The role of financial support: Strategies of farm households on diversification of income sources under two policy scenarios

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Abstract: External framework conditions such as financial support provided under the European Common Agricultural Policy (CAP) influence decision-making of farm households on how to distribute labour resources on and off the farm business to earn household income. To assess the relation of income diversification strategies and financial support, we have tested two policy scenarios as benchmark cases of farm behaviour: One describes the status quo and the other assumes a complete termination of financial support. Using survey data of 2,154 farm households, preferences regarding future income generation through agricultural production, on-farm diversification activities, and off-farm employment, including a shutdown of production were compared across scenarios. To account for the heterogeneity of investigated farm households, a typology approach was applied to distinguish type-related decision-making structures. The typology generated by factor and cluster analysis integrated relevant variables and depicted six farm types. The farm types showed strong variations regarding their behaviour under both scenarios. Results indicate that under hypothetical conditions of termination of CAP support, an increased share of farm households – throughout all types – would choose to quit farming, yet to varying degrees. Farms opting for continuation tend to diversify activities in order to cope with increased income risk and exposure to markets. The behavioural patterns thus show the complex interrelationships of internal household and business characteristics and external framework conditions in farm households' decision-making for their survival. Those are relevant for the design of targeted rural development policies.

Keywords: Rural development, CAP, labour allocation, pluriactivity, cluster analysis, farm typology

1. Introduction

In response to market pressures, changing political framework conditions, increased price and cost pressure as well as economic risk, farm households often redistribute their resources, particularly labour, in order to secure their income. Diversification as an extension of on and off-farm business activities thus represents an important adjustment and restructuring strategy. Diversification of the business on the agricultural holding includes agricultural services, contract farming, tourism or direct marketing (Ilbery et al., 1997; Piorr et al., 2007; Præstholm & Kristensen, 2007). Notably family and smaller farms tend to broaden their income basis by employing household members outside the agricultural holding (Gasson et al., 1988; Maye et al., 2009; McNamara & Weiss, 2005; Meert et al., 2005). Farms gradually shifting their labour resources towards off-farm employment may finally decide to exit from farming completely (e.g. Breustedt & Glauben, 2007; Glauben et al., 2006; Kazukauskas et al., 2013).

Formulated in terms of microeconomic theory of household behaviour, decisions to reallocate resources result from comparing the utility of a marginal increase of labour supply across different alternatives. Farmers compare the benefits of working on-farm in different enterprises, for primary production in general assumed to exhibit decreasing returns to scale, with the wage that could be earned in off-farm employment. The indifference point represents the reservation wage rate which can be derived from utility maximising household models (e.g. Huffman, 1980). Income risk is another driving factor often included in modelling (McNamara & Weiss, 2005). Translating theoretical models into empirical applications such as regression models or multivariate clustering approaches, several studies have investigated those factors that drive farmers' decisions to shift their resources away from primary agricultural production. Tested variables include farm households' socio-economic characteristics and the business structure of their holdings (Barbieri & Mahoney, 2009; García-Arias et al., 2015; Hansson et al., 2013; McNally, 2001; Serra et al., 2005; Sharpley & Vass, 2006) as well as the local context and framework conditions (Lange et al., 2013; Meraner et al., 2015; Pfeifer et al., 2009; Zasada et al., 2011). Changes in the European Common Agricultural Policy (CAP), e.g. the implementation of decoupled single farm payments, have been theorized to influence labour allocation decisions of farmers by generating wealth and substitution effects (Hennessy & Rehman, 2008; Petrick & Zier, 2011). The CAP also fosters on-farm diversification activities under its Rural Development Programme by providing substantial market incentives for business establishment and diversification activities (Dwyer et al., 2007; Zasada et al., 2015).

