Evaluating the role of financial flexibility in farmers' investment decisions using latent class analysis

Friederike Anastassiadis* and Oliver Mußhoff

Department for Agricultural Economics and Rural Development,
Faculty of Agricultural Sciences,
Georg-August-University

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*Department for Agricultural Economics and Rural Development,
Faculty of Agricultural Sciences,
Georg-August-University Göttingen, Platz der Göttinger Sieben 5, D-37073 Göttingen
friederike.anastassiadis@agr.uni-goettingen.de

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Abstract

The global structural change in the agricultural sector entails adaptation processes, which often involve leveraged investments resulting in decreasing equity ratios of farms. Lower equity ratios can be followed by a reduction in the financial flexibility of farms. If additional investments with debt capital are made, the financial flexibility may be further restricted. The question that arises is if farm managers already consider the financial flexibility when making investment decisions. In the present study, farmers are faced with hypothetical investment alternatives in a discrete choice experiment. The investment alternatives differ in their profitability, the risk involved and in their impact on the farm's financial flexibility. The estimation of a latent class model, with four classes, reveals that in all classes the amount of debt capital necessary for the investment is relevant for the farmers' decision. In three of the four classes, the farmers' utility of an investment alternative decreases cetris paribus if the amount of debt capital increases.

Keywords Financial flexibility, investment decision, latent class analysis

JEL code C35; G11; Q14

1. Introduction

In all economic sectors, businesses are constantly faced with changing framework conditions. In order to stay competitive, entrepreneurial adaptations are imperative. The technical progress, volatile markets, reforms of the agricultural policy and the impacts of the global climate change also promote adaptations for farms. The associated investments are of increasing volumes and are made at ever declining intervals. Consequently, farms' capital intensity increases more and more. Therefore, extensive internal financing, one of the main sources of financing within the agricultural sector (ODENING, 2003), is hardly possible. This results in a higher percentage of debt capital or in decreasing equity ratios. On average, the equity ratio of German farms, which generate their income mainly from agricultural activity, was 84.3% in the financial year 2000/2001 (BMELV, 2001) and 79.6% in the financial year 2010/2011 (BMELV, 2011a). The average equity ratio of farms owned by legal persons in the east of Germany is with 64.6% (58.8%) below the national average in the financial year 2000/2001 (2010/2011) (BMELV, 2001; BMELV, 2011a). Specifically farms which have invested in livestock rearing have an equity ratio of only 20% to 40% (BAHRS et al., 2004, p. 12-13). In contrast, the average equity ratio of German small and medium-sized enterprises was 15% in 2004 (DEUTSCHE BUNDESBANK, 2006, p. 55).

A high proportion of debt capital can lead to a decline in the farm's credit reserves (= maximum debt limit less indebtedness of the farm). Next to the adjustment of the private investment and disinvestment, the credit reserves are one of the farm's main sources of financial flexibility (cf., e.g., LINS et al., 2010; DEANGELO et al., 2011; DENIS and MCKEON, 2012). In this context, financial flexibility is referred to as "the degree of capacity and speed at which the firm can mobilize its financial resources in order to take reactive, preventive and exploitive actions to maximize the firm value" (BYOUN, 2007, p. 2). Thus, a possible consequence of low equity ratios is that the farms' financial flexibility becomes limited. If these farms make an investment with a high share of debt capital, this usually leads to a further reduction of their credit reserves and also of their financial flexibility. The situation that a farm can only cover its future financial needs at worse terms than the present ones, or even not at all, is an indicator for a reduced financial flexibility in the future (DEANGELO et al., 2011, p. 236). If this is the case, the opportunity costs of raising debt capital must be considered for the investment decision (DEANGELO et al., 2011, p. 258). The classical investment theory however, does not take into account these opportunity costs of the debt capital.

With this in mind, the question arises if farm managers take into consideration financial flexibility in their investment decisions. The present study therefore aims to investigate the role the financial flexibility plays in agricultural investment decisions in more detail. To our knowledge, this question has not been examined in the agronomic context. To answer this research question, we carried out a discrete choice experiment (DCE) with farm managers who choose from hypothetical investment alternatives that have a different effect on the farm's financial flexibility. A DCE allows us to determine preferences for action alternatives, without explicitly asking for them (Stated Preferences

Approach). By relating the participants' choice behaviour to the characteristics of the action alternatives and their individual features, complex structures of the decision-making process can be revealed (LOUVIERE, 2001). An advantage of the DCE over the Revealed Preferences Approach is the opportunity to include hypothetical action alternatives (TRAIN, 2009, p. 152).

