An experimental analysis of German farmers' decisions to buy or rent farmland

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Abstract

Farmland is a principal production factor in agricultural production. Farmers have the opportunity to buy or to rent farmland. In this paper, we apply a discrete choice experiment (DCE) to analyze farmers' individual buying and rental decisions for farmland. The net present value (NPV) is used as normative benchmark to evaluate farmers' decisions in the experiment. Sociodemographic and business variables as well as farmers expectations about developments of farmland prices are used as covariates in the econometric analysis. Our results reveal that farmers have a higher willingness to buy than to rent farmland. Covariates as the farm size and the farmers risk attitude influence the farmers' decisions in the DCE while no effect was observable for the individual expected purchase price change. Finally, we find that farmers act only in nearly the half of all decision in accordance with the NPV.

Keywords: Agricultural Land Market, Rent-or-Buy Decision, Discrete Choice Experiment, Net Present Value

1 Introduction

Agricultural production relies on farmland constituting a principal production factor that is often scarce (Gloy et al. 2011). Commonly, farmers can decide to either buy or rent farmland. While the analysis of farmland prices and rental rates has a long tradition in agricultural economics, the recent boost in farmland prices and rental rates in large parts of the world and in particularly in Germany has renewed the interest in this strand of research among academics and policymakers alike (Breustedt and Habermann, 2011; Fuchs, 2002; Herriges et al., 1992; März et al., 2016). Following economic theory, farmland prices should equal the discounted stream of expected returns as estimated by the net present value (NPV). In empirical research on farmland prices agricultural returns are typically approximated by rental rates establishing a direct link between farmland prices and rental rates. Thus, farmland prices and rental rates should be cointegrated according to the NPV (Gutierrez et al., 2007).

However, there is evidence showing that expected returns cannot fully explain the development of farmland prices (Hanson and Meyers, 1995). Besides farm-related characteristics such as soil quality, livestock density or the portion of high value crops grown, non-agricultural attributes also contribute to farmland prices (Borchers, Ifft and Kuethe, 2014). Moreover, empirical studies indicate that although farmland price and rental rate movements are highly correlated, price movements are not in accordance with the expected relationship suggested by the NPV approach (Ibendahl and Griffin, 2013). To date, the reasons for the empirical rejection of the NPV model and the determinants that make farmers want to either buy or rent farmland are not clear.

In order to analyze the prevailing discrepancies between buying and rental decisions for farmland we conduct a discrete choice experiment (DCE) with German farmers and seek to address the following research questions:

1) How do the analyzed determinants/attributes effect buying and rental decisions for farmland?
2) Do the analyzed determinants/attributes drive sales prices and rental rates for farmland in the same way?
3) Are rental or buying decisions of farmers` in line with the NPV?

To the best of our knowledge, this is the first experimental study that analyses farmers' individual buying and rental decisions for farmland. In each choice decision of the DCE, farmers can buy land, rent land or choose an opt-out option. Attributes considered in the DCE are gross margin generated from the offered farmland, interest rate, reduction of direct payments and price. For each choice situation, we conduct a normative benchmark comparison based on the NPV. In addition, we ask the farmers about current and future developments of farmland prices and rental rates serving as covariates in our econometric approach. With our study, we endeavor to enhance the understanding of farmland prices and rental rates while taking individual decisions and attitudes of farmers into account.

The paper is structured as follows: In section 2, we explain the material and methods. In section 3, we present the results of the analysis. Finally, the paper closes with a conclusion in section 4.

2 Material and Methods

2.1 Data Collection

For the empirical analysis, primary data was collected from German farmers. An anonymous online survey was developed and available for participants from February to March 2018. Farmers were invited to participate in the survey through a mailing list of the university, newsletters of regional associations and social media channels. In total 443 opened the link to start the survey. 29% dropped the survey after reading the first page. Further 23% did not complete the survey so that 48% completed the questionnaire

after clicking on the link. As mentioned before, we used a mailing list of the university. This list contains e-mail addresses of farmers who have participated in previous surveys and who have agreed to participate again. Participating farmers received an incentive of € 10 for a fully completed survey. Furthermore, five farmers were randomly selected to win a further € 100 each. In total, 213 farmers participated in the survey. The surveys of 204 farmers were included in the evaluation, while 9 surveys could not be used because the participants provided implausible information.