In this paper, we aim to further enhance the understanding of the strategic decision-making of farmers with regard to the allocation of household labour resources and employment of a diversification strategy on or off the farm, including the shutdown of agricultural production. We are primarily interested in analysing policy impacts by comparing two scenarios with varying degrees of financial support using the case of hypothetical termination of all support measures as benchmark. Our study is based on empirical farm-level data from a sample of 2,154 farms across a variety of case study regions in nine European countries. To account for behavioural differences between farms, we identify different farm types using a quantitative modelling approach of factor and cluster analysis. The propensities to diversify are assessed for these farm types. The modelling procedure is summarised in section 2. Section 3 compares the differences in decision-making behaviour across farm types and scenarios. The following discussion takes up these aspects and contextualises them with the literature and the policy dimension feeding into a final conclusion on

our findings. The presented research contains findings that are an extension of results and further application of methods described in Weltin et al. (2016).

2. Data and methodological approach

2.1 Data set

The data used for analysis are obtained from a questionnaire-based survey of 2,363 farm households in eleven case study regions located in nine European countries. The survey was carried out within the European research project CAP-IRE in 2009. The sampling procedure is described in Viaggi et al. (2013a). Table 1 provides an overview on the included regions.

Table 1: Overview on case study areas included in the sample

Case study area	**Country**	**NUTS**	**No. of farms** (2010)	**UAA in Mio. ha** (2010)	**Av. farm size in ha** (2010)	**No. of obser-vations**
Emilia-Romagna	Italy	ITH5	73,470	1.03	14.5	300
Noord-Holland	Netherlands	NL32	5,010	0.13	26.1	300
Macedonia & Thrace	Greece	EL11	178,600	1.91	10.7	300
Podlaskie	Poland	PL34	84,700	1.03	12.2	249
North Eastern Scotland	United Kingdom	UKM5	4,740	0.45	95.9	168
Andalusia	Spain	ES61	246,100	4.40	17,9	201
Yugoiztochen	Bulgaria	BG34	56.980	0.87	15.3	273
Centre	France	FR24	25,080	2.31	92.2	140
Midi-Pyrénées	France	FR62	47,900	2.54	53.0	155
Lahn-Dill-District	Germany	DE722	611	0.24	39.8	117
North-East Brandenburg	Germany	DE40	3,381	0.86	255.3	160

Source: Eurostat data base. Note: UAA= utilized agricultural area.

2.2 Research design and methods

To compare farmers' strategies regarding future (from 2014 onwards) diversification of their income sources, we used stated preferences of farm households included in the survey. Their decisions were assigned to five categories as depicted in Table 2. Farmers were asked to state their plans under two policy scenarios: First, a baseline scenario with continuation of European agricultural policy and second, a "No CAP" scenario with the hypothetical complete abolishment of all forms of financial support.

Table 2: Investigated income diversification strategies

Strategy	**Explanation**
Combined diversification	Household increases labour for on and off-farm income diversification.
On-farm diversification	Household increases labour for on-farm income diversification.
Off-farm diversification	Household increases labour for off-farm income diversification.
No diversification	Household does not increase any income diversification activity or decrease labour for diversification activities.
Exit	Household stops the farming activity completely.

Source: Own representation.

Despite acknowledging the relevance of external factors, such as regional (bio-physical and socio-economic) framework conditions, in this paper, we focus on the dependency of diversification decisions from internal (farm household and business) characteristics as identified in the literature. Therefore, we used a data set of heterogeneous European farms and applied factor and cluster analysis to develop a farm typology. Such delineation of farm types makes apparent different patterns of strategic decision-making behaviour. Previous applications focus on farm-specific development pathways (Iraizoz et al., 2007), resource use behaviour (Kurz, 2008; Schwarz et al., 2009), differences within specific production systems (Caballero, 2001; Moreno-Pérez et al., 2011; Riveiro et al., 2013) or, in the case of income diversification, farm typologies identify adopters of alternative farm enterprises (Daskalopoulou & Petrou, 2002; Præstholm & Kristensen, 2007) or differences in the propensity to diversify (Chaplin et al., 2004; Lange et al., 2013; López-i-Gelats et al., 2011).