The present study is structured as follows: Section 2 provides a literature review about the topic of 'financial flexibility' and describes the generation of hypotheses. In section 3, the experimental design of the DCE as well as the data base are described, while the data analysis is outlined in section 4; in addition, the results of the DCE are explained in more detail. Finally, the paper finishes with conclusions and future prospects (section 5).

2. Theoretical background

2.1. Literature review

BAKER (1968), BARRY and BAKER (1971) as well as BAKER and BHARGAVA (1974) investigate the role of credits in the liquidity management of farms. These studies came to the conclusion that credit rising is associated with a loss in liquidity, which must be considered for operational decisions and which involves opportunity costs. BARRY et al. (1981) ask agricultural bankers to decide about several hypothetical credit inquiries, while the farm's financial situation varies. The authors demonstrate that credit costs — the sum of the credit interest rate and the opportunity costs for reduced credit reserves — negatively correlate with the farm's income situation. In other words, if the farm's maximum debt limit decreases due to a negative income situation of the farm, the remaining credit reserve diminishes and the resulting opportunity costs increase. The detected correlation was found to be stronger for investment credits than for operative credits. SONKA et al. (1980) carried out a similar simulation experiment with agricultural bankers as well. The authors examined the correlation between the financial situation of a potential borrower and the credit amount offered by a bank. From the results of the experiment, they established that farms which had nearly reached their maximum debt limit jeopardize their access to bank credits and thus, their credit reserves. Furthermore, agricultural bankers consider the debt equity ratio and therefore, the farm's risk-bearing capacity, as an important and decisive factor for lending.

Recent agricultural research focuses on the explanation of the capital structure of farms (e.g., BARRY et al., 2000; FEATHERSTONE et al., 2005), as well as on credit risks and the farms' liquidity management, which is investigated from a risk management perspective (e.g., MISHRA and LENCE, 2005). In the context of investment decisions, the opportunity costs of the debt capital or the term 'financial flexibility' have not been discussed in agronomic publications.

Relevant literature to the aforementioned subject can primarily be found in the field of economic sciences. Qualitative studies by GRAHAM and HARVEY (2001), BANCEL and MITTOO (2004) as well as BROUNEN et al. (2004) highlight the maintenance of the financial flexibility as a decision-making factor for investment decisions. The econometric analysis of data from several British firms by

MARCHICA and MURA (2010) revealed similar results: financially flexible firms are able to make larger and more profitable investments than financially inflexible firms. DENIS and MCKEON (2012) determined that established theories, such as the pecking order theory, are not able to explain the capital structures of real firms since these theories do not consider the value of financial flexibility. GAMBA and TRIANTIS (2008) develop a model and show, by means of a simulation, that the value of a firm's financial flexibility can be measured. Here, the costs of external financing of the firm are influential for the value, as well as the expectations regarding the future financial needs and investment options. Furthermore, the authors found out that financially flexible firms always make profitable investments and are consistently able to pay out dividends (GAMBA and TRIANTIS, 2008, p. 2263). Using data from firms in the United States, CLARK (2010) examines the influence of financial flexibility on the capital structure decisions of firms. The author comes to the same results as DEANGELO et al. (2011) by saying that firms consider the opportunity costs of the debt capital when deciding on their capital structure. These opportunity costs arise from the small possibility to remove debt capital in the future.

The aforementioned studies show and explain a correlation between the financial flexibility and investment, however, they do not provide any explanation about how and to which extent farmers consider the financial flexibility for their investment decisions, or if the latter is relevant for the decisions at all.

