FORCED SALES AND FARMLAND PRICES

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BODENPREISE BEI ZWANGSVERSTEIGERUNGEN

Abstract

In this paper we analyse agricultural land prices in the state Brandenburg. Our objective is to understand the price formation in foreclosures. Knowledge of the impact of foreclosures is desirable for the determination of mortgage lending values. The effect of foreclosures can be decomposed into two parts. First, the effect of a pressured sale, which will likely reduce the realized price compared with an unpressured sale and second, the effect of an auction, which may lead to a price premium. The empirical analysis is based on a rich data set of land prices in Brandenburg between 2000 and 2011 provided by the "Oberer Gutachterausschuss für Grundstückswerte". The treatment effect of forced sales is derived by means of a statistical matching approach. Our results show that on average prices premia rather than price discounts are realized in forced sales of agricultural land. The price differential between forced and non-forced sales, however, is not constant but depends on the land market conditions.

Keywords: Forced sales, land prices, treatment effect

Zusammenfassung

In diesem Beitrag werden landwirtschaftliche Bodenpreise in Brandenburg analysiert. Ziel ist es, die Preisbildung bei zwangsversteigerten Flächen zu untersuchen. Die Wirkung einer Zwangsversteigerung kann in zwei Teileffekte zerlegt werden. Dem preismindernden Effekt eines Notverkaufes steht der preiserhöhende Effekt einer Auktion gegenüber. Die Kenntnis des Gesamteffekts ist unter anderem wichtig, um Beleihungswerte landwirtschaftlicher Flächen zu ermitteln. Die empirische Analyse stützt sich auf umfangreiche Einzeldaten des Oberen Gutachterausschuss für Grundstückswerte im Land Brandenburg zwischen 2000 und 2011. Um den Treatmenteffekt der Zwangsversteigerung kausalanalytisch erfassen zu können, wird ein Matchingverfahren angewendet. Es zeigt sich, dass bei Zwangsversteigerungen im Durchschnitt keine Preisabschläge, sondern Preisaufschläge gegenüber vergleichbaren, nicht zwangsversteigerten Flächen realisiert werden. Allerdings sind die Preisdifferenzen nicht konstant, sondern variieren in Abhängigkeit von der Lage auf dem Bodenmarkt.

Schlüsselbegriffe: Zwangsversteigerung, Landpreise, Treatmenteffekt

1 Introduction

This paper was motivated by the simple but not trivial question: What is a reasonable mortgage lending value of agricultural land? It is essential for creditors to know this value when offering loans to farmers since the mortgage lending value constitutes an upper limit for the loan. The idea behind is that the mortgaged land can be sold at any time within the loan contract period at least at the mortgaged lending value in case of a loan default. A starting point for its derivation is the sale value (liquidation value) of land which, in general, will deviate from book keeping values. The mortgage lending value, however, is usually smaller than the current sales value. There are at least two reasons to justify this price shaving: first, the future sale value in the contract period is random and thus a risk averse lender will discount the current sales value as a precautionary measure. Second, in case of a credit default the liquidation of the mortgaged land will be a forced sale that takes place within a bankruptcy proceeding. It frequently conjectured that realized prices in forced sales are lower compared with “normal” land market transactions were sellers are not under financial stress (e.g. ALLEN and SWISHER 2000). In this paper we focus on the second argument, that is we want to explore if there is really a price discount in forced sales and if so, how large is it? This question has to be answered empirically. For that purpose we analyze land price data in the state Brandenburg that have been realized in forced sales over the period 2000-2011 and compare them with prices of unforced sales in that state. A direct comparison of these two groups and the identification of a forced-sales-effect is challenging for several reasons. First, land characteristics vary between the sold land plots and one has to control for these differences carefully. Second, the land market in East Germany evolved dynamically within the last decade showing high rates of price increase. This development may cover a price discount of forced sales. Finally, one may face a self-selection problem such that land that is sold in foreclosure auctions differs systematically from land in a control group. Thus we have to create a proper counterfactual. The econometric approach that we pursue in this paper accounts for the first and the second problem.

The paper is organized as follows: We start with a literature review in order to provide a theoretical foundation for our hypothesized impact of forced sales. Next, we briefly describe the land market in Brandenburg and the legal environment under which forced sales are carried out, followed by a description of our data. Section 4 discusses the econometric model and the results. The paper ends with conclusions about the determination of mortgage lending values for agricultural land.

2 Previous Research and Derivation of Hypotheses

Three strands of literature are relevant for our research question. The first one deals with pricing of farmland. The objective is to identify factors that determine the level of land prices. Knowledge of these factors is helpful for understanding price differentials in cross sectional data. This kind of analysis is usually conducted in a hedonic pricing framework (cf. PALMQUIST and DANIELSON 1989). HUANG et al. (2006) classify factors, that are commonly used in hedonic studies on land prices, into four groups, namely productivity characteristics, neighbourhood characteristics, location and environmental characteristics. Almost all empirical studies on farmland values include a measure of soil quality and parcel size in order to capture productive capacity (e.g. XU, MITTELHAMMER and BARKLEY). MENDELSON, NORDHAUS and SHAW (1994) focus on the effect of climatic variables on farmland values. Population density and per capita income are frequently used to represent non-farm factors and competing potential land uses. Location characteristics are, for example, the distance to large cities and environmental variables may refer to swine farm density or the number of biogas plants in a region (BREUSTEDT and HABERMAN 2010). Moreover, almost all recent hedonic studies on land prices emphasize the necessity of dealing properly with spatial effects (cf. PATTON and MCERLEAN 2003).