The questionnaire was structured as follows: Firstly, participating farmers were asked to provide general operating data regarding their farms. Secondly, the DCE was conducted. Next, questions were posed to identify the farmers' perceptions of different aspects of the land market. Finally, socio-demographic data was collected. The farmers needed 23 minutes on average to complete the questionnaire.

2.2 The Discrete Choice Experiment

DCEs are underlying the stated preference approach which allows for conclusions to be drawn from previously non-articulated preferences about real choice decisions (Louviere et al., 2000). Thereby, the attribute-based measure of respondents' preferences is possible through a scenario of hypothetical decision-making situations (List et al., 2006). In a DCE, participants are confronted with a number of choice sets consisting of different alternatives and are asked to select one of the given alternatives. Each presented alternative is characterized by pre-defined attributes and their associated levels. By systematically varying the attributes with their levels the respective influence on the selection decision can be determined (Louviere et al., 2000).

To examine the preferences of German farmers for either buying or renting farmland, utilization of a DCE is advisable because there is insufficient data

about the direct decision making of farmers to buy or to rent farmland. In particular, there is no data available on how the farmer chooses to buy or lease the same parcel; thus, an experimental design is necessary to identify determinants driving farmers' decisions on the land market.

2.2.1 Attributes and Levels in the Discrete Choice Experiment

Table 1. Attributes and levels in the DCE.

Attributes	**Levels**
Purchase price	10.000 €/ha; 20.000 €/ha; 30.000 €/ha; 40.000 €/ha; 50.000 €/ha
Rental price	200 €/ha; 400 €/ha; 600 €/ha; 800 €/ha; 1.000 €/ha
Interest rate	1 %; 3 %; 5%; 7 %
Gross margin	200 €/ha; 400 €/ha; 600 €/ha; 800 €/ha; 1.000 €/ha
Direct Payments	0 €/ha; 90 €/ha; 180 €/ha; 270 €/ha

Source: Author`s own illustration

The DCE utilized in this investigation presented the following decision situation to the participating farmers: the farmers had to choose either to buy or to rent farmland or to reject both of these options (opt-out). The opt-out alternative was included because to acquire additional farmland is voluntary. A forced choice could lead to inaccuracy and inconsistency with demand theory (Hanley et al., 2001). In each decision situation, the decision to buy or to rent farm land was described by the following attributes: price, interest rate, gross margin and direct payments. These attributes and their levels were chosen based on the premises of relevance and complexity of the experiment. Both were addressed by reviewing the literature, seeking expert advice and conducting a pilot study with 14 farmers. The attributes and levels used in the experiment are shown in Table 1.

To insure that farmers understood the offered attributes and levels in the DCE, we included an introduction text at the beginning of the experiment where all attributes and their characteristics were presented. The description

of the attributes remained available to participants throughout the whole experiment by using "mouse over buttons" in each choice set. By moving the cursor over the buttons, clarification information became visible. In this way, we ensured that the chosen attributes and levels were understood and present during the whole experiment.

2.2.2 Generation of Choice Sets

The experimental design of the DCE is comprised of two alternatives and five attributes, resulting in a full-factorial design of 2,000 possible decision situations or choice sets. However, for practical use, the number of choice sets was reduced by applying a so-called "efficient design", because otherwise it would be too extensive. Efficient designs allow for the consideration of ex ante information and the associated uncertainty in terms of random distributions regarding the population's utility parameters. In such designs, prior parameter estimates are drawn from Bayesian parameter distributions and are therefore known as Bayesian or D-efficient designs (Rose and Bliemer, 2009). Preliminary data for our final design was collected in a pilot study with 14 farmers. The D-error is used as efficiency criterion for the efficient design as it considers the minimization of the standard errors and the covariance of the estimated utility parameters. Based on the preliminary data, a D-efficient Bayesian design (D-error of 0.020) was created using the software Ngene 1.1.2 (Choice Metrics, 2016). As a result, the number of choice sets was reduced to 15 and presented to the participating farmers in randomized order. One of these 15 choice sets is shown in Table 2.