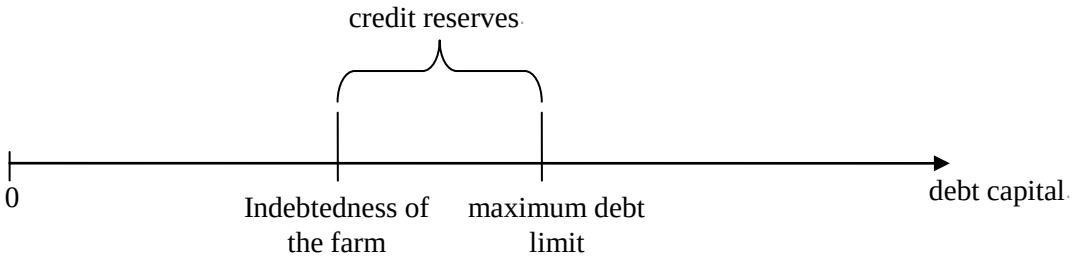
2.2. Generation of hypotheses

One primary source of financial flexibility are the farm's credit reserves (cf., figure 1a; cf., e.g., LINS et al., 2010; DEANGELO et al., 2011; DENIS and MCKEON, 2012). Due to the prevailing financing structure, these credit reserves are one of the most important sources of financial flexibility in the agricultural context, besides private investment and disinvestment. In principle, a farm has two options in order to maintain or increase its financial flexibility. On the one hand, a reduction of the share of debt capital at a constant maximum debt limit increases the credit reserves and contributes to an increase of the financial flexibility (cf., figure 1b). On the other hand, it is possible to increase a farm's maximum debt limit by, for example, making an investment. Depending on the amount of debt capital used for this investment, the farm's credit reserves can be also expanded and therefore, the financial flexibility can be improved (cf., figure 1c).

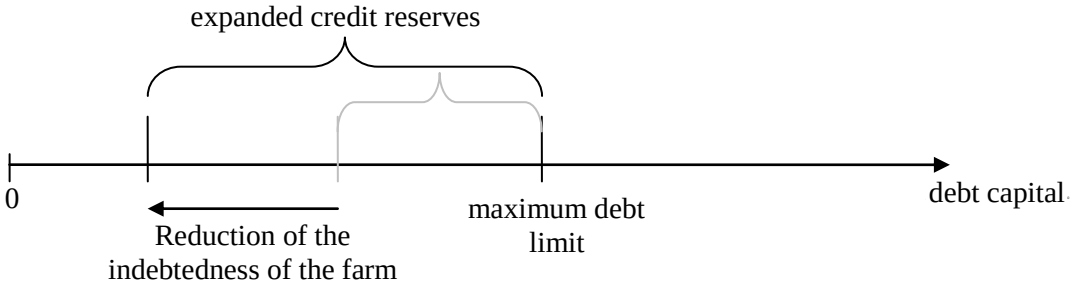
As it is not possible to expand the maximum debt limit to infinity due to information asymmetries and possible costs of insolvency (DEANGELO et al., 2011, p. 236), only a limited extent of debt capital is available for farms. Hence, debt capital is a scarce resource that involves increasing costs with increased frequency of use. A farm that raises debt capital today, possibly reduces its opportunity to acquire further debt capital at the present conditions in the future. Thus, the farm reduces its financial flexibility. The impact on the financial flexibility therefore needs to be taken into account as opportunity costs when deciding on raising debt capital (DEANGELO et al., 2011, p. 258).

Figure 1: Credit reserves and expandability

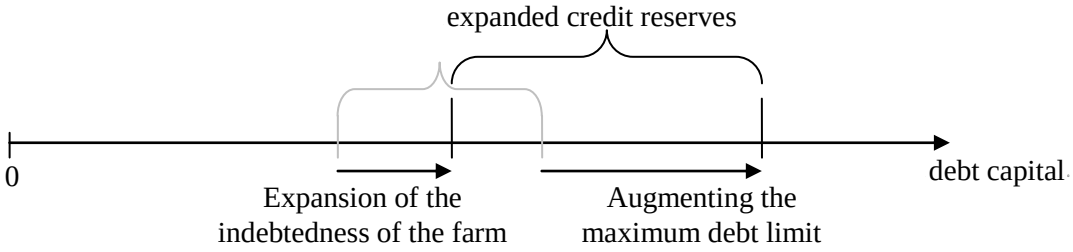
a) Determination of the credit reserves as difference of the maximum debt limit and the indebtedness of the farm



b) Expansion of the credit reserves by reducing the indebtedness of the farm



c) Expansion of the credit reserves by augmenting the maximum debt limit, e.g., through investments



Source: Author's own illustration

In this respect, the financial flexibility should be relevant for investment decisions. Consequently, hypothesis 1 is based on the following correlation:

> *Hypothesis 1 'financial flexibility'*: If the implementation of the investment alternative leads to a lower future financial flexibility of the farm, this will, c.p., have a negative impact on the utility the farmer associates with the investment alternative.

