

THE VALUE OF FORMAL LAND TITLES IN MARKET TRANSACTIONS: EVIDENCE FROM KINONDONI MUNICIPALITY TANZANIA.

ABSTRACT: Under property informality, perceptions on transaction failure risks at purchase can diversify the spectrum of possible prices depending on anticipated occupation strategies subsequent to purchase. Based on survey data on 1246 land purchasers from Kinondoni municipality, Dar es Salaam Tanzania, binomial logistic regression models were implemented to predict pre-purchase perceived transaction failure risks and mixed effect models were utilised to examine the effect of the predicted risks on (2010 constant) price of 400m² plots. The results suggest that risk averse households pay on average around Tanzanian Shillings (Tshs) 10,000/= more if they intend to effectively occupy their newly acquired plots than they would pay for similar but ineffectively occupied plots simply because of a relatively lower perceived transaction failure risk associated with the former. This observation suggests that risk-price premium in land transaction is dependent on the anticipated occupation strategy subsequent to purchase. On average "frequent visitation" after purchase induces a higher risk-price premium over formal purchases. A Legal title to a "vacant plots" has a relatively smaller risk-price premium of around Tshs. 5,000/= over "effective occupation" for the same but a relatively higher risk-price discount is associated with "frequently visited" plots among risk lovers. These risk-price premia yields translates to an average of around Tshs. 16,000/= for each 400m² plot purchase. These marginal risk-price premia suggest that informal and formally titled plots sale on average, at around the same price regardless of whether the purchaser is risk averse or otherwise. In terms of policy, titling of vacant land has limited transaction risk-reduction effect, purchasers might be indifferent between formal and informal purchase of vacant land.

KEYWORDS: housing transaction, transaction risk, developing countries, price premia

INTRODUCTION

The current state of the literature suggest that improving access to quality property information can, guarantee right holders a higher certainty of ownership and facilitate transactions (De Soto H. , 1989; De Soto H. , 2000; Field, 2003). Many of the land in cities of the developing world are however, extra-legal because they do not conform to specific laws and regulations that govern the real estate sector (Fennell, 2011; Arnott, 2009; Berner, 2001; Malpezzi, 2014; Brueckner & Selod, 2009; Gupta, 2010; Dam, 2006). Within the same developing country's city it is possible to have formal and informal properties something that leads to Multiple Ownership Structures (MOS) (Wu, Gyourko, & Deng, 2012; Lombard, 2015; Song, 2015). MOS arises from government failure to authoritatively determine rights and protect right holders against ownership and transaction risks over the entire urban jurisdiction (Toulmin, 2006; Gupta, 2010; Yu, Wu, Zheng, Zhang, & Shen, 2014) or from acceptance of informality as part of the urban built environment (Song, 2015; van Gelde, Cravino, & Ostuni, 2015; Kombe & Kreibich, 2001). MOS can therefore be described in a similar manner as "legal pluralism". All these terms mean the existence of more than one recognised/legal property ownership structure/system within the same urban jurisdiction/city.

The effect of formal titles on property prices in developing countries have been examined by a number of researchers. Friedman et al, (1988) found out that a rented squatter dwelling unit in Manila would, on average, rent for 15 percent more had it been in the formal sector; whereas an owned squatter dwelling unit would sell for 25 percent more under analogous conditions. These percentages were interpreted as the risk premia on squatters' dwellings. Jimenez, (1984) established that on average formal renters pays 18% higher than squatters while owners pay 57% higher than squatters on purchase. The difference reflects the market value of improved title quality. Further empirical evidence suggests that the value of a new squatter dwelling is around 66 percent of the value of a similar formal unit. The discount on new unit was however around 34 percent if it is located in a squatter area (Navarro I. A., 2008).