The second strand of literature discusses the impact of forced or pressured sales on asset prices. It is consensually argued that the knowledge about the fact that the current owner face an urgent need to dispose of the asset for liquidity or health reasons leads to a price discount compared to unpressured sales (ALLEN and SWISHER 2000). The decisive point is that the asset market may face a temporal and /or regional illiquidity so that additional supply lowers the market clearing price. This effect is less pronounced in a booming market which is short in supply. Empirical evidence for this conjecture is provided by CAMPBELL et al. (2009) for the U.S. housing market. Further reasons for price discounts are vandalism or protection costs as long as houses are vacant. These reasons, however are specific to the housing market and do not apply to the land market, where land does usually not fall idle before a forced sale. Analyses of pressured land sales in agriculture are rare. An exception is KING and SINDEN (1994) who surprisingly find no significant price discount in the Australian land market.

The third strand of literature analyses the role of market mechanism in price formation. This literature is relevant here, because pressured sales are usually carried out in the framework of an auction. Therefore it is necessary to disentangle two effects when analyzing empirical price data, first, the impact of time and liquidity constraints of the seller and second, the influence of the market mechanism. The latter aspect has been discussed in the auction literature theoretically and empirically. LUSHT (1996) compares house prices realized in (English) auctions with prices that came out in private negotiations. He finds that prices brought out on auctions were about 8 per cent higher compared with private house sales. This finding is questioned by MAYER (1995, 1998). He argues that if auctioned assets sell at higher prices than in search markets both market mechanisms could not co-exist because auctions also allow to sell the asset sooner. Thus sellers were always better off using auctions. Using data from real estate auctions in U.S. he finds price discounts for auctioned properties. These price discounts, however, are not constant over time. Rather, price discounts on auctions are relatively large in downturn markets and they almost vanish in booming markets. Significant price discounts on auctions are also reported by ALLEN and SWISHER (2000). However, QUAN (2002) offers a theoretical explanation why auctions could offer price premia relative to search markets. He derives a partial equilibrium model where buyers and sellers can choose between an auction and as search market as a mechanism for real estate disposition. In equilibrium it is optimal for buyers incurring high search costs to attend an auction instead of participating in the search market. Due to this self-selection buyers are willing to pay higher prices at auctions.

Summing up there is no clear prediction on the size and the sign of a price discount / premium for enforces land sales from auctions. While it is undisputed that pressured sales will result in lower prices this effect might be (over)compensated by using auctions as a market mechanism. In any case we expect price discounts to be lower in prospering market conditions.

3 Forced Sales in the Federal State Brandenburg

3.1 Legal Frame of Forced Sales in Germany

In Germany the forced sale (or foreclosure) is a tool for creditors (e.g., banks) to dispose loan securities whose debtors (e.g., farms) default on their debt service. Here, we focus on debtors who mortgaged their arable land. Important parameters in a forced sale process are the calculation of the regular market price, the minimum bid, the auction date as well as the date of the bid acceptance and the date of the transfer of ownership. Stakeholders of a forced sale process are the court-appointed appraiser, the judicial officer, the creditor and his estate agent (KOLKMANN, 2010). The responsibility of the appraiser is the calculation of the open market price. This price has a high relevance because the expected price of the bidders and creditors aligns to the open market price estimation of the expert. The minimum bid marks the starting value of a forced sale auction. It takes into account costs of the foreclosure as well as permanent rights of third persons to the farmland, e.g. the rights of way. The judicial officer guides the whole forced sale process. His principal duty is the execution of the auction. Besides this obligation he is responsible for the period between initial request and the actual auction appointment. The appointment for the forced sale auction has to be published at least six weeks and not earlier than 6 month before the auction date. The announcement of the forced auction is regularly distributed through an electronic information system or through newspapers which are appointed by the responsible court (§36(2), §39(1) & §43 (1) GESETZ ÜBER DIE ZWANGSVERSTEIGERUNG UND DIE ZWANGSVERWALTUNG (ZVG), last Revision 07.11.2011). Furthermore the judicial officer underlies social charge which means he has to care for a fair process for all participants. In most cases there is more than one creditor but regularly the principal creditor is a bank because it has normally the biggest amount of outstanding accounts.

3.2 Data and Descriptive Statistics

The land price data for the Federal State of Brandenburg are provided by the "Oberer Gutachterausschuss für Grundstückswerte im Land Brandenburg".[1] We focus on the Federal State of Brandenburg because it offers an interesting opportunity to examine one part of the dynamic East German farmland market.

In general, farmland is an immobile and short production factor and since all land is in use, land is only available in the market if other farms cease or reduce production and sell or lease their land. In the East German federal states the land market has some peculiarities since the formerly state-owned land is privatized and sold by public auctions. The main seller on behalf of the German ministry of finance is the "Bodenverwertungs- und verwaltungs GmbH" (BVVG).