Table 2. Example choice set.

	Buy	Rent	Opt-out
Price	10.000 €/ha	200 €/ha	
Interest rate	3 %		Neither buying or renting
Gross margin	600 €/ha		
Direct payments	180 €/ha		
Which alternative do you choose?	O	O	O

Source: Author`s own illustration

2.3 Econometric Analysis of the Choice Model

Along with the Random Utility Theory (Luce, 1959; McFadden, 1974) the utility U of an individual *n* for choosing an alternative *s* is divided in a deterministic component *V* and an independent and identically distributed (IID) random component ε_{in} (Hensher and Greene, 2015). With x_{sn} as a vector of attributes and socio-economic characteristics of *n*, and β_n as a vector of individual parameters associated with x_{sn}, the utility function for individual *n* for choosing an alternative *i* is:

$$U_{sn} = V_{sn} + \varepsilon_{sn} = \beta_n x_{sn} + \varepsilon_{sn} \quad (1)$$

An individual *n* chooses the alternative for which it has the highest preferences. Under the assumption of utility maximization, the probability P_{in} that an individual *n* chooses alternative *s* instead of *j* from a finite set of choices C_n is:

$$P_n(s) = Prob(U_{sn} > U_{jn}) \; \forall \; j \in C_n, s \neq j \quad (2)$$

In our analysis we apply a mixed logit model. The mixed logit model, also referred to as random parameter model, allows regarding random taste variation which means that individuals have different βs. Hence, the preference heterogeneity may be considered in the estimation process (Train, 2009; Hensher and Greene, 2015). In mixed logit models the utility parameters β_n are varied randomly across the sample population (Hensher and Greene, 2015). The choice probability in the mixed logit model is:

$$P_{sn} = \int_{\beta} \left(\frac{exp(\beta_n x_{sn})}{\sum_i exp(\beta_n x_{sn})} \right) f(\beta) d(\beta) \quad (3)$$

The panel-structure of the data set may be considered in the estimation process (Train, 2009). Therefore, the random parameters are constraint to be constant over choice situations. Equation (3) becomes then:

$$P_{sn} = \int_{\beta} \left(\prod_t \frac{exp(\beta_n x_{nst})}{\sum_s exp(\beta_n x_{nst})} \right) f(\beta) d(\beta) \quad (4)$$

where t = 1,…,T contains the number of choice situations. The integral in equation (4) has no closed form and cannot be calculated exactly. Thus, the choice probability is approximated through simulation of log-likelihood functions LL_n determined by R simulation runs:

$$LL_n = \sum_n ln \frac{1}{R} \sum_r \prod_t \frac{exp(\beta'_n x_{nst})}{\sum_s exp(\beta'_n x_{nst})} \quad (5)$$

In order to consider the heterogeneity in preferences within mixed logit models, it is necessary to enter individual specific attributes via interaction terms in the model estimation process (Boxall und Adamowicz, 2002; Hanley *et al.*, 2001).

The marginal WTP for an attribute is computed by dividing the estimated attribute parameter of the variable in question by the estimated attribute parameter of the monetary variable (Hu *et al.*, 2012; Schulz *et al.*, 2014):

$$WTP_{X_k} = -\frac{\beta_k}{\beta_P}, \quad (6)$$

where β_k and β_P are the estimated coefficients of the attributes X_k and the price P. We kept the parameters of the price attributes fixed. A varying price parameter would result in a distribution of the WTP that is a ratio of two distributions, leading to complications in evaluation (see, e.g., Lancsar et al. (2017) for further insights). The WTP values and their confidence intervals were derived by the Krinsky method using the Stata module *wtp* by Hole (2007) with 10,000 replications. We calculated the WTP from statistically

significant parameter estimates of Model 1 for the purchase and rental alternatives and their attributes and from Model 2 for the sociodemographic and business variables to account for preference heterogeneity.