A cluster analysis aims at maximizing the heterogeneity between while minimizing the homogeneity within clusters as an appropriate feature to delineate different farm types (Köbrich et al., 2003). In order to identify relevant variables that can be used to cluster farms, we selected as many variables as possible from the data set based on a literature review on income diversification. We applied factor analysis to reveal the correlation structure of the variables in the data set and reduce its dimensionality for cluster analysis. The income diversification decisions of farmers were compared across scenarios for the identified farm types in the cluster analysis. This was done by comparing relative frequencies of strategy choices. All steps of the methodological approach are summarized in Figure 1. The data includes many non-metric variables, which is why we could not apply standard procedures of factor and cluster analysis but had to address the peculiarities of a mixed data set. Relevant steps are included in Figure 1 and references are provided when non-standard approaches had to be used. Otherwise, factor and cluster analysis were performed according to Backhaus et al. (2011, p.323 ff.).

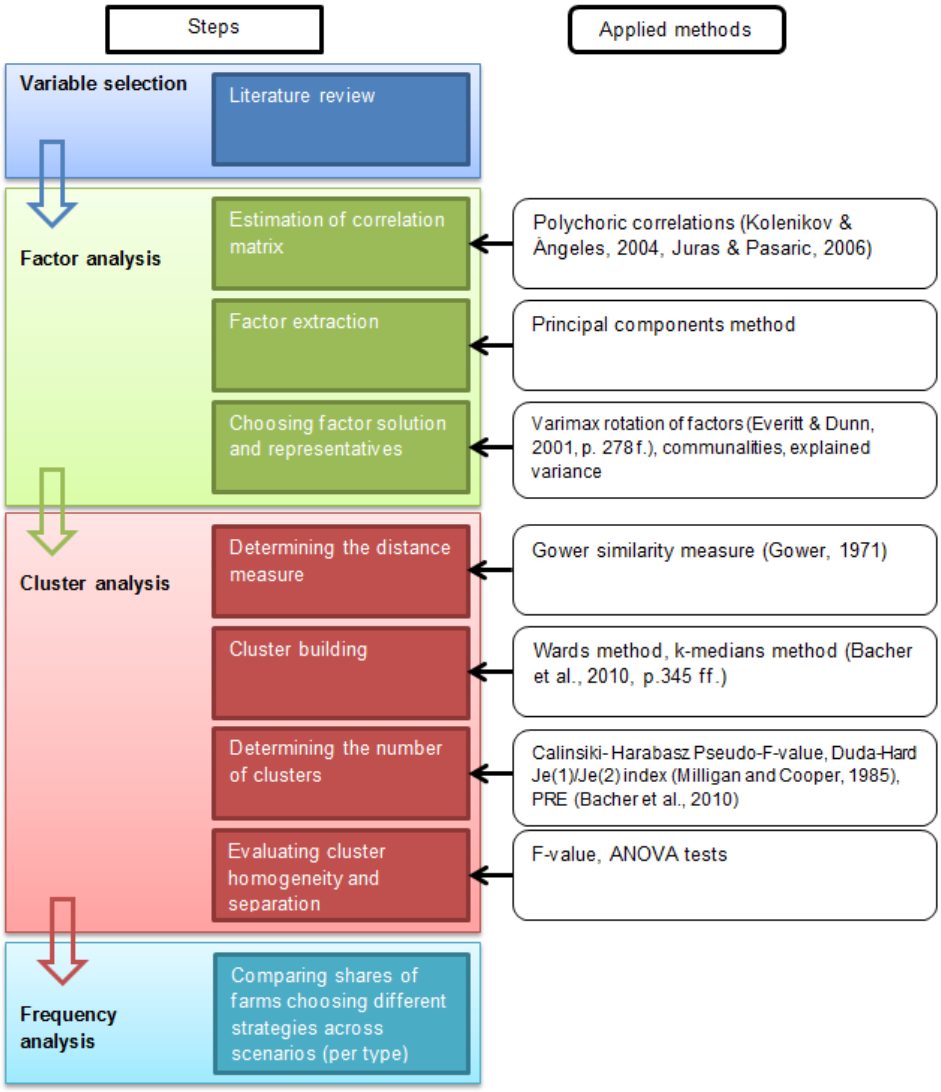

Figure 1: Applied methodological steps. Source: Own representation.