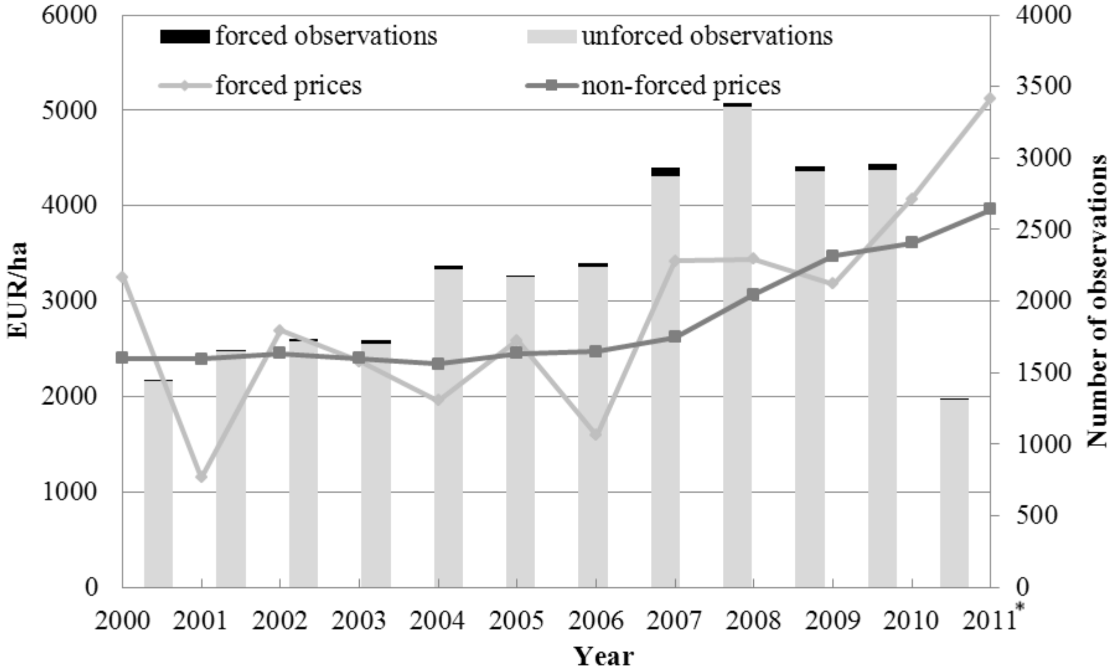
The dataset contains information about land prices, soil quality, plot size and the date of sale. The observations can be classified into unforced sales and forced sales. The latter includes only cases with a foreclosure procedure. In the sequel we consider this group as the treatment group. The control group contains all other forms of land transactions like the 'normal' market sales that take place if one farmer ceases production and offers the land either through a non-public auction or via negotiations with other farms and also sales from auctions within the privatization process. This implies that in both groups – forced and non-forced sales – we observe prices from public auctions: the procedure of forced sales and the auctions within the privatization process. Unfortunately, it is not possible to identify the BVVG-land sales in the data. As a consequence, we cannot explicitly identify the effect of the public auction itself.

The original dataset has been modified by several ways before we analyse the impact of forced sales. First, so called unusual sales have been removed. These include transactions between relatives or similar cases which are supposed to be not representative for a regular price building. This left us with 58,464 observations representing a total traded area of 324,145 hectares.

Unfortunately, we had to omit more than half of the remaining observations due to missing information about price relevant factors, e.g., soil quality. Furthermore, we eliminated observations which were sold at a price of exactly 1.00 Euro per square meter since these observations can be assigned to highway compensation procedures, i.e. farmers who are forced to sell their land for the highway construction and get a fixed compensation in return. We also exclude outlier observations in which land is expected to be used for residential development. Overall, the final sample includes 26,786 observations with a traded area volume of 116,787 hectares in the period from January 2000 to September 2011. Hence, we analyse about 46% of the original observations with about 36% of the original area. The number of forced sales within this sample adds up to 284 (1%) observations over the whole period.

[1] Each federal state in Germany has such a committee endowed with some administrative power. Their task is to ensure market transparency by collecting all agricultural land sales prices, providing standard land values which are disseminated through an annual market report. Moreover, this committee also provides expert opinions with regards to specific land values.

Figure 1: Development of farmland prices (Brandenburg)



Source: Own calculations based on data from OBERER GUTACHTERAUSSCHUSS BRANDENBURG.
*Observations only until September

As shown in Figure 1, the farmland prices increased rapidly in the last 5 years. Figure 1 also depicts the price development of forced sales. They seem to be more volatile compared to the non-forced sales over the years which might also be partly due to the low number of observations. It can be further seen that the prices start to increase from 2006 on and in the last two years the prices are much higher compared to the non-forced sales. This gives a first impression of the price differences between forced and unforced sales; it seems that there is no discount on forced sales. Both groups, however, may differ in price relevant factors, so that a direct comparison may be misleading.