Studies of formal and informal markets in Tanzania have pointed out that prices paid for land are limitedly linked to utility maximisation hypothesis since occupiers sell to meet immediate need (transaction need) including household expenditure on education, health and even food and alternative shelter (Young & Flacke, 2010; Dübel, 2007). Additional observations however, point to the possibility of a higher price for formal than informal land (Collin, Sandefur, & Zeitlin, 2015). There are however, limited evidence that such lower prices in informal housing is in any way associated with perceptions of the buyers about informality at the time of purchase. Similarly, some studies points to proximity consideration in purchase of plots and housing which may be motivated by social consideration (Limbumba, 2010) or economic opportunities (Eliwaha, 2011; Alananga, 2015). There is however no any study to date that has attempted to explain land demand in terms of perceived transaction failure risks due to questionable title or sellers qualities.

In this study it is incontestable that informal land are priced lower than their formal counterparts but it is unclear as to whether such lower prices are in any way associated with more perceived post-transfer transaction failure risk at purchase. That is there is little evidence that occupiers of informal housing in Tanzania and developing countries in general perceive relatively more transaction failure risks as a result of informality when compared to their formal counterparts. This is supported by the confidence that people have in informal housing as noted through a good mix of residents and housing quality observable in many of the so called informal settlements (Sivam, 2002; Kironde L. , 2006; Mushumbusi, 2012; Sheuya, 2010; Ali & Sulaiman, 2006). This study therefore, analyses the perceived transaction failure risks in relation to purchase price (in real value) for both formal and informal land (defined to include finished and unfinished houses and plots) in order to establish the associated risk-reduction price premia of different land types being transacted. The main hypothesis is that formal land fetch significant risk reduction price premia over informal ones at purchase.

MODELLING INFORMALITY IN PROPERTY TRANSACTIONS

The basic model in this study examines relocation as an informal mechanisms to moderate perceived risks in transaction. Buyers who purchase land for incremental housing construction closer to where they live are said to “effectively occupy” their newly acquired properties. These effective occupiers are presumed to experience the lowest transaction failure risk (π_A) at property purchase and pay for the newly acquired plots. A part from the purchased plots, they consume the composite good and have income . A household buying a distant plot, can relocate such that its utility is equivalent to purchasing within residency proximity or can stay within current locality in which case it is said to “ineffectively occupy” the purchased property. If it relocates it pays price for the newly acquired property (H_s), transport cost P_f and expenditure on a composite good (g_s). Its budget constraint will be $Y=H_s P_f+g_s+T$. If the household decides to ineffectively occupy the newly acquired property, it faces the budget, $Y=H_s P_f+H_R P_i+g_s$. If all households take the probability of losing the newly acquired rights π_A as given, then each chooses the *ex post* consumption bundle by maximizing the expected utility as:

$$E[U]=\pi_A u^R(g_R, H_R)+(1-\pi_A)u^S(g_S, H_S) \quad [1]$$

Substituting the budget constraints for effective occupation ($H_R=(Y-g_R-T)/P_i$) and ineffective occupation ($H_S=(Y-g_S-H_R P_i)/P_f$) into the expected utility function we have;

$$E[U]=\pi_A u^S(g_S, (Y-g_S+H_R P_i)/P_f)+(1-\pi_A)u^R(g_R, (Y-g_R-T)/P_i) \quad [2]$$

Suppressing the subscripts on π_A and maximising the expected utility function yields the first order condition as;

$$\begin{aligned} \frac{E[U]}{\partial H_R} &= -P_f \frac{\partial u^S}{\partial g_S} + \frac{\partial u^S}{\partial H_R} = -P_f u_g^S + u_H^S = 0 \\ &= \frac{u_H^S}{u_g^S} = P_f \end{aligned}$$