2.4 Derivation of the Benchmark

In the DCE participating farmers have to decide if they would like to use additional land for agricultural production. There are $s = 3$ decision alternatives (A_s): (i) purchasing land, (ii) renting land and (iii) not using additional land (opt-out). A pure profit maximizing decision-maker will choose the alternative s which delivers the highest present value (PV) of the returns from additional land:

$$\max_{A_s} PV(A_s) \tag{7}$$

To calculate the present value of the returns of each decision alternative we have to take the different attributes and their levels which are given in the DCE into account: The purchase price (PP) and the annual rental rate (RR) for land as well as the interest rate (i). Furthermore, the average expected gross margin per land unit (GM) and the average expected direct payments (DP) over a time horizon of $T = 10$ years is given in the DCE. Additionally, we have asked the participating farmers what changes they expect in purchase prices over the next ten years, i.e. what will the growth rate for land prices r be? For the purchase alternative we can calculate the present value of the returns of additional land as follows:

$$PV(A_{purchase}) = -PP + (GM + DP) \cdot CF_{i,T} + PP \cdot (1 + r) \cdot (1 + i)^{-T} \tag{8}$$

$CF_{i,T}$ denote the capitalization factor given the interest rate i and the considered time horizon T.

For the rental alternative, the present value of the returns of additional land can be calculated as follows:

$$PV(A_{rent}) = (-RR + GM + DP) \cdot CF_{i,T} \tag{9}$$

The payoff from not using additional land (opt-out) is zero:

$$PV(A_{opt-out}) = 0 \quad (10)$$

On the one hand, we can derive the alternative which maximizes the utility of a pure profit maximizing decision-maker (benchmark). On the other hand, we observe the decision alternative which was selected by the participant in the DCE. Finally, we can compare the normative benchmark with the decisions observed in the experiment. By doing so, we can answer the question whether a decision-maker decides in accordance with a profit maximizing decision-maker or if considerable deviations are occurring.

3 Results

3.1 Descriptive Statistics

Table 3 displays the descriptive statistics of the business and sociodemographic variables of participating farmers. It is especially remarkable that the farm size in our sample does not match the German average. However, the median in our sample was 85 hectares, which indicates that there is also a high share of smaller farms in our sample. Nevertheless, our results have to be evaluated with a focus on large farms.

Furthermore, the average regional purchase price is 43,027 Euro per hectare higher, compared to the German average which is 24,064 (Statistical Federal Office, 2018). The same applies for the rental price, which was Euro 613 per hectare in our sample, while the average rent is Euro 328 per hectare and year in Germany. On average, farmers expect a 12.56% increase in purchase and a 11.57% increase in rent over the next 10 years. Two thirds of the farmers come from north-west Germany. A further 12% are located in Eastern and 21% in Southern Germany. The average respondent was 38 years old. In the German farming population, the average farmer was 53 years old in 2013 (AgriDirect Deutschland GmbH, 2013) and therefore older than farmers in our sample.

Table 3. Survey descriptive statistics (N = 204).

Variable	Sample Mean (SD)		Germany[1)]
Farm acreage (total in hectares)	199.71	(365.35)	58
Cubic meter manure per hectare	17.56	(28.83)	
Regional purchase price (in €/ha)	43,027	(26185)	24,064
Regional rental price (in €/ha)	613.23	(324.38)	328
Expected purchase price (in %)[2)]	12.56	(18.45)	
Expected rental price(in %)[2)]	11.57	(20.06)	
Region: North (in %)[3)]	36.76		
Region: East (in %)[3)]	11.76		
Region: South (in %)[3)]	20.59		
Region: West (in %)[3)]	30.88		
Age of respondent (in years)	38.22	(12.40)	53
Farmer is female (in %)	3.92		8
Risk attitude[4)]	5.03	(2.23)	
Respondent is the manager of the farm (in %)	61.76		28
Respondent is the farm successor (in %)	25.49		31
Farmer with university degree (in %)	50.00		10
Full-time farmer (in %)	81.86		48
Organic farmer (in %)	8.82		8

1) Sources Statistical Federal Office 2010, AgriDirect Deutschland GmbH 2013, BLE 2017, Statistical Federal Office 2017, Statistical Federal Office 2018

2) Individually expected purchase/rental price change for a time horizon of ten years

3) The distribution of the federal states is as follows: north (federal states: Lower Saxony, Schleswig-Holstein, Bremen, Hamburg), east (federal states: Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt, Thuringia, Berlin), south (federal states: Baden-Wuerttemberg, Bavaria), and west (federal states: North Rhine-Westphalia, Hesse, Rhineland-Palatinate, Saarland).