Even the profitability is relevant for the decision for or against an investment alternative. When assuming a decision-maker, who (also) considers the pursuit of profit to be a business goal (WILLIAMS and SHUMWAY, 1998; WILLOCK et al., 1999), the following can be expected:

> *Hypothesis 2 'profitability'*: A high profitability of the investment has, c.p., a positive impact on the utility a farmer attaches to the investment alternative.

Investment decisions are made under uncertainty. The decision-maker's evaluation of the risk involved in the investment alternative depends on his/her risk attitude (cf., e.g., HARWOOD et al., 1999; BARD

and BARRY, 2000). Risk-averse decision-makers avoid taking over risk or at least demand for a risk premium, whereas risk-seeking decision-makers are even looking for risk. Risk-neutral decision-makers do not ascribe importance to risk. Thus, hypothesis 3 is as follows:

> *Hypothesis 3 'risk'*: A risk-averse (risk-seeking) farmer evaluates, c.p., a high risk negatively (positively). Accordingly, the utility of this investment decreases (increases). For a risk-neutral farmer, the risk associated with the investment, c.p., does not have any influence on the utility of the investment alternative.

3. Experimental design

Our experiment consists of three parts: The first part comprises the DCE regarding investment decisions, while in the second part, farmers are interviewed about how they dealt with the decision situations in the DCE. Finally in the third part of the experiment, farmers are asked to make some indications regarding the economic situation of their farm and personal characteristics. In the following, the design of the DCE will be explained in more detail.

Decision-making situation

In the DCE, the farmers are faced with a scenario, in which they have liquid assets in the amount of €100,000. The participants are to decide about their preferred use of the money. It is clearly explained to them that they are asked to make a decision that is as realistic as possible for their farm. The decision-making situation comprises two different, and mutually exclusive, investment alternatives with a useful lifetime of 15 years each time. As the latter are neutrally referred to as 'investment A' and 'investment B', they are generic alternatives. Moreover, a status-quo alternative is also available by placing the money with a bank instead of investing it.

Attributes and their levels

The selectable investment alternatives are described by the three attributes 'financial flexibility', 'profitability of the investment' and 'risk' and are depicted by common operating numbers whose levels comprise possible present and future values (ADAMOWICZ et al., 1998, p. 13; cf., table 1).

The DCE models how much debt capital is needed for the implementation of the investment alternative. This is done on the basis of the following assumptions: The more debt capital has to be raised, the more considerable the impact may be, c.p., on the future financial flexibility of the respective farm (cf., section 2.2). The amount of debt capital, which is necessary for the investment in addition to the €100,000 of equity capital, varies between €200,000, €400,000 and €600,000. The attribute 'profitability of the investment' is modelled by the key performance indicator for profitability 'equity ratio', which is frequently used in practice. The accounting results of the test farms of the BMELV reveal that farms with a factor income, which at least corresponds to the benchmarks according to §4LwG, were able to earn a return on equity of between 2.6% and 9.7% in the financial year 2009/2010 (BMELV, 2011b, p. 62). That is why, the return on equity varies between five, seven and nine percent in the DCE. The effect that the risk attached to the investment has on the farm is

modelled by the key performance indicator 'whole-farm risk of insolvency'. An investment can reduce or increase the whole-farm risk of insolvency or leave it unchanged. In order to quantify the risk attached to the investment, it is assumed that the whole-farm risk of insolvency is either halved, left unchanged or doubled. The status-quo alternative is characterized as follows (cf., table 1: underlined levels): The bank deposit provides that an annual return of three percent, debt capital is not necessary and also the whole-farm risk of insolvency is not changed.

Table 1. Attributes and their levels in the DCE

Attributes and key performance indicator		Levels [a)]
Financial flexibility	Necessary debt capital	€0; €200,000; €400,000; €600,000
Profitability of the investment	Expected return on equity of the investment	3%; 5%; 7%; 9%
Risk	Whole-farm risk of insolvency	unchanged; halved; unchanged; doubled

Source: Author's own illustration
Notes: [a)] Passages underlined indicate the levels of the status-quo alternative 'placing the money with a bank'.