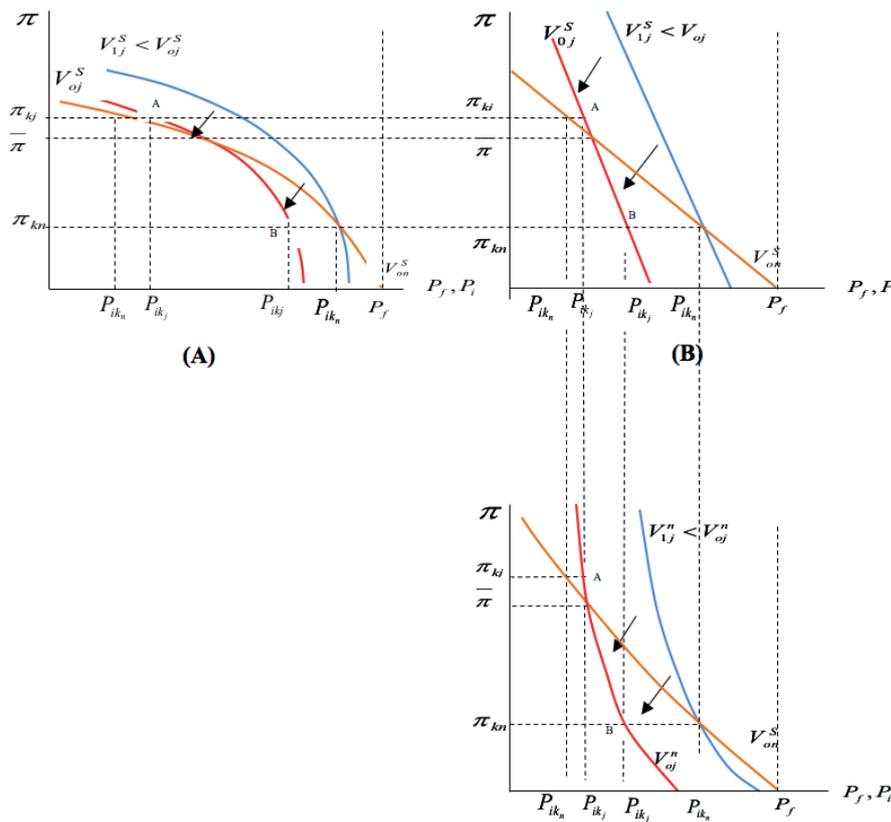
and

$$\frac{\partial E[U]}{\partial H_S} = (-P_i) \left\{ \left[\frac{\pi}{1-\pi} \right] \frac{\partial u^S}{\partial g_S} + \frac{\partial u^R}{\partial g_S} \right\} + \frac{\partial u^R}{\partial H_S} = (-P_i) \left\{ \left[\frac{\pi}{1-\pi} \right] u_g^S + u_g^R \right\} + u_H^R = 0 \quad [3]$$

$$P_i = \frac{u_H^R}{\left\{ \left[\frac{\pi}{1-\pi} \right] u_g^S + u_g^R \right\}}$$

In the first condition, the marginal rate of substitution between housing and the composite goods must equal its price as it is the case in symmetric markets. The second condition is that the ratio of expected utility from “effective occupation” and the sum of the utility of consuming the composite good with “ineffective occupation” and lost/gained utility from consuming the composite good with “effective occupation” should equal the price at new location (P_i). The two condition suggest that prices for ineffectively occupied informal properties (P_i) are likely to be lower than effectively occupied ones (P_f) since $u_H^R = u_H^S$. Logically, “staying” after purchasing a distant land reduces the purchaser’s utility by increasing the probability of losing the newly acquired informal property. The first order condition can be solved for the optimal quantity of housing for ineffective and effective occupation as shown in equation 4:

Figure 1: Land preferences in effectively and ineffectively occupied housing based on formal-informal dichotomies postulated in Jimenez, (1984)



With proper transformation of 4 into indirect utility function it is possible to estimate 4 in terms of price as with , and the distribution of are determined outside the model. Under homogenous title risk perceptions the equilibrium and clears the market and a household decision involves only comparing expected utility from staying and from relocating . With , households are better off “ineffectively occupying” their newly acquired distant properties something that increases the demand and price of “effective occupation” until the difference between and induces a sufficient disutility on current occupation (price-induced disutility) to offset the extra utility due to “ineffective occupation”. Relocating closer to newly acquired property is attractive if the potential price-induced disutility of staying (higher price) outweighs the risk-induced disutility (expected transaction failure risk) of the same. Contrariwise, staying is attractive if the potential price-induced disutility is lower than the expected risk-induced disutility.