4) Self-assessed risk attitude on a scale from 0 = "not at all willing to take risk" to 10 = "very willing to take risk."

Source: Author's own calculation.

Half of the respondents had a university degree. Therefore, the share of farmers with an academic education in our sample is higher than the German

farming population, in which only 10 % have a university degree (Hemmerling et al., 2013). This might be inter alia explained by the fact that we generated our sample using an online survey. Online experiments have great advantages, due to the low costs and potential participants can be easily reached (Granello and Wheaton, 2004). However, access to the internet and willingness to participate in an online experiment is to a great extent education-dependent (Granello and Wheaton, 2004). Also, the share of farm managers in our sample is higher than the share in the German farming population. The advantage of this is that we have a high share of decision-makers in our sample.

3.2 Estimation Results of the Discrete Choice Experiment

The results of the mixed logit model are presented in Table 4. First, we estimate a model only including the purchase/rental attributes which were presented to farmers in the DCE (Model 1). Model 1 therefore illustrates how the average participating farmer values the determinants of the decision to buy or to rent land. However, the statistically significant standard deviations in Model 1 reveal heterogeneity around the mean for all variables except gross margin. To account for possible causes behind the detected heterogeneity, we analyze factors which potentially influence this by including interaction terms with the random coefficients (Model 2 in Table 4). Based on the coefficients estimated in Table 4, we calculate the WTP for the purchase and rental alternatives, their attributes and as well as for the sociodemographic and business variables to account for preference heterogeneity (Table 5).

Table 4. Estimation results of the Mixed Logit Model (n = 204)[1)].

Variable	Coefficient			
Attributes:	*Model 1*		*Model 2*	
Buying farmland	4.661	***	2.461	***
×Interest rate	-0.507	***	-0.498	***
×Gross margin	0.006	***	0.006	***
×Direct payments	0.005	***	0.005	***
×Purchase price	-0.0002	***	-0.0002	***
Renting farmland	1.284	***	-0.421	
×Interest rate	0.014		0.011	
×Gross margin	0.004	***	0.004	***
×Direct payments	0.006	***	0.006	***
×Rental price	-0.007	***	-0.007	***
Business and sociodemographic variables:				
Buying farmland				
× Expected purchase price[2)]			-0.003	
× Risk attitude[3)]			0.259	***
× Farm acreage			-0.001	*
× Cbm manure per hectare			0.014	**
× Regional purchase price			0.00001	**
Renting farmland				
× Expected purchase price[2)]			-0.008	
× Risk attitude[3)]			0.196	***
× Farm acreage			-0.0004	
× Cbm manure per hectare			0.006	
× Regional rental price			0.001	**
Standard deviation (SD) of random parameters:				
SD Buying farmland	1.698	***	1.371	***
SD Renting farmland	1.120	***	0.987	***
SD Interest rate × buying farmland	0.420	***	0.427	***
SD Interest rate × renting farmland	0.130	***	0.116	**
SD Direct payments × buying farmland	0.002	***	0.002	***
SD Direct payments × renting farmland	0.001	***	0.001	***
Goodness of fit:				
Log-Likelihood	-2,155.165		-2,124.414	
AIC	4,342.331		4,300.827	

1) ***p < 0.01; **p < 0.05; *p < 0.10; Number of random Halton draws = 2,000; AIC = Akaike's Information Criterion.
2) Individually expected purchase/rental price change for a time horizon of ten years
3) Self-assessed risk attitude on a scale from 0 = "not at all willing to take risk" to 10 = "very willing to take risk."
Source: Author's own calculation.

As revealed by the results in Model 1 (Table 4), farmers have a statistically significant higher preference to buy than to rent farmland: the coefficient for the constant "buying farmland" is 4.661 and therefore three times as high as the coefficient for the constant "renting farmland". The WTP of the average

farmer for buying farmland is Euro 21,298 per hectare, while the willingness to rent has a value of Euro 179 per hectare (Table 5).