3. Results

3.1 Identified relevant factors

We identified 21 relevant variables for income diversification decisions included in the data set. They are presented with descriptive statistics in Table 3. As result of the factor analysis, we reduced the number to eleven factor representatives which are displayed in bold letters in Table 3. The factors explain 86% of total variance. All communalities i.e. explained variances of single variables are at least 0.78. Thus the eleven representatives approximate the information content of all 21

variables for the subsequent cluster analysis. Due to missing values, the number of observations had to be reduced to 2,154 for cluster analysis.

Table 3: Selected variables and factor representatives

Variables (Factor representatives in bold letters)	N	Min	Max	Mean	StDev.
Social and demographic household characteristics					
Number of household members	2,356	1	12	3.50	1.43
Number of children (< 18 years) in household	2,345	0	6	0.70	1.02
Number of old people (> 65 years) in household	2,342	0	5	0.50	0.75
Members working full-time on farm	2,345	0	9	1.20	0.80
Members working on farm (total)	2,337	0	9	1.90	1.05
Highest educational level in household	2,346	1	6[b]	3.60	1.13
Income					
Income share from agricultural production	2,290	1	6[c]	4.25	1.76
Structure of production					
Land owned (in ha)	2,333	0	5,000	45.9	163.96
Land operated (in ha)	2,304	0	7,500	93.4	300.20
Specialisation in cropping[a]	2,363	0	1	0.41	0.49
Specialisation in livestock[a]	2,363	0	1	0.28	0.45
Organic farming activities[a]	2,363	0	1	0.11	0.31
Farm organization					
Total number of employees[g]	2,302	0	104	2.10	6.60
Number of full-time employees	2,312	0	40	0.70	2.51
Sole proprietorship[a]	2,363	0	1	0.72	0.45
Participation in agri-environmental scheme[a]	2,324	0	1	0.26	0.44
Use of farm advisory service[a]	2,348	0	1	0.57	0.49
On-farm diversification activities					
Labour share for on-farm diversification	2,276	0	6[c]	0.40	1.05
Direct sale to final consumer[a]	2,331	0	1	0.12	0.33
Location					
Less-favoured area	2,359	0	2[d]	0.98	0.95
Altitude	2,358	1	3[e]	1.50	0.65

Source: Own representation. Note: [a] *Dummy variables, coded 0 and 1; 0 equals "no" and 1 equals "yes";* [b]*coding: 1 "none and primary", 2 "lower secondary education", 3 "upper secondary education", 4 "post-secondary non-tertiary education", 5 "first stage of tertiary education", 6 "second stage of tertiary education";* [c]*coding: 1 "<10%", 2 "10% to 20%", 3 "30% to 49%", 4 "50% to 69%", 5 "70% to 89%", 6 ">89%". For labour share on-farm diversification 0 means "no on-farm diversification";* [d]*coding: 0 "not", 1 "partly", 2 "completely";* [e]*coding: 1 "plain", 2 "hill", 3 "mountain"*

3.2 Description of identified farm types

The result of the cluster analysis favours the existence of six clusters. Comparing relevant characteristics of the farms represented in the clusters as displayed in Table 4, farm types can be well interpreted and named. Multivariate analysis of variance (MANOVA) tests confirmed that mean vectors of variables differ across clusters. However, most clusters i.e. farm types are set apart by certain characteristics while being similar to others concerning other variables.

In short, the generic farm types can be characterised as follows: *Pluriactive small farm households* (type 1) consist of smaller and rather older households that generate a larger share of income outside agriculture. *Young organic farm households* (type 2) all engage in organic farming activities,

consist of big and comparably young families, and are most likely to hire additional employees. *LFA-adapted mixed farms* (type 3) lie to a large extent in less-favoured areas that are relatively frequently mountainous, where they engage in mixed farming, and they have the best education. *Traditional part-time crop farms* (type 4) are crop specialists in non-LFA plain areas that are rather old, apply small amounts of household work on-farm and least likely to engage in on-farm diversification. *Small-scale livestock specialists* (type 5) are small households which rarely hire employees, specialised in livestock farming, but with high propensities for on-farm diversification. *Intensive livestock professionals* (type 6) generate high shares of income from livestock farming businesses run by big families on comparably large areas of land in less-favoured areas. All farm types are present in almost all case study areas albeit with varying extent and some regional tendencies of agglomeration.