In practice the transaction failure risk perceptions may vary across settlements within the same city and it is possible that even “ineffective occupation” may have relatively lower perceived transaction failure risk leading to . For risk averse households, “effective occupation” (relocation) following a distant purchase is more likely than ineffective occupation unless is sufficiently low. Assuming a fixed transaction failure risk for each occupation stragegy, observed land prices are equivalent to households’ willingness to bid at each . The locus of combinations of perceived transaction failure risk and price that would make the purchaser indifferent between effective and ineffective occupation are shown Figure 1 as under the assumption that and are monotone and continuous in and . Panel (A) suggest that if the risk-reduction effect of higher prices is increasing at an increasing rate, the fall in utility resulting from higher price can fully be compensated for by a subsequent reduction in transaction failure risk. Buyer’s willingness to bid higher for “effective occupation” rather than “ineffectively occupation” increases. Panel

(B) indicate that if the risk-reduction effect of higher prices is increasing at a constant rate, the fall in utility resulting from higher price has a constant risk reduction effect. Buyer's willingness to bid for "effective occupation" rather than "ineffective occupation" remains unchanged across risk levels. Panel (C) indicate that if the risk-reduction effect of higher prices is increasing at a decreasing rate, a small fall in utility resulting from higher price would require a larger reduction in transaction failure risk. That is buyer's willingness to bid for "effective occupation" rather than "ineffectively occupation" diminishes as risk increases.

The preceding analyses suggest that demand for land in legal pluralistic markets can be determined by price-risk preferences among market participants. The higher the price the higher is the disutility from "ineffective occupation" and the more likely that households will demand reduced through "effective occupation" leading to the downward sloping informal housing preferences. Thus the transaction failure risk must be low for any household to pay a higher price for an ineffectively occupied informal property (Tinsley, 1993). In other words, people buy highly risky properties only when they are somehow compensated through lower price otherwise they will strongly demand "effective occupation" through proximity to moderate perceived transaction failure risk. "Ineffective occupation" may however, be motivated by a guaranteed title to ownership. In formalised settlements, transaction failure risk tend to be lower but most land purchases goes into the hand of a few powerful and well connected individuals and speculation tend to dominates (Fekade, 2000; Rath & and Routray, 1997; Yonder, 1987; Payne, 1996). As long as the more connected are a certain class (i.e. rich), speculated land tend to be priced at a higher price than when speculated by the poor (Boucher, 2005). As a result of these higher prices, those with less economic muscles tend to be pushed further to the urban fringe where they expect to "ineffectively occupy" informal land at a cheaper price (Vincent, 2009).

The utility from "ineffective occupation" may be determined by the utility of effective occupation and the redistributed consequences arising from diversities in population, growth rate and construction cost across settlements within the same city (Tinsley, 1993; Hansen & Skak, 2008); variation in housing types (Takeuchi, Cropper, & Bento, 2006); relative proximity to physical and social networks, workplaces and the CBD (Rath & and Routray, 1997); neighbourhood and housing services, poor sanitation and pressures on schools (Tinsley, 1993; Manaster, 1968; Penrose, de Castro, Werema, & Ryan, 2010; Rose, 2006; Field, 2003) and lot size (Friedman, Jimenez, & Mayo, 1988). Other factors for utility differences may include original land access modality (Durand-Lasserve, Durand-Lasserve, & Selod, 2013), gender of household head since female household head often engender less transfer uncertainty (Lanjouw & Levy, 1998), type of employment, household size, duration of residency and education level (Friedman, Jimenez, & Mayo, 1988). According to Selod & Tobin, (2013) the social connectedness (proximity to LAO) make social distance an important determinant of the costs that household pay to mitigate transaction failure risk. Well connected individuals are more likely to enjoy lower transaction failure risk at a lower cost than less connected individuals (Navarro I. A., 2008). The multiplicities of housing utility determinants suggest that title alone may not be an important signal of expected prices in legal pluralistic markets (Navarro & Turnbull, 2010). Other factor must be considered in the modelling process.