Operationalization

The experimental design of the DCE with two generic alternatives and three attributes with three levels respectively, results in a full factorial design of ($3^3_{\text{Investment A}} \cdot 3^3_{\text{Investment B}}$ =) 729 possible decision situations or choice sets. The full factorial design is too extensive and is thus reduced for a reasonable deposit. To do so, a 'D-Efficient Bayesian Design' was created (FERRINI and SCARPA, 2007) using the software Ngene 1.1.1 (CHOICEMETRICS, 2012). This design takes into consideration preceding information about the utility parameters of the population, as well as the uncertainty involved. In order to generate this previous information, a pre-test was conducted with twelve farmers using an 'Optimal Orthogonal in Differences (OOD) Design' (cf., BURGESS and STREET, 2005). In this way, it was possible to reduce the number of choice sets presented to the participants to 12 choice sets. Table 2 shows one of these choice sets.

Table 2. Exemplary choice set

Investment alternative	Investment A	Investment B	Bank deposit
Necessary debt capital	€200,000	€400,000	€0
Expected return on equity	5%	7%	3%
Whole-farm risk of insolvency	halved	unchanged	unchanged
How do you want to spend your money?	○	○	○

Source: Author's own illustration

Data

The experiment was carried out online with German farmers from July until November 2012. Each farmer needed approximately 30 minutes to complete the experiment. Farmers were recruited through the alumni network of the Georg-August-University Göttingen and were also asked to make other farmers they know aware of the experiment.

Table 3. Descriptive statistics

Decision situation	
Number of non-answered choice sets out of 732 choice sets	0
Proportion of the decisions for investment A or B (%)	87
Proportion of farmers who evaluate the choice decisions to be easy (%)	54
Socioeconomic data	
Average age (years)	34
Proportion of female participants (%)	11
Proportion of farmers with a university or college degree	59
Proportion of farmers with no agricultural education (%) [a)]	6.5
Proportion of farmers with an university degree in agricultural science (%) [b)]	44
Average risk attitude (self-assessment)[b]	6.1
Farmographics	
Average farm size (arable land and grassland in ha)	409
Proportion of farms which expect no investment opportunities in the near future	62

Source: Author's own calculations

Notes: [a)] Degree of agricultural education: 0=no agricultural education (6.5%); 1=agricultural traineeship (24.6%); 2=state certified farmer (4.9%); 3=participant with a degree of a technical college (8.2%); 4=participant who takes his/her master in agriculture (11.5%); 5=participant who has a university or college degree in agricultural science (44.3%).

[b)] Self-assessment of the personal risk attitude using a scale ranging from 0 (=totally risk-averse) to 10 (=very risk-seeking) (cf., DIW, 2010).

Table 3 shows the descriptive statistics of the 61 farmers, who participated in the experiment. All 732 choice sets (=12 choice sets per farmer · 61 farmers) could be used for analysis. In 87% of the decision situations, farmers decided for one investment alternative. 54% of the participants indicate that they evaluated the choice decisions they responded to as easy. The average age of farmers is 34 years (σ=11.8; Min=20; Max=57). 11% of them are female and 59% of them have a university degree. Only 6.5% of the participating farmers have no agricultural education. The majority, 44.3% of them, have a university degree in agricultural science. On average, farmers assess themselves as slightly risk seeking (μ=6.1; σ=1.8; 0=very risk averse; 5=risk neutral; 10=very risk seeking). The average agricultural land size is 409ha (σ=609ha). 62% of the farmers expect no investment opportunities in the near future.

4. Analysis of the DCE

4.1. The econometric analysis of DCE with latent class models

There are two general model types to account for heterogeneity in preferences through the systematic component of the utility: the mixed logit model and the latent class (LC) model. Due to the fact that LC models are semi-parametric, they are not based on strict distributional assumptions about individual heterogeneity. Besides that, it is not necessary to decide *ex ante* which variables explain the heterogeneity in the preferences (cf., for a comparison between the mixed logit model and the LC model see GREENE and HENSHER (2003)). GREENE and HENSHER (2003) point out that none of the models are unambiguously preferred over the other. Nevertheless, in this paper the LC model is applied.

The earliest papers which analyze DCE with LC models originate from SWAIT (1994) and BHAT (1997). In the past 10 years these models are becoming more frequently used in DCE applications. For example, BOXALL and ADAMOWICZ (2002) analyze recreational choices of wilderness parks with LC models. GREENE and HENSHER (2003) also estimate this type of model to investigate the choice of long-distance travel mode. Heterogeneity of preferences is found by BIROL et al. (2006) when analyzing the choice of wetland management scenarios in Greece with LC models. RUTO and GARROD (2009) also use it to investigate the preferences of farmers for the design of agri-environment schemes. HEYNES et al. (2013) apply a LC approach to value potential improvements to coastal water quality in Ireland. In the following paragraphs, the LC model is briefly described (for more detailed information cf., BOXALL and ADAMOWICZ (2002) and COLOMBO et al. (2009)).