Table 4: Characterization of farm types by selected variables

Farm type		**1**	**2**	**3**	**4**	**5**	**6**	**all**
	Number of observations	540	138	328	586	329	233	2,154
Social and demographic household characteristics								
HH size	Share of HH with ≤2 members	35	12	27	32	34	12	29
HH structure	Share of HH with children	36	70	42	31	44	65	42
	Share of HH with old people	36	25	26	29	31	34	31
HH work	Share of HH with 0 members (full-time)	21	17	13	20	16	3	16
	Share of HH with ≥ 2 members (full-time)	25	46	38	30	32	62	35
Education	Mean of levels	3.6	3.7	3.8	3.4	3.6	3.5	3.6
Income								
Income from agriculture	Share of HH with <10%	15	6	10	13	12	4	12
	Share of HH with ≥90%	25	40	36	40	35	60	37
Characterisation of the agricultural holding								
Speciali-sation	Share of crop specialist farms	55	43	40	69	0	0	41
	Share of mixed farms	45	49	59	25	0	2	31
	Share of livestock specialist farms	0	7	2	6	100	98	28
Organic	Share of HH producing organic products	5	100	0	4	9	5	11
Land	Median owned land in ha	10	15	10	10	16	28	12
	Median operated land in ha	19	22	35	20	26	50	25
Farm structure and organisation								
Employment	Share of HH with full-time employees	18	31	30	21	15	27	22
	Share of HH having employees	31	55	52	52	25	39	42
Farm organisation	Share of HH with sole proprietorship	78	83	69	69	65	73	72
	Share of HH with farm advisory service	0	73	100	100	0	96	58
	Share of HH with AES	19	45	30	24	28	34	27
Specific variables regarding on farm diversification								
On-farm diversifi-cation	Share of HH with activities	20	20	17	10	23	14	17
	Share of active HH with labour share for on-farm diversification >50%	15	15	18	24	24	6	18
	Share of HH with direct sale of products	13	26	15	9	13	6	12
Location	Share of HH not located in LFA	44	34	0	94	41	15	47
	Share of HH completely located LFA	48	60	88	0	54	73	45
	Share of HH located in plain area	60	28	21	74	74	49	57
	Share of HH located in mountainous area	5	18	23	1	4	21	9

Source: Own representation. Note: Colouring indicates highest values in dark green, second highest in light green, lowest in dark red and second lowest in light red; HH = household, AES = agri-environmental scheme.

Type 1: Pluriactive small farm households; Type 2: Young organic farm households; Type 3: LFA-adapted mixed farms; Type 4: Traditional part-time crop farms; Type 5: Small-scale livestock specialists; Type 6: Intensive livestock professionals

3.3 Policy scenario differences in strategic decision-making of farm types

The comparison of farm types' choices regarding future diversification strategies reveals that substantive differences in propensities for future strategies exist when policy conditions are assumed to change. Figures 2a to 2f show the relative frequencies of farms choosing one of the five discussed strategies for each farm type across policy scenarios. Considering all farms, reflected by the orange bars, the general picture indicates that across types and scenarios the three diversification options are least likely. The young organic farm households are the only exception with over 40% of farms opting to increase one of the diversification activities in the baseline scenario, with a strong majority for on-farm diversification. Pluriactive small farm households are least likely to diversify. "No diversification" is the strategy mostly applied under the baseline scenario.