RESEARCH METHODOLOGY

The data used in this study were collected from Kinondoni municipality. The Municipality is one of the three municipalities of the city of D'Salaam others being Temeke and Ilala. According to the 2012 population and housing census, the municipality has a population of 446,504 households (National Bureau of Statistics -Tanzania, 2013). The municipality embraces two official systems of land tenure, the first is a "temporary" Residential License (RL) and the other is a granted Certificate of Right of Occupancy (CRO)¹. A RL is a 5 year term tenure mode for urban dwellers who have informally (extralegally) built houses in unplanned areas. The rights under RL are basically synonymous to any title to land though it only reflects recognition of the occupier by the government. The RL lacks many of the features of a formal title such as perpetual security, collateralisability and transferability (Collin, 2013), but is the most advocated means for formalising urban properties under the Property and Business Formalisation Programme locally abbreviated as MKURABITA (Mkakati wa Kurasimisha Rasirimali na Biashara Tanzania). A CRO

¹ The LR was initially introduced as a temporary measure to address the problem of lack of title among urban dwellers throughout Tanzania. However this tenure mode seems to be permanent as the initial 2 years tenure term was extended to 5 in 2005.

is the highest tenure mode defined and guaranteed by the government for for up to 99 years. It confers upon the holder all use, transfer and occupation rights within the prescribed limit of the title. A CRO is basically a long term lease of public land rather than properties on the land. Furthermore, a CRO does not “protect” property owners from Government taking but facilitate compensation and is effective in mitigating expropriation risk compared to RLs (MKURABITA, 2008). The vast majority of the municipality’s land owners however, have neither of the two.

DATA AND VARIABLES

To obtain the data for use in this study, an extensive survey based on a structured questionnaire was carried out between January and June 2014 in 27 out of the 34 wards of Kinondoni municipality reaching a total of 2340 house owners and 2005 tenants. The questionnaires were self administered by the researcher using 10 independent surveyors. Depending on the purchased property, the response was 1246 filled questionnaires from among land purchasers, 96 unfinished housing purchasers and 172 finished housing purchasers. This paper reports only on the purchasers of land plots. The questionnaire covered the variables as defined in Table 1. The sampling strategy implemented can be described as “subward clustered incidental sampling” strategy. This is because even if properties were selected systematically along major roads and along pathways, inclusion of individual respondents depended on availability and willingness to participate.

S/N	Variable Name	Abbrev.
Dependent variables		
	Title induced transaction failure risk; whether the occupier/buyer doubted the title declared by the seller at purchase (“High” if the occupier doubted; “Low” if otherwise)	R1
	Seller’s induced transaction failure risk (“High” if the occupier/buyer doubted the seller/or agents at the time of purchase; “Low” if otherwise)	R2
	Price is the 2010 adjusted purchase prices for land in Tshs	Preprice
Independent variables		
A	Demographic variables	
A:1	Household head gender (either “Male” or “Female”)	HhGender
A:2	Age of household head at purchase in years	Age
A:3	Household income at purchase in natural log in Tshs	Hhincome
B	Property related variables	
B:1	Neighbours at habitation “Less than 2” if less than two; “Btn 2-5” if between 2 and 5; “Btn 5-10” if between 5 and 10; “10 and above” if 10 or more	Neighatp2
B:1	Occupation strategies after purchase (“EO” if relocated to protect new property; “LG” if relied title documents to protect rights; “VIS” if relied on frequent visitation of purchased property)	Occtypeq
C	Ward level control variables	
C:1	Purchaser’s mobility after purchase (“Relocated” if moved towards the newly acquired property; “Stayed” if otherwise)	Mobafterp
C:2	Purchase ward categories (“PW_Within” if purchased within residency ward; “PW_Outside” if otherwise)	Puchwcat
	Mobility after purchase (“Stayed” if did not move; Relocated if otherwise)	Mobafterp
D	Distance and time variables	
D:1	Distance to CBD in Km	DistCBD