In LC models the underlying distribution of preferences is assumed to be represented by a discrete number of heterogeneous latent classes, but within each class the preferences are homogenous. Therefore, the probability that individual *n* which belongs to class *s* with *s* = (1, 2, ..., *S*) chooses investment alternative *i* is calculated by means of a conditional logit model:

$$P_{in|s}(\beta_{ks}) = \frac{exp(\beta_{ks}{}' x_{ik})}{\sum_j exp(\beta_{ks}{}' x_{jk})} \tag{1}$$

where the utility of alternative *i* can be described by the sum of *k* utile attributes $\boldsymbol{x}_i$ weighted by the (not individual-specific, but class-specific) utility parameters β_{ks}. Being a utility maximizer, individual *n* chooses alternative *i* instead of *j* from a given set of alternatives C_n if the following applies: $U_i > U_j \;\; \forall\, j \in C_n, \; i \neq j$. The membership of an individual towards a specific class depends on individual-specific variables, z_n, and follows a multinomial logit process:

$$P_{ns}(\alpha_s) = \frac{exp(\alpha_s{}' z_n)}{\sum_s exp(\alpha_s{}' z_n)} \tag{2}$$

In the LC model the probability that an individual *n* chooses investment alternative *i* is calculated from (1) and (2) under the assumption that $P_{in|s}$ and P_{ns} are independent:

$$P_n(i) = \sum_s \left(\frac{\exp(\boldsymbol{\alpha}_s{}' \boldsymbol{z}_n)}{\sum_s \exp(\boldsymbol{\alpha}_s{}' \boldsymbol{z}_n)} \right) \left(\frac{\exp(\boldsymbol{\beta}_{ks}{}' \boldsymbol{x}_{ik})}{\sum_j \exp(\boldsymbol{\beta}_{ks}{}' \boldsymbol{x}_{jk})} \right) \tag{3}$$

where $P_n(i)$ is independent from the affiliation to a specific class. The number of classes, *S*, must be exogenously determined in the LC model. Several criterions, among others the BIC-criterion, find application when deciding for the number of classes. Models with a different number of classes are estimated and that model which fits the criterion best is used. Furthermore, the researcher‘s assessment, the complexity of the model (GLENK and COLOMBO, 2011), as well as the significance and signs of the utility parameters in the LC model (SCARPA and THIENE, 2005) play a role in the decision for the number of classes measured.

4.2. Results

Several LC models with a varying number of classes are estimated. Among these models, the model with four classes has the lowest BIC-value and is therefore the best model for this criterion. The results are presented in table 4.

Table 4. Results of the four-class LC model

Variable	LC model [a)] Class 1	Class 2	Class 3	Class 4
Attributes in utility function				
ASC [b)]	0.195 (0.24)	0.919 (0.83)	-3.324* (-2.46)	2.210 (2.21)
Debt capital in € 1,000	0.002** (2.46)	-0.001^{+} (-1.86)	-0.004*** (-4.75)	-0.009*** (-8.77)
Return on equity in %	0.589*** (10.69)			
Risk of insolvency – halved [c)]	0.541* (2.57)			
Risk of insolvency – doubled [c)]	-3.553*** (-11.51)	-0.491^{+} (-1.94)	-3.056*** (-7.01)	-1.694*** (-3.58)
Class membership function				
Agricultural education [d)]	0.289 (1.37)	-0.817* (-2.38)	0.933** (3.07)	-0.405 (-1.40)
University degree [e)]	2.246* (2.27)	-1.608 (-1.11)	2.995* (2.44)	-3.634 (-1.55)
Easy decision [f)]	-0.128 (-0.37)	2.080** (3.02)	-1.192** (-2.62)	-0.760 (-1.57)
Future investment opportunity [g)]	-0.551^{+} (-1.85)	1.011* (2.05)	-0.229 (-0.52)	-0.231 (-0.51)
Class size in %	0.48	0.20	0.21	0.12
R^2 / BIC-value	0.45 / 749			

Source: Author's own calculations using LG Choice 4.5

Notes: [a)] 61 participating farmers; 732 decisions; z-values in parentheses; $^{+}$ p<0.1; * p<0.05; ** p<0.01; *** p<0.001.