Table 1: Summary Statistics of the Farmland Prices and Characteristics

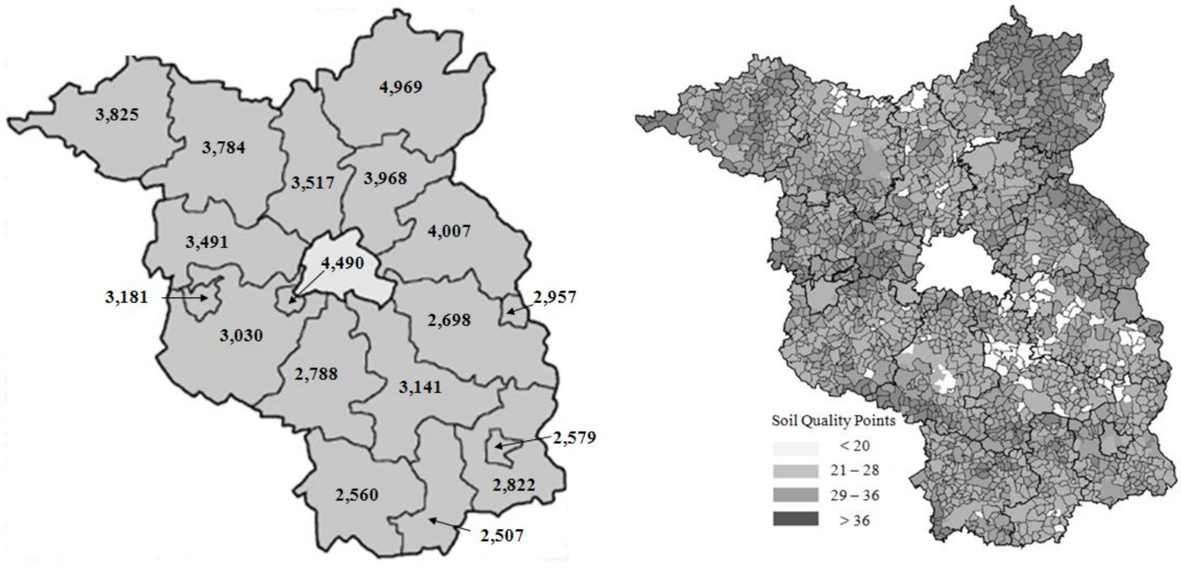
Group	**Statistic**	**Price** (€ per hectare)	**Soil quality arable land**	**Soil quality grassland**	**Area** (hectares)
Non-forced sales N=26,502	Mean	2,844	26.34	25.51	4.38
	Std. deviation	1,572	11.19	7.03	10.22
	Min.	58	1	1	0.01
	Max.	19,397	80	60	427.77
Forced sales N=284	Mean	3,074	26.98	23.46	3.08
	Std. deviation	2,588	11.01	6.15	5.82
	Min.	154	1	8	0.01
	Max.	20,835	72	40	47.56
Total N=26,786	Mean	2,847	26.34	25.49	4.36
	Std. deviation	1,586	11.19	7.02	10.18
	Min.	58	1	1	0.01
	Max.	20,835	80	60	427.77

Source: Own calculations based on data from OBERER GUTACHTERAUSSCHUSS BRANDENBURG.

Table 1 shows the descriptive statistics of the crucial farmland characteristics for the non-forced and the forced sales (treatment) group. Note, soil quality is measured with a scale from 1 to 102 which reflects the soils' productive capacity. The mean price of the forced sales is higher; however, it shows a higher standard deviation. The soil quality does not differ much between the groups and interestingly, the average plot size is higher in the non-forced sales group. Note that the forced occurred later in time on average than the non-forced sales and thus they may be driven by the general market price increase since 2006.

Figure 2 shows average prices of the years 2008, 2009 and 2010 for each county (Landkreis) in Brandenburg on the left-hand-side. In addition the right-hand-side of this figure depicts the average soil quality points. Apparently, there is a strong relation between soil quality and the price for agricultural land. Particularly in the north-east of Brandenburg rather higher soil qualities are observed which result in higher land prices. Visual inspection of the regional distribution of the land prices in Figure 2 suggests the existence of spatial dependency in this variable. Farmland plots with rather low prices are concentrated and form low-price-regions and likely have neighbours also with lower prices. The same holds for high-price regions. Similar findings are reported in previous studies on hedonic land pricing (e.g. PATERSON and BOYLE 2002, PACE et al. 1998) describe similar phenomena. Unfortunately, we are unable to test for possible spatial correlation in the prices, since no spatial coordinates of the land plots are available in the data. In the subsequent analysis spatial dependence is taken into account by controlling for soil quality. Actually, Figure 2 shows that much of the spatial dependence in land price can be traced back to spatial dependence in soil quality. Moreover, we introduce county dummies in the hedonic land price function. The remaining spatial effects are supposed to be negligible.

Figure 2: Mean price (2008, 2009 and 2010) per Landkreis in Euro/hectare



Source: Own calculations based on data from OBERER GUTACHTERAUSSCHUSS BRANDENBURG and LANDESAMT FÜR LÄNDLICHE ENTWICKLUNG, LANDWIRTSCHAFT UND FLURNEUORDNUNG 2010

4 Model and Results

4.1 Modelling the Treatment Effect

Based on the insights from the literature review it is very likely that two main but reversing effects are present when analysing forced sales. First, the public tender ensures market transparency and thereby increases the number of potential bidders. This may induce a positive price effect. Second, the procedure of a forced sale under time pressure may induce a negative effect. As mentioned above our data set does not allow us to distinguish between forced auction sales and auction sales as for instance occurring with the privatization of formerly state owned land in East Germany. Thus, we can only determine the effect of a forced sale within a public tendering procedure and it is not possible to isolate those effects. In order to measure the impact of a forced sale on the farmland price there is need to create a counterfactual situation, i.e., what would have been the price if the land was not sold as a forced sale via a public auction? The potential price for a plot of land that was sold under forced sales conditions is never observed under non-forced conditions. Such observations are only available within experiments and hence, direct estimates of the individual forced-sales effects are not possible. Thus, we refer to the estimation of aggregated causal effects (MORGAN and WINSHIP, 2007).