The striking feature under the "No CAP" scenario is the increase in exit rates. Although for exit decisions, differences across farm types are evident. Under the baseline scenario, young organic farm households and intensive livestock professionals have very low exit rates, whereas these exceed 30% for the other livestock type and 20% for the pluriactive small farm households and traditional part-time crop farms. LFA-adapted mixed farms show with 62% the highest exit rate in the "No CAP" scenario. Under the conditions of terminated financial support, young organic farm households have a large increase of exit rates, whereas the exit rate only modestly increases for the intensive livestock professionals to 32%. On-farm diversification shares decrease under the "No CAP" scenario for all types, whereas combined and off-farm diversification shares increase for some, especially for the livestock types. Taken together, shifting labour resources towards off-farm employment is a general reaction across types.

The high propensity to opt for the exit strategy conceals much of the fluctuations in single diversification trajectories chosen by farm households that would continue their business. Therefore, dark bars show the propensity to increase diversification on-farm, off-farm or combined only for the surviving farms (under the baseline scenarios 363 farms exit, under the "No CAP" scenario 951).

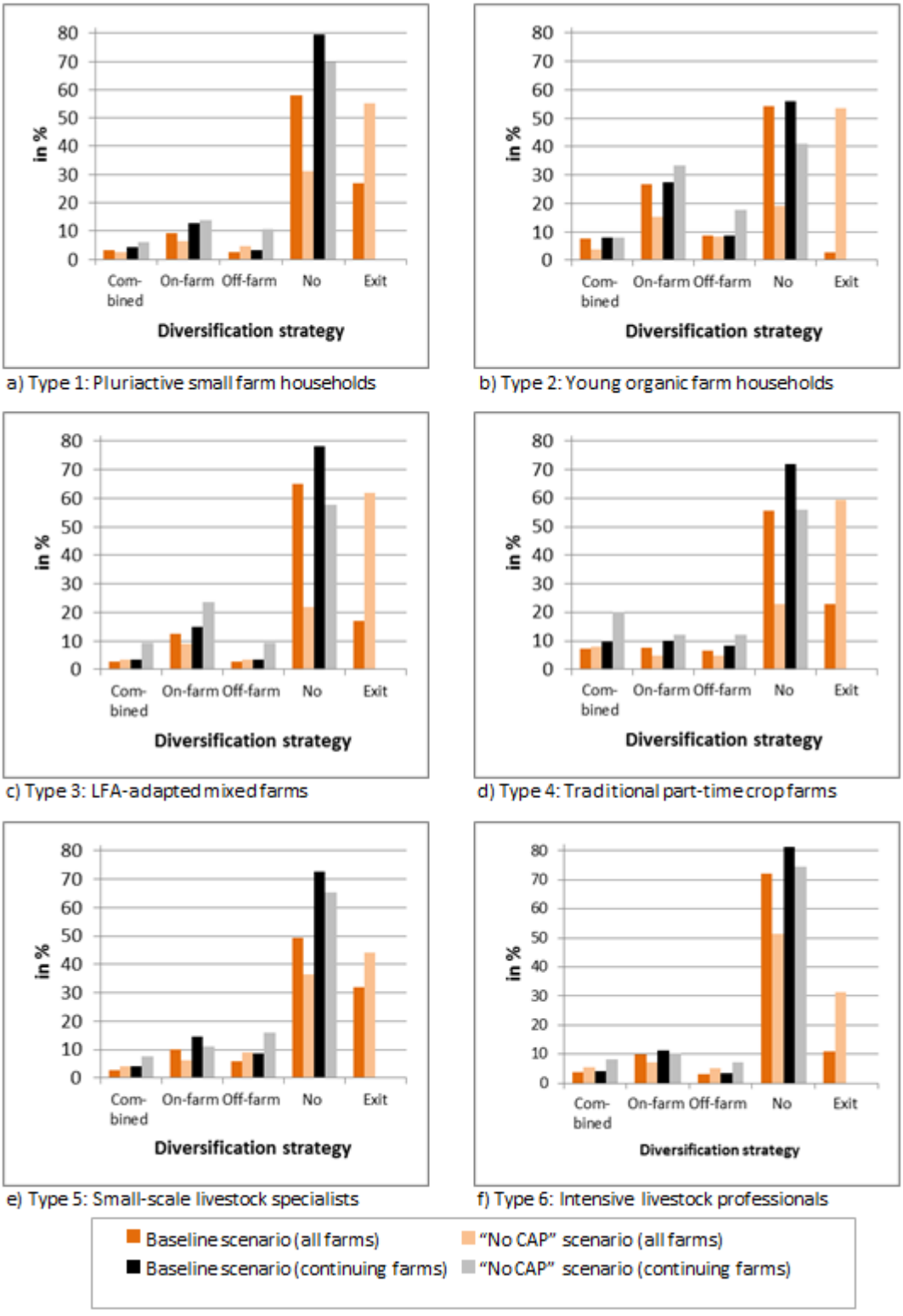

Figure 2 a - f: Differences in the propensities to choose one of the five diversification strategies across scenarios per farm type. Source: own representation.
Note: Strategies are described in Table 1.

The overall picture shows that for most farm types the preferred strategy is increasing on-farm diversification. Under the “No CAP” scenario all diversification strategies are chosen more frequently as a response to the termination of financial support, except on-farm diversification for the livestock types. Almost all farm types show the strongest increases in off-farm diversification strategies under less supportive political circumstances. However, there is indication for strong farm type differences. Amongst the already identified leaders in diversification, the young organic farm households, almost 35% opt for an increase in on-farm diversification. They are followed by the LFA-adapted mixed farms. The traditional part-time crop farms have the highest shares of farms choosing combined diversification with an increase up to 20% under the “No CAP” scenario. Farm types with generally low preferences for diversification are the intensive livestock professionals and the pluriactive small farm households.

4. Discussion

4.1 Methodology