[b)] Binary-coded; reference: Status-quo alternative 'placing the money with a bank'.

[c)] Effect-coded, reference: Risk of insolvency unchanged.

[d)] Degree of agricultural education: 0=no agricultural education; 1=agricultural traineeship; 2=state certified farmer; 3=participant with a degree of a technical college; 4=participant who takes his/her master in agriculture; 5=participant who has an university or college degree in agricultural science.

[e)] Binary-coded; reference: participant has no university or college degree.

[f)] Participants are asked to evaluate the following statement at a five state Likert scale ranging from -2='does not apply at all' to 2='applies completely': 'It was easy to make a decision'.

[g)] Binary-coded; reference: the participant sees no investment opportunity for his/her farm in the near future.

The conditional logit model includes a binary-coded alternative-specific constant (ASC). The ASC takes on the value one for an investment alternative and the value zero for the status-quo alternative. Moreover, the attributes 'debt capital', 'return on equity' and 'risk of insolvency' are included in the model. A Wald test for linear restriction[1] confirms the linearity of the attributes 'debt capital'

[1] In order to examine the assumption that the utility in the utility parameters is linear, a test of linearity is carried out. To do so, the attributes are effect-coded (cf., HENSHER et al., 2005, p. 344-351). Each time, the middle value of the three levels is chosen as reference. Thus, for each attribute, there are two effect-coded variables included in the model estimation - one variable codes the higher and one the lower level. The linearity assumption is regarded as complied if it is possible to estimate significant utility parameters, which are in the same ratio as the distances of the levels to the reference level, for both effect-coded variables of an attribute. Based on the reference level, it is ensured in this way that a change in the attribute by one unit - no matter in which direction - results in an equal change in the absolute value of the selection probability.

(p-value=0.48) and 'return on equity' (p-value=0.42). Thus, the attribute variables 'debt capital' and 'return on equity' are included in the model estimation. In contrast, for the attribute 'risk of insolvency' it is not possible to assume a linear interdependency (p-value of the Wald test for linear restriction<0,001). Therefore, the effect-coded variables instead of the attribute variables are included in the model.

In all classes participants evaluate the attribute 'profitability' homogenous. The higher the profitability, the more positive is the effect of this aspect on the utility of the investment alternative. The variable 'insolvency of risk-halved' is also class independent. All participants value an investment alternative which halves the risk of insolvency as significantly positive. Whereas the other attributes are heterogeneously valued between the different classes.

The first class, with 48% of the participants is the largest class. Farmers of this class do not have any general preference for an investment of the money or for placing it with a bank (ASC is not significant), whereas the amount of debt capital necessary plays a significant role in their decision. In contrast to the other groups, they evaluate a higher amount of debt capital necessary positively. Instead, they evaluate a doubling of the risk of insolvency more negatively than farmers of classes 2 and 4. Class membership is significantly influenced by the variable 'university degree' and 'future investment opportunity'. On average, highly educated farmers who face no future investment opportunity for their farm are more likely to be in this class.

The second class includes 20% of the participating farmers, who also do not have any general preference for an investment of the money or for placing it with a bank. In contrast to class 1, the higher the amount of debt capital necessary, the more negative is the effect of this aspect on the utility of the investment alternative. Unlike class 1, farmers of class 2 consider a doubling of the risk of insolvency as less negative. Class membership is significantly influenced by the variables 'agricultural education', 'future investment opportunity' and 'easy decision'. The probability that a farmer belongs to class 2 decreases with a higher agricultural education; it increases if the farmer evaluates the choice decision to be easy. Contrary to the first class, farmers who expect an investment opportunity in the future are more likely to be in class 2.

The third class includes 21% of the participating farmers, who prefer placing the money with a bank. However, if they do consider an investment, the amount of debt capital necessary is relevant for their decision. The higher the amount of debt capital necessary, the more negative is the effect of this aspect on the utility of the investment alternative. Similar to the farmers of the first class, the farmers of this class attach a high importance to a doubling of the risk of insolvency. The class membership depends on several variables. On average, the probability of class membership increases with a higher agricultural education and having a university degree, whereas it decreases if farmers evaluate the choice decision to be easy.