In the following we use the terms control (unforced) and treatment (forced) state. Since a plot of land cannot be observed at the same time as a non-forced and forced sale we define an indicator variable d_i where i indexes[2] the observations with

$$d = \begin{cases} 1 & \text{if forced,} \\ 0 & \text{otherwise.} \end{cases}$$

The respective prices are accordingly denoted by p^1 (forced sales price) and p^0 (non-forced sales price). The estimation of the treatment effects is usually conducted by means of average treatment effect on the treated (ATT), which is defined as follows:

$$ATT \quad = E[p^1 - p^0 \mid d = 1] \tag{1}$$

where $E[p^1 \mid d = 1]$ is the expected price under forced sales conditions. $E[p^0 \mid d = 1]$ denotes the expected hypothetical outcome of an observation in the treatment group under the assumption of the control state, i.e. the counterfactual price for a plot that was sold via a forced-sale under normal (non-forced sales) conditions. Controlling for differences in plot size, quality and date of sale we need to find a good estimate for $E[p^0 \mid \mathbf{x}, d = 1]$ since we cannot observe both outcomes for the same plot of farmland. It denotes the expected price of a plot that was in the forced-sales group under non-forced sales conditions conditional on the k covariates summarized in the $(k \times 1)$-vector $\mathbf{x}$.

Under the so called conditional independence assumption (CIA) the treatment assignment while controlling for the covariates must be independent from the respective outcome. Hence, $E[p^0 \mid \mathbf{x}, d = 0]$ equals the hypothetical price $E[p^0 \mid \mathbf{x}, d = 1]$. This assumption is rather strict; in either case, we could not account for possible factors since such information is not available. Still, there might be some unobserved factors like regional patterns in the land market that may affect both: the treatment assignment (being a forced sale) and the outcome (realized price). This means we cannot rule any bias from omitting factors that affect both even though we assume this bias to be low since the main determinants for the treatment assignment are not related to the plot of land itself.[3] The challenge is that only under the CIA the ATT can be consistently estimated, otherwise the ‘selection bias’ occurs. The latter becomes apparent by expanding the expected difference in observed prices:

$$E\left[p^1 \middle| d = 1\right] - E\left[p^0 \middle| d = 0\right] = \underbrace{E\left[p^1 - p^0 \middle| d = 1\right]}_{ATT} + \underbrace{E\left[p^0 \middle| d = 1\right] - E\left[p^0 \middle| d = 0\right]}_{selection\,bias} \tag{2}$$

In what follows we refer to two approaches to derive the ATT. First we define the counterfactual model also known as potential outcome model based on a regression analysis. Thereby we estimate a price function for the control group and use the estimates to predict a

[2] We suppress the subscript i where possible.
[3] See WOOLDRIDGE (2002) and the cited literature there for further details.

hypothetical price using the forced sales observations. Second, we refer to a matching procedure (nearest neighbour). The idea is to select close observations with similar characteristics defined through the covariates such that the counterfactual is taken from the observation sample.[4] This implies that for each forced sale observation we seek a matched counterfactual price to directly compare the means. A rather simple mean comparison would be naïve since it would neglect possible differences in the land characteristics such as soil quality and plot size.

4.1.1 ATT using Price Regressions

We estimate the price function using the observations from the control group. The estimated coefficients of the price function are then taken to predict a hypothetical price for the forced sales data. This creates counterfactual observations for the treatment group. The regression equation is defined as:

$$p_i^0 = \mathbf{x}_i \beta^0 + u_i^0 \qquad (3)$$

where $\mathbf{x}_i$ denotes the i-th row (observation) of the matrix of covariates containing: soil quality, plot size as well as regional county (Landkreis) and year dummies. u_i^0 denotes the error term assumed having zero mean and being uncorrelated with the covariates. The hypothetical price of the forced sales under non-forced conditions is derived using

$$E[p^0 \mid d = 1] = \frac{1}{n^1} \sum_{i=1}^{n^1} \mathbf{x}_i \hat{\beta}^0 \qquad (4)$$

wherein n^1 denotes the number of forced sales observations in the data set and $\hat{\beta}^0$ the vector of estimates from the regression using the control group data. The ATT is derived as the difference between the realized price and the hypothetical price.

$$ATT = \frac{1}{n^1} \sum_{i=1}^{n^1} p^1 - \frac{1}{n^1} \sum_{i=1}^{n^1} \mathbf{x}_i \hat{\beta}^0 \qquad (5)$$

4.1.2 ATT using Matching

An alternative way is to refer to matching procedures that allow us to find pairs of observations from the treatment and control group with similar characteristics based on the covariates. The idea of matching is to compare one individual from the treatment group with an individual from the control group with similar characteristics. The challenge thereby is to define similarity between several covariates describing the characteristics. We apply direct covariate matching and use the Mahalanobis metric to define the similarity between the plots. The advantage of this metric is its rather simple applicability (RUBIN, 1980).