As expected, an increasing interest rate results in a negative willingness of farmers to buy farmland. For a one percent increase in the interest rate the WTP to buy farmland of the average farmer decreases by Euro 2,316 per hectare (Table 5). For the decision to rent farmland the interest rate has no statistically significant influence.

The attribute "gross margin" has a statistically significant influence on the decision to buy, as well as on the decision to rent farmland (Table 4). According to a Wald-Test, the gross margin has a significantly higher effect on the farmers' decision to buy rather than to rent farmland. Considering the WTP, farmers are willing to pay for an additional Euro gross margin of 26 per hectare in the buying alternative and Euro 0.51 per hectare in the renting alternative (Table 5).

Direct payments have a statistically significant influence on the farmers' decision to buy and to rent farmland. Nonetheless, a Wald-Test showed no statistically significant difference between the coefficients between the alternatives to buy or to rent (Table 4). As shown in Table 5, the WTP for an additional Euro direct payment is 21 Euro per hectare in the buying and 0.79 Euro in the renting alternative.

In Model 2, we include the individually expected purchase and rental price change for a time horizon of ten years as additional control variable. As shown in Table 4 the expected price change has neither an influence on the farmers' decision to buy nor to rent farmland. Statistically significant influence is revealed by the farmers risk attitude for the purchase and the rental decision. The more risk seeking a farmer is, the higher the WTP is. For buying farmland the WTP increases with one step on the risk scale by 1,194 Euro per hectare, while for renting farmland the WTP is Euro 27 per hectare higher.

Table 5. Willingness to pay (WTP) estimates of significant variables (n = 204)[1)].

Variable	WTP Model 1 (95% confidence interval)	WTP Model 2 (95% onfidence interval)
Buying farmland	21,297.76 (19,176.93 to 23,425.99)	11,330.09 (6,214.86 to 16,313.44)
×Interest rate	-2,316.59 (-2,728.33 to -1,904.92)	-2,293.56 (-2,721.17 to -1,854.58)
×Gross margin	26.29 (23.77 to 28.85)	26.49 (24.06 to 28.99)
×Direct payments	21.45 (15.42 to 27.58)	21.28 (15.61 to 27.05)
Renting farmland	179.19 (123.32 to 235.08)	-
×Gross margin	0.51 (0.45 to 0.57)	0.51 (0.45 to 0.57)
×Direct payments	0.79 (0.61 to 0.96)	0.78 (0.61 to 0.96)
Buying farmland		
× Risk attitude[3)]	-	1,194.16 (571.42 to 1,821.62)
× Farm acreage	-	-3.87 (-8.05 to 0.31)
× Cbm manure per ha	-	65.02 (0.35 to 129.45)
× Regional purchase price	-	0.07 (0.01 to 0.13)
Renting farmland		
× Risk attitude[3)]	-	27.47 (13.37 to 41.78)
× Regional rental price	-	0.14 (0.04 to 0.24)

1) Krinsky method with 10,000 replications.
2) Individually expected purchase/rental price change for a time horizon of ten years
3) Self-assessed risk attitude on a scale from 0 = "not at all willing to take risk" to 10 = "very willing to take risk."
Source: Author's own calculation.

Our results further indicate a statistically significant negative effect of the farm size on the WTP to buy farmland. Lehn und Bahrs (2018) found an unshaped relationship between the WTP for buying land and the farm size. First, the WTP decreases with increasing farm size, but at a specific farm

size, the WTP increases. Allen und Borchers (2016) found that rental rates paid by farmers decrease with farm size. Therefore, although the farm size has in our analysis no effect on renting farm land, we are not the first who found a negative relationship between farm size and acquiring additional land. A higher amount of cubimeteres (cbm) manure per hectare significantly increases the WTP of farmers to buy farmland. For each additional cbm per hectare, farmers are willing to pay Euro 65 per hectare (Table 5). This result gives a hint that farmers with a high amount of manure need additional farmland. Significant influence is further revealed by the regional purchase and rental price. With increasing regional prices the WTP of farmers for buying and renting farmland increases. However, the WTP values are only of small magnitude indicating that the regional price is not a fundamental in the decision to buy or to rent farmland.

