	**723**	**67.1**

Source: Own calculations based on SCARLED data.

An in depth analysis of the four factors determining diversification potential and the observed actual diversification behaviour suggests that seven household types can be distinguished in the sample. Although all four factors that constitute diversification potential (Figure 3) are significant, need for diversification and internal conditions have the highest impact. Both factors are determined by four key variables that have been intensively discussed in diversification literature and that, again, are found important, i.e. farm size, dependency ratio, age, and education (Table 2). The following description of seven household types therefore concentrates on these variables, i.e. the need for diversification and internal conditions.

(1) **Potential job-starters** have a diversification potential. They are not diversified although they face a need for diversification and have favourable internal conditions. They operate smaller farms, adult household members are on average comparatively young and are fairly well educated. Job-starters use their potential as farmers but pass up their chances for non-farm employment.

(2) **Distress-push diversifiers** have a diversification potential and, in opposite to the potential job-starters, are actually diversified. They face a need for diversification and make use of favourable internal conditions. This household type is characterised by small farms, low dependency ratios, young household members, and high education. Households of this type found a strategy that allows them to sustain their livelihoods under constraint agricultural assets by employing their non-farm diversification potential.

(3) **Pensioners** have no diversification potential and are not diversified. They face a high need for diversification but due to their adverse internal conditions, non-farm income diversification is no real option for them. The households have only small farms and, obviously, a high dependency ratio. The latter corresponds with the high average age of adult household members.

(4) **Farmers with a diversification potential** are not diversified. They have a slight need for diversification because there is quite a high share of dependent household members to support. Nevertheless, they operate larger scaled farms thus they are not under pressure to diversify. Adult household members are middle aged and well educated thus, internal conditions for non-farm income diversification are favourable. But the most striking characteristic is that the households do not use their diversification potential and concentrate on farming instead.

(5) **Demand-pull diversifiers** have a diversification potential. They are diversified although - if one looks at their base in farming - there is no obvious need for diversification. They operate medium-scaled farms and have a low dependency ratio. Otherwise, internal conditions are only relatively favourable. Although the average age of adult household members is rather low, the highest educated household members attended only secondary school causing the ambivalent picture for the internal conditions.

(6) **Past demand pull diversifiers** are the only type of households that is diversified although this type does no longer have a diversification potential, i.e. external conditions[7] are in the best case only on a fair level. The households cultivate larger farms and have a low dependency ratio causing a low need for diversification. The educational level is high and although the adult household members are older compared to household type 5, the internal conditions are still good.

(7) **Farmers with no diversification potential** do neither face a need for diversification nor do they fulfil the internal conditions for non-farm income diversification. On the one side, they own comparably larger farms and on the other side; their lower educational level prevents non-farm income diversification. Those households are not diversified and focussing on agriculture seems straightforward for them.

Table 2. Characteristics of household types (median values).

	Types of farm households	Farm size (ha)	Dependency ratio (ratio)	Age (years)	Education [1)] (scale)	Diversi-fication potential [2)]	Diversified
Households having a need for diversification	**(1) Potential job-starters**						
	Bulgaria (N=37)	1.2	0.67	43.0	4	0.85	No
	Hungary (N=23)	3.0	0.00	41.0	3	0.50	No
	Romania (N=44)	4.0	0.50	54.7	3	0.54	No
	Slovenia (N=36) [4)]	7.3	2.00	49.5	3	0.85	No
	(2) Distress-push diversifiers						
	Bulgaria (N=109)	1.8	0.50	41.5	4	0.85	Yes
	Hungary (N=112)	4.0	0.29	39.9	3	0.54	Yes
	Poland (N=115)	2.8	0.33	39.0	4	0.68	Yes
	Romania (N=146)	3.0	0.25	42.0	4	0.84	Yes
	(3) Pensioners						
	Bulgaria (N=46)	4.6	1.75	62.0	4	0.15	No
	Hungary (N=51) [5)]	8.0	1.00	60.0	3	0.43	No
	Romania (N=31)	3.4	3.00	67.0	3	0.15	No
Households having no need for diversification	**(4) Farmers with diversification potential**						
	Poland (N=48)	9.8	1.00	43.0	4	0.85	No
	(5) Demand-pull diversifiers						
	Slovenia (N=151)	7.1	0.50	39.0	3	0.50	Yes
	(6) Past demand-pull diversifiers						
	Bulgaria (N=31)	15.0	0.50	46.3	4	0.15	Yes
	Hungary (N=32)	10.5	0.00	51.3	3	0.43	Yes
	Poland (N=10)	11.0	0.00	47.6	4	0.49	Yes
	Romania (N=3) [6)]	5.1	0.00	57.0	4	0.45	Yes
	Slovenia (N=14)	12.6	1.00	42.3	2.5	0.38	Yes
	(7) Farmers without diversification potential						
	Poland (N=26)	9.3	0.50	49.0	2	0.15	No
	Slovenia (N=12)	12.5	1.00	60.0	2.5	0.15	No

Source: Own calculations based on SCARLED data.

Notes: Missing countries in the household types indicates that this type was not found in the country's survey sample.

[1)] Education: 1: no schooling, 2: primary school, 3: secondary school, 4: high school, 5: university degree. [2)] Index: 0: no diversification potential, 1: high diversification potential.

Results suggest that the need for diversification caused by the interplay of farm size and dependency ratio divides rural farm households in two groups. Within each group, individual households have a potential for diversification or not. The key variables that distinguish the

[7] External conditions are assessed by the remoteness of the village, the labour market situation, and the regional purchasing power (Figure 3).

households are age and education. Potential households may start a non-farm employment or may decide to stay with their current situation. Over the years, potential households will lose their potential and finally stop their non-farm income activities.

5 Conclusions

Promoting structural change in the most efficient way means to address the household types in the right way. Not all development options, i.e. farm development, farm exit, starting self-employment, or going for a waged job, are equally suitable for all households thus fine targeting of policy measures according to the socio-economic situation of a household is recommended. With respect to employment diversification, households of farmer's type are expected to be most promising. These households have the best capital endowment thus rural entrepreneurs are most likely found among them. Measures supporting entrepreneurship accompanied by training and business guidance are best targeted to those households. Likewise, educational measures that increase employability of household members in the non-farm wage sector could support income diversification.

For potential job-starters and distress-push diversifiers, stopping farming is still a feasible option. General education as well as occupational retraining will improve their employability in the non-farm sector. For pensioners, no rural development policy measures are recommended because they do no longer have a development potential. Nevertheless, functioning social systems are necessary for them to prevent poverty. For farmers and (past) demand-pull diversifiers, farm development is an option. Farm investment support complemented by professional training and advice by extension experts in terms of how to access modern agri-food chains is best offered to them.

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