The Mahalanobis metric is a one-dimensional measure to define the distance between the observations. It is derived using the covariates explaining the land prices and defined as the squared deviations between the covariates divided by the variance-covariance matrix of the variables:

$$M_{ij} = (\mathbf{x}_i - \mathbf{x}_j)' \Sigma_{\mathbf{x}}^{-1} (\mathbf{x}_i - \mathbf{x}_j) \qquad (6)$$

where $\Sigma_{\mathbf{x}}$ denotes the variance-covariance matrix of the covariates correcting for correlation within the observations. If the variables are uncorrelated, the Mahalanobis distance is reduced to the Euclidian distance (DE MAESSCHALCK et al., 2000).

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[4] An overview is given by HENNING and MICHALEK (2008).

The average treatment effect of the treated is given by (MORGAN and WINSHIP, 2007):

$$ATT_{match} = \frac{1}{n^1}\sum_i \left[\left(p_i | d_i = 1 \right) - \sum_j \omega_{ij} (p_j \mid d_j = 0) \right] \quad (7)$$

where n^1 is the number of treatment cases, i denotes the index over treatment cases, j is the index over control cases and ω_{ij} denotes the weights as follows:

$$\omega_{ij} = \begin{cases} 1 & \text{if } \min \| M_{ij} \| \\ 0 & \text{otherwise} \end{cases}$$

The matching algorithm matches the counterfactual value for each treatment case. We refer to the nearest neighbour matching algorithm. This type of matching algorithm constructs the counterfactual for each treatment case using those control cases that are closest to the respective observation. The derived Mahalanobis metric gives the distance such that the smallest distance can be chosen.[5] If only one nearest neighbour is chosen for each treatment case then ω_{ij} equals 1 for the matched control case and 0 for all other control cases. A shortcoming of the nearest neighbour matching algorithm is that sometimes poor or even no matches may occur (MORGAN and WINSHIP, 2007). Moreover, general shortcomings of matching apply here. Matching based on land plot characteristics does not consider regional differences – the comparison plot of land must not be in the same regions and the respective regional market settings like number of farms may differ. This is due to the rather strict conditional mean independence assumption under which the matches are comparable even though this may not hold in this setting (see also HECKMAN et al., (1997)).

4.2 Results

Starting with the derivation of the ATT based on regression results, we proceed as follows. We use the observations from the control group and estimate a price function. The price regression includes characteristics like quality of the arable and the grassland, plot size, the squared plot size, year dummies in reference to 2000 and in order to reduce the possible spatial correlation county dummies (Landkreise) were considered.[6] BoxCox[7] testing results reveal a log-linear model, i.e., we regress the logarithms of the land prices per square meter on the explanatory variables.

$$\begin{aligned} \ln(price)_i &= \beta_{AZ} AZ_i + \beta_{GZ} GZ_i + \beta_{area} area + \beta_{area2} area^2 \\ &\quad + \sum_{d=1}^{18} \gamma_{county,j} D_j^{county} + \sum_{t=2001}^{2011} \gamma_{year,t} D_t^{year} + error \end{aligned} \quad (8)$$

where i indexes the observation number for each sold plot and d indexes the respective 18 counties in Brandenburg. AZ and GZ, respectively, denote the soil quality for arable and grassland. The coefficient estimates for all β- and γ-parameters are given in table 2 the results are given. The majority of the variables is significant at the 1 %-level. Referring to figure 1 it is not surprising that the year dummies from 2001 to 2006 are not significant but the price increases from 2007 on show a significant impact. The R-squared is rather of about 0.90 which may indicate still present autocorrelation, for instance, spatial autocorrelation.

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[5] Note, we use STATA 12 and the command psmatch2 developed by LEUVEN and SIANESI (2005).

[6] As mentioned above, possible spatial correlation cannot be considered using spatial econometric techniques since no plot specific spatial coordinates are available.

[7] Details of this procedure can for instance be found in DAVIDSON and MACKINNON (2004).

Table 2: Regression results

Dependent Variable Log price (Euros per square meter)	Coefficient estimates	P-value
Soil quality arable land (*AZ*)	0.006	0.000
Soil quality grassland (*GZ*)	-0.002	0.000
Area (hectares)	-0.002	0.000
Area squared (hectares)	1.33e-05	0.001
D^{2001}	-0.016	0.364
D^{2002}	0.013	0.462
D^{2003}	0.026	0.163
D^{2004}	-0.008	0.631
D^{2005}	0.0175	0.305
D^{2006}	0.025	0.133
D^{2007}	0.086	0.000
D^{2008}	0.237	0.000
D^{2009}	0.375	0.000
D^{2010}	0.426	0.000
D^{2011}	0.498	0.000

Table 3, shows the predicted hypothetical price, the mean of the annually observed prices of both groups and the ATT. The naïve mean comparison yields a price difference of about 230 Euros per hectare over the years. Based on the parameter estimates for the covariates we predict a hypothetical price using only the forced sales observations. The mean difference between the hypothetical price from the prediction and the realized forced sales price is 600 Euros per hectare. This effect corresponds to the average treatment effect of the treated. We further expect these effects to vary over time, which is actually the case.