Farm typologies are applied to account for heterogeneity in the motivations and decisions of farm households (Kurz, 2008; Schwarz et al., 2009) and to distinguish different behavioural patterns (Cortez-Arriola et al., 2015). The developed farm typology shows differences in behaviours across types. This demonstrates the usefulness of this tool in the case of a heterogeneous large sample of farms with a broad regional distribution and widens the effective use of typologies addressing questions of pluriactivity, for example by Chaplin et al. (2004); Daskalopoulou and Petrou (2002); Lange et al. (2013); Præstholm and Kristensen (2007), beyond a regional scale. It allows detecting common patterns and trends for the behaviour of farm households that stem from very different areas in terms of agricultural development, structure and agronomic site conditions in Europe.

Future strategies of the households used in the analysis are stated preferences. The question to what extent these equal the actual future behaviour of the households ought to be addressed. The concordance has to be precise enough to investigate stated preferences as proxies of actual behaviour. Viaggi et al. (2013b) deduct from the literature on stated preferences that they reveal the actual behaviour in the majority of cases. If present, the direction of the bias might be ambiguous. However, the authors argue that due to the difficulties households face to plan ahead, the strategy of “no reaction” might be overestimated which is supported by the fact that 27% of farms in the baseline and 23% in the “No CAP” scenario either did not know what they would do or chose not to answer the strategy questions.

4.2 Behavioural differences in the baseline scenario

Our results show that in the baseline scenario the “no reaction” strategy dominates. Apart from possible distortions by a small bias deriving from stated preferences, it might indicate that many farms have already reached the optimal amount of diversification as diversification shares have been found to be already substantial (Bateman & Ray, 1994; Pieniadz et al., 2009). However, all investigated farm types are below the EU average of one third of farms pursuing other gainful activities (European Commission, 2013, see Table 4). Under the investigated baseline scenario that matches the policy of the CAP 2007 - 2013, a natural exit rate ranging from three (young

organic farm households) to 32% (small-scale livestock specialists) consists of farmers that plan to shut down their business in near future despite the current policy support. Reasons found to explain exit tendencies are among other ageing e.g. for the pluricative small farm households (Glauben et al., 2006), business sizes e.g. for the small-scale livestock specialists (Glauben et al., 2006) and crop production e.g. for the traditional part-time crop farms (Breustedt & Glauben, 2007).