Class 4 is comprised of 12% of the participating farmers and is the smallest class. Farmers, similar to class 3, also prefer placing the money with a bank. However, if they do consider an investment, the

amount of debt capital necessary for the investment plays a role in their decision. In comparison to class 2 and 3, the farmers of class 4 evaluate a higher amount of debt capital necessary more negatively. Similar to the other classes, they evaluate a doubling of the risk of insolvency as negative, but not as negative as the classes 1 and 3. The class membership is significantly influenced by none of the class membership variables.

Test of hypotheses

In three of the four classes, the utility parameter of the attribute 'financial flexibility' is significantly negative (cf., table 4). If a higher share of debt capital is, c.p., necessary for an investment alternative, this has a negative effect on the utility of the investment for these farmers. Thus, Hypothesis 1 cannot be rejected in principle (cf., table 5). At a first glance, the results reveal no direct relationship between farmer`s evaluation of the attribute financial flexibility and the financial performance of the farm or other determinants of the importance of the financial flexibility found in the literature (cf., section 2.1). With regard to this there is only one exception: the class membership function variable 'future investment opportunity'. In two of the four classes, it is relevant for the class membership probability whether the farmers expect an investment opportunity in the near future or not. This is in accordance with GAMBA and TRIANTIS (2008), who point out that investment options expected for the future influence the value of the financial flexibility.

Contrary to the other classes and therefore also contrary for hypothesis 1, farmers of class 1 evaluate a higher amount of debt capital necessary positively. The positive utility these farmers associate with a higher amount of debt capital, and therefore a lower future financial flexibility, of the farm can be explained by the fact that these farmers expect no other investment opportunities in the future. Therefore, these farmers have no necessity to preserve financial flexibility. On the contrary, they evaluate a higher amount of debt capital necessary positively because they want to seize the opportunity to invest which they do not expect to have in the future.

Table 5. Test of hypotheses

Hypotheses			Result
H1	Financial flexibility	If the implementation of the investment alternative leads to a lower financial flexibility farmers evaluate it negatively.	Not rejected
H2	Profitability	The more profitable an investment alternative, the more positive the effect on the utility.	Not rejected
H3	Risk	Risk-averse farmers evaluate risk negatively. Risk-neutral farmers evaluate risk as meaningless. Risk-seeking farmers evaluate risk positively.	Rejected

Source: Author's own illustration

The attribute 'profitability' has a significantly positive utility parameter in all classes (cf., table 4). Farmers therefore consider a high profitability of the investment class independent as positive. This has, c.p., a positive effect on the utility of an investment and thus, hypothesis 2 cannot be rejected (cf., table 5).

The utility parameter of the effect-coded variable 'risk of insolvency – doubled' is significantly negative in all classes. In contrast, the utility parameter of the effect-coded variable 'risk of insolvency – halved' is measured class independent as significantly positive (cf., table 4). Therefore, the average farmer in all classes considers a doubling (halving) of the risk of insolvency as negative (positive). The class membership functions of all four classes do not suggest any relationship between the evaluation of the attribute 'risk' and the risk attitude of the farmer. On that basis, hypothesis 3 is rejected (cf., table 5).

5. Summary and outlook

Farms increasingly make more investments which involve large shares of debt capital. Consequently, there is a trend to low equity ratios in the German agricultural sector. Lower equity ratios can be followed by a reduction in the financial flexibility of farms. If additional investments with debt capital are made subsequently, the financial flexibility may be further restricted. Therefore, the aim of the present study is to investigate the current role of the financial flexibility in investment decisions using a DCE. In all classes analysed, the amount of debt capital necessary for the investment is relevant for the farmers' decision. In three of the four classes, the individual utility of an investment alternative for the farmer decreases, c.p., with an increasing amount of debt capital. For their decision for or against an investment alternative, these farmers take into account the impact of the selected alternative on the financial flexibility of their farms. Only the farmers in one class evaluate a higher amount of debt capital positively. This can be ascribed to the fact that these farmers do not expect any opportunity to invest in the future.

The results of the present study are based on hypothetical decisions. The question of whether the decision-making behaviour of real decision situations is different from those in hypothetical decision situations has been examined several times. The results of various studies regarding the aforementioned research question provide abundant evidence that there is no discrepancy between real and hypothetical decision-making behaviour (cf., e.g., IRWIN et al., 1992; WISMAN and LEVIN, 1996; KÜHBERGER et al., 2002). Hence, hypothetical decision-making behaviour can be considered as a "reasonable, qualitatively correct picture of real choices" (KÜHBERGER et al., 2002, p. 1164). Nevertheless, this should be confirmed by another study for the agricultural context.

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