Table 3: Predicted hypothetical price and observed price (Euros/hectare) for the forced sales group

Year	Hypothetical price (1)	Observed price forced sales (2)	Observed price non-forced sales (3)	Price difference (2)-(1)
2000	2,354	3,246	2,400	892
2001	2,445	1,151	2,390	-1,294
2002	1,958	2,692	2,450	734
2003	2,075	2,368	2,400	293
2004	1,878	1,960	2,340	82
2005	1,969	2,595	2,450	626
2006	2,279	1,589	2,470	-690
2007	2,237	3,418	2,620	1,181
2008	2,584	3,437	3,070	853
2009	2,902	3,183	3,470	281
2010	3,295	4,070	3,610	775
2011	3,159	5,125	3,960	1,966
Total	2,475	3,075	2,844	600

Source: Own calculations based on data from the OBERER GUTACHTERAUSSCHUSS BRANDENBURG.

The results based on the regressions are now compared to the findings based on matching. Starting with the nearest neighbour matching based on Mahalanobis metric as indicator for similarity. The Mahalanobis metric was calculated with the regular price influencing factors like soil quality, plot size (without the squared version), day of the transaction, county dummies and the principal characteristic (arable or grassland). The smaller the Mahalanobis metric between two observations is the more similar are the two observations concerning the mentioned factors. The nearest neighbour algorithm finds for each forced sold case the most similar unforced case based on Mahalanobis metric.
We find an ATT of 294 Euro per hectare on average over the years. Compared to the previous result the ATT is closer to the observed price difference (230 Euro per hectare). The nearest neighbour matching also carries out a positive forced sale effect but the extent is only half of the ATT of the regression model. Note, in contrast to the regression analysis we consider the time differently. We use the time as continuous variable since we expect to have more precise matches with respect to the time. The results are shown in table 4.

Table 4: Mean observed prices and matched price observations using the Mahalanobis distance and nearest neighbour matching

Year	Matched price using M_{ij} (1)	Observed price forced sales (2)	Observed price non-forced sales	Price difference (2)-(1)
2000	3,258	3,246	2,400	-12
2001	2,222	1,151	2,390	-1,071
2002	2,392	2,692	2,450	300
2003	2,303	2,368	2,400	65
2004	2,312	1,960	2,340	-352
2005	1,998	2,595	2,450	597
2006	2,303	1,589	2,470	-714
2007	2,502	3,418	2,620	916
2008	2,969	3,437	3,070	468
2009	3,461	3,183	3,470	-278
2010	3,347	4,070	3,610	723
2011	4,289	5,125	3,960	836
Total	2,781	3,075	2,844	294

Source: Own calculations based on data from the OBERER GUTACHTERAUSSCHUSS BRANDENBURG.

5 Discussion and Conclusions

Contrasting land prices realized in foreclosures with prices from regular land sales we found that forced sales did not sell at a discount on average. On the contrary, according to the most conservative estimate prices quotes in forced sales were about 300 Euro higher than prices in non-forced sales in Brandenburg in the last decade. This result is somewhat surprising, but not contradictory to pricing theory. As mentioned in section 2, two opposed effects interact in the price formation of foreclosures, namely the (negative) liquidity effect of a pressured sale on the one hand and the (positive) effect of auctions on the other hand. Our results reveal that the latter effect outweighs the former in Brandenburg's land market. Another interesting finding is that the price premium related to foreclosures is not constant over time. We rather observe substantially higher price premia since 2006, i.e., the beginning price boom in land markets in the new federal states. This result is in line with earlier empirical findings reported in the auction and real estate literature.
What can we conclude from these outcomes for our initial research question, the appraisal of mortgage lending values? In view of the documented price premium of foreclosures is

tempting to conclude that no price shaving from regular sale values is necessary at all. This ignores, however, the variability of the price differential between forced and non-forced sales as well as the variability in the level of land prices. In 2001, for example, land put up for a compulsory sale sold at a discount of approximately 50% compared with regular land market transactions. That means, if the mortgage lending value of land in 2000 was fixed at the current sales price (i.e. 2400 Euro/ha on average) creditors would suffer a considerable loss in case of a debt default in 2001. This situation is the worst case that occurred in the observation period, but extremely risk averse debitors may consider it as relevant. As a general rule, one can state that price shaving of mortgage lending value should be more pronounced in a downturn market for two reasons: first, the expected price level is likely to decrease and second, the price difference between foreclosure prices and normal sales prices may become negative. Moreover, one can conclude that a constant discount on a current land price is usually not appropriate. One should rather adapt the mortgage lending value to the expected conditions of the land market in the credit period.

Nevertheless, these findings need to be interpreted considering the limitations of the matching procedure. It was not possible yet to test whether the found differences are statistically significant. Even though this is a very popular method to evaluate many types of effects, it remains a major issue discussed in the evaluation literature. Besides this, the reasons for being in the forced sales group cannot be assumed to be fully independent of the price formation process in local markets. HECKMAN et al. (1998) point to the necessity to consider the economic reasoning behind the treatment and to account in an econometric sense for the endogenous treatment variable. A further critical assumption can be seen in the additive separable treatment effect. There might exist a different price function under forced sales that could not be identified due to data limitations. Since the available data permitted to consider more sophisticated econometric models and evaluation methods our findings can be interpreted as a first indication for price differences. Future work needs to further disentangle the effects for public auctions and forced sales through public auctions. Also the regional settings in the land market need to be taken into account since we cannot exclude any interaction and competitive issued that may affect both, the local price for land and the reasons for insolvency.