3.3 The Normative Benchmark

Table 6 describes the decisions of the farmer in the DCE and the normative benchmark for a pure profit maximizing decision maker. In the DCE "purchase the land" ("rent the land", "opt-out") was chosen by the farmers in 41.6% (25.4%, 33,0%) of the 3,060 cases (204 farmer x 15 choice sets). The normative benchmark is derived as described in section 2.4 but without regarding the individual expected purchase price change. From the 15 decision situations in the experiment, the purchase alternative was in 26.7%, the rental alternative in 56.3% and the opt-out in 20% of the cases maximum profit. Therefore, we identify a discrepancy between the farmers' decisions in the experiment to the profit maximizing decision. However, it might be possible that farmers regard their individually expected change of the purchase price while conducting the experiment. To regard this, we follow the normative benchmark described in section 2.4 including the individual price expectations. Derived from this, it is optimal to purchase the

land (rent the land, opt-out) in 39.6% (44.7%, 15.7%) of the 3,060 cases. It becomes clear that even the consideration of individual price expectations only leads to maximum profit decisions by farmers in 48.5% of cases.

Table 6. Decisions of the farmers in the DCE and normative benchmark for a pure profit maximizing decision maker (N=3,060).

	Decisions in the DCE	Normative Benchmark without individually expected change of the purchase price	Normative benchmark with individually expected change of the purchase price
Share of purchase decisions	41.6%	26.7%	39.6%
Share of rental decisions	25.4%	56.3%	44.7%
Share of opt-out decisions	33.0%	20.0%	15.7%

Source: Author's own calculation.

Table 7 gives an overview about the farmers' decisions in the DCE and the normative benchmark for a pure profit maximizing decision maker. As a result, farmers act in 54.3% of the cases, in which the purchase decision was recommendable, in accordance with the benchmark. In 31.5% of the cases they decided to opt-out and only in 14.1% to rent the farmland. This indicates that farmers prefer to choose the opt-out instead of renting farmland. In cases where renting land would be recommendable, farmers comply with the benchmark only with a probability of 38.0%. Instead of the profit maximizing decision to rent the land, farmers decide in 38% of the cases to buy the farmland and in 24% of the cases to opt-out. Again it becomes obvious that renting farmland is the less preferred alternative.

Finally, farmers act according to the benchmark in cases in which opt-out would be recommendable with a probability of 63.3%. A potential status quo bias, the endowment effect and the evaluation of the net present value have to be evaluated in the further research progress.

Table 7. Comparison of farmers' decisions in the DCE and normative benchmark for a pure profit maximizing decision maker (N=3,060).

	Share
Decisions according to the benchmark	48.5%
If **purchasing** land is optimal according to the benchmark…	
participants purchase land	**54.3%**
participants rent land	14.1%
participants chose opt-out	31.5%
If **renting** land is optimal according to the benchmark…	
participants purchase land	38.2%
participants rent land	**38.0%**
participants chose opt-out	23.8%
If opting-out of land is optimal according to the benchmark…	
participants purchase land	18.8%
participants rent land	17.9%
participants chose opt-out	**63.3%**

Source: Author's own calculation.

4 Conclusion

This paper analyzes the prevailing discrepancies between buying and rental decisions for farmland based on a discrete choice experiment with German farmers. Besides the econometric analysis of determinants for the buy-rent decisions, we calculate the net present value of the returns of each decision alternative in the experiment. Therefore, this study gives insights into farmers' willingness to buy or to rent farmland and answers the question whether farmers decide in accordance with the net present value.

Our results show that farmers prefer buying over renting farmland. Thereby, this decision is influenced by determinants as the gross margin, the interest rate, direct payments and farm characteristics. Furthermore, farmers act only in nearly the half of all decision in accordance with the net present value. This indicates that the buy-rent decision is driven by further factors and not just by profit maximization. Against this background, to understand farmers' decisions on the land market not only land prices but also other factors like the farm size need to be taken into account.

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