We also found farm type specific patterns regarding the other diversification activities. The farm typology, assigned to six clusters, exhibits a mixture of traditionally established types like "pluriactive small farm households" or "LFA-adapted mixed farms" for which diversification strategies already generate a substantial share of income, as described in the literature (Bessant, 2006; López-i-Gelats et al., 2011; McNally, 2001; Robinson, 2013), and rather novel ones like "young organic farm households" or "intensive livestock professionals". In particular young organic farm households but also LFA-adapted mixed farms tend to further increase on-farm diversification activities. This is especially visible when looking only at those farms that stay in business. This behavioural pattern could be related to their larger family size because the attractiveness of exploiting unused family business potential compared to food production potential is high (Mann, 2009), and location in less-favoured areas which can be favourable for diversification into agri-tourism (McNally, 2001).

4.3 Behavioural changes under the "No CAP" scenario

Interesting insights into the motivation and drivers to choose future adjustment and restructuring strategies can be gained from the comparison with the hypothetical scenario of termination of all financial support. Across all farm types, the main tendency is to shift labour towards off-farm employment mainly in the form of shutting down the business (except for the livestock types exit rates exceed the 50% threshold), but also in the application of combined and off-farm diversification strategies. This means that missing financial support will generate pressure on the labour market in other sectors. In particular, taking into account the high share of exit decisions of farms in LFA locations under the "No CAP" scenario, the challenging implications for rural development have to be considered.

The most robust type is the intensive livestock professionals, whose income structure barely depends on support, indicating that lump-sum financial support schemes such as single farm payments do not influence the labour allocation decision (Pieniadz et al., 2009). In contrast, the young organic farm households, which are leaders in future diversification activities across scenarios but whose exit rates increases strongly from 3 to 53%, are very likely to depend on financial support for their survival. Petrick and Zier (2011) describe that organic farms engaged in agri-environmental schemes need lump-sum government transfers for these activities and are otherwise dependent on off-farm employment, which is confirmed by our findings. The explored differences across types illustrate the complex interdependencies of factors that have to be taken into account when inferring on farmers' reactions to changes in the CAP and steering diversification decisions in a desired direction for public and private investments.

When looking only at surviving farms, the propensities for off-farm diversification see the largest increases. However, a general increase in all diversification activities as a response to the loss of financial support demonstrates that diversification can be interpreted as a survival strategy as it has been found in other studies (López-i-Gelats et al., 2011; Meert et al., 2005). Carrying out additional on-farm activities does not show strong dependency on the policy scenario, as found by

Pieniadz et al. (2009), suggesting curbing effects of the overall CAP instrument, which is dominated by production-oriented single farm payments. The shifting of financial resources to rural development measures in the current funding period 2014-2020 represents an important step in this regard.

5. Conclusion

The alteration of political framework conditions that affect farm adjustment strategies have been current issues in European rural development policy. Despite a comparably long history of valuable research on topics such as diversification and structural change, the evidence based on theoretical models of farm households' utility largely refers to in-depth investigations of single factors in specific case studies. This study takes a broad empirical approach based on a survey of 2,154 farms from eleven European regions. It compares choices to allocate labour resources on and off the farm including a complete shutdown of agricultural production under two contrasting policy scenarios. We observe a strong tendency of rising exit rates as it is reported by farmers in relation to the termination of CAP support. At the same time on and off-farm diversification as survival strategy among farms that decide to continue their farming activity is observed. In order to disentangle the complexity of determining factors, we developed and applied a joint approach of factor and cluster analysis to determine farm types showing distinct behavioural patterns. The distinguished six clusters exhibit types of different robustness to the loss of market support, and varying propensities to diversify for surviving farms. So far, relatively unknown types, such as intensive livestock professionals, show a strong tendency to continue agricultural production with low propensity to diversify independently of the policy scenario. In contrast, young organic farm households have a high propensity to diversify on farm but strongly depend on market support. The patterns revealed by the farm typology and the benchmark scenarios show that the interrelation of many different factors is relevant to determine farmers' reactions to changes in the CAP, and common trends are not likely in the heterogeneous European farm population. Information specific to certain types is therefore relevant in order to develop targeted rural development policies that are tailored to the specific needs of beneficiaries.

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