References

ALLEN, M. T. and J. SWISHER (2000): An Analysis of the Price Formation Process at a HUD Auction. In: Journal of Real Estate Research 20: 279-298.

BREUSTEDT, G. and H. HABERMANN (2010): Einfluss der Biogaserzeugung auf landwirtschaftliche Pachtpreise in Deutschland. Vortrag anlässlich der 50. Jahrestagung der GEWISOLA vom 29.09. – 01.10.2010, Braunschweig

CAMPBELL, J. Y., S. GIGLIO and P. PATHAK (2011): Forced Sales and House Prices. In: American Economic Review 20: 2108-2131.

DAVIDSON, R. and MACKINNON, J. (2004): Econometric Theory and Methods. Oxford University Press

DE MAESSCHALCK, R., D. JOUAN-RIMBAUD and D. L. MASSART (2000): The Mahalanobis distance. In: Chemometrics and Intelligent Laboratory Systems 50:1-18

GESETZ ÜBER DIE ZWANGSVERSTEIGERUNG UND DIE ZWANGSVERWALTUNG (2011): Bundesgesetzblatt Teil III, Abschnitt III: Bestimmung des Versteigerungstermins.

HECKMANN, J. J., H. ICHIMURA and P. E. TODD (1997): Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme. In: The Review of Economic Studies Ltd. Oxford University Press

HENNING, C. and M. JERZY (2008): Working Econometric policy evaluation techniques: milestone for effective 2nd pillar policies or a pure academic exercise? In: Agrarwirtschaft 57 Heft 3/4: 232-243

HUANG, H., G. Y. MILLER, B. J. SHERRICK and M. I. GÓMEZ (2006): Factors Influencing Illinois Farmland Values. In: American Journal of Agricultural Economics. 88(2): 458-470

KING, D. A. and J. A. SINDEN (1994): Price Formation in Farm Land Markets. In: Land Economics Vol. 70, No.1: 38-52

KOLKMANN, B. (2010): Die Zwangsversteigerung – Ablöse oder Zweittermin? Abschlussarbeit zur Erlangung des Titels Immobilien-Ökonom (GdW) an der EBZ Business School, University of Applied Sciences, Bochum

LANDESAMT FÜR LÄNDLICHE ENTWICKLUNG, LANDWIRTSCHAFT UND FLURNEUORDNUNG (2010): Datensammlung für die Betriebsplanung und die betriebswirtschaftliche Bewertung landwirtschaftlicher Produktionsverfahren im Land Brandenburg. Ministerium für Infrastruktur und Landwirtschaft des Landes Brandenburg, Potsdam

LEUVEN, E AND B. SIANESI (2003): PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing. Statistical Software Components 2001, 43, Boston College Department of Economics, revised 13 Dec 2011.

LUSHT, K. M. (1996): A Comparison of Prices Brought by English Auctions and Private Negotiations. In: Real Estate Economics Vol. 24, 4: 517-530

MAYER, C. (1995): A Model of Negotiated Sales Applied to Real Estate Auctions. In: Journal of Urban Economics 38: 1-22

MAYER, C. (1998): Assessing the Performance of Real Estate Auctions. In: Real Estate Economics 26: 41-66

MENDELSOHN, R., W. D. NORDHAUS and D. SHAW (1994): The Impact of Global Warming on Agriculture: A Ricardian Analysis. In: The American Economic Review Vol. 84, No 4: 753 - 771

MORGAN, S. and C. WINSHIP (2007): Counterfactuals and Causal Inference. Cambridge University Press, New York

PACE, R. K., H. W. WATTS, J. M. CLAPP and M. RODRIGUEZ (1998): Spatiotemporal Autoregressive of Neighbourhood Effects. In: Journal of Real Estate Finance and Economics 17(1): 15-33

PALMQUIST, R. B. and L. E. DANIELSON (1989): A Hedonic Study of the Effect of Erosion Control and Drainage on Farmland Values. In: American Journal for Agricultural Economics Vol. 71, No. 1: 55-62

PATERSON, R.W. AND K. J. BOYLE (2002): Out of Sight, Out of Mind: Using GIS to Incorporate Topography in Hedonic Property Value Models. In: Land Economics 52(2): 561-581

PATTON, M. AND S. MCERLEAN (2003): Spatial Effects within the Agricultural Land Market in Northern Ireland. In: Journal of Agricultural Economics Vol. 54, 1: 35-54

QUAN, D. C. (2002): Market Mechanism Choice and Real Estate Disposition: Search Versus Auction. In: Real Estate Economics 30: 365-384

RUBIN, D. B. (1980): Bias Reduction Using Mahalanobis-Metric Matching. In: Biometrics Vol. 36, No. 2: 293-298

WOOLDRIGE, J. (2002): Econometrics Analysis of Cross-Section and Panel Data. Massachusetts institute of technology

XU, F., R. C. MITTELHAMMER and P. W. BARKLEY (1993): Measuring the Contributions of Site Characteristics to the Value of Agricultural Land. In: Land Economics Vol. 69, No. 4: 356 - 369