D:2	Duration of stay in current location in years	Dur
D:3	Occupation delays in years	ARY
D:4	Year of Acquisition (actual)	YPA
D:5	Year of Acquisition category (intervals of 5 since 1965)	YPAC
D:6	Locality of purchase ("PW_Within" if purchased within residency ward; "PW_Outside" if otherwise)	Puchwcat
E	Title induced transaction failure risk specific predictors (Adverse selection)	
E:1	Legality at purchase ("LG_Access" if legal; "IF_Access" if informal; "OR_Access" if other mode of access)	Accessmode
E:2	Perceived capacity to transfer rights ("Incapable" if cannot; "capable" otherwise)	Captrans
E:3	Title verification before purchase ("Verifiable" if verified through documented title; "NotVerifiable" if otherwise)	Verifp2
F	Mistrust risk specific predictors	
F:1	Social connectivity ("Connected" if has known relationship at local of community level; "NotConnected" if otherwise)	Socconnect
F:2	Perceived ability to collateralise property ("NotAssignable" if unable; "Assignable" if otherwise)	Assignofrights
F:3	Perceived credibility of owners at transaction ("NotCredible" if doubtful; "Credible" otherwise)	Ownercre
G	Credibility induced transaction failure risk specific predictors (Moral hazard)	
G:1	Perceived likelihood of unlawful taking ("Expropriable" if likely; "NotExpropriable" if otherwise)	Exproofrights
G:2	Perceived recoverability of rights ("Recoverable" if assignor retaking is possible; "NotRecoverable" if otherwise)	Recovofrights
G:3	Enforement of rights after purchase ("VIS" if frequent visits; "EO" if effective occupation; "LG" if government guarantee)	Enforcp2

The unit of data collection was a household as defined by the National Bureau of Statistics (National Bureau of statistics (Tanzania), 2009). The data on prices and perceived risks were aggregated hierarchically as shown in Figure 4. At the lowest level, price depends on the intended occupation strategy which defines the expected ownership risks subsequent to occupation. For the buyer, the demand for "effective occupation" after purchase may be reflected in perceived recoverability of rights, illegal expropriability, assignability and the general perception about seller's (including agents) credibility. These additional variables were utilised in analysing prices and both risks based on the definition provided in Table 1.



Figure 2: Hierarchical nature of price data given the perceived risks at purchase and occupation strategies (NB. EO, "effective Occupation", VIS = "Frequent Visitation" and LG = "Formal/Legal title")

To classify whether a purchaser is risk averse or otherwise the following strategy was adopted. When a purchaser is observed to have paid a higher price while his/her risk perception on the transaction is also high (above median risk perception in the subsample), She/he is tagged as a “risk lover” and when a purchaser pay lower price when his risk perception is high, She/he tagged as “risk averse” and when a purchaser pay a marginal price difference (not statistically tested) for a high and low risk transaction, She/he is tagged as “title-risk neutral”. The technique is to simply divide transaction risk perceptions as High (median or above) and low (below median) and then compute price differentials between the two (Low-High) across occupation strategies (subsamples). A positive price differentials mean that the purchaser pays a premium for low risk transactions (risk averse) and a negative title-risk price premium suggest that the purchaser pays higher for higher title-risk (risk lover) and when title-risk *premia* are so small, the purchaser is said to be risk neutral.

DATA ANALYSIS

Logistic regressions models were used to predict the perceived transaction failure risks. The models’ functional form included linear and polynomials partial correlations as well as interaction of some variables. To predict the respective risks the following model was implemented:

$$\text{Log} \left(\frac{\pi}{1-\pi} \right) = \beta_o + \beta_H R + \beta_D D + \beta_H Q * D \quad [5]$$

Where π is the probability of perceiving title or credibility induced transaction failure risk as the case may be, β_o are the risk specific determinants and $\beta_H, \beta_D, \beta_H Q * D$ are the other control variables identified in the literature including the demographic attributes of the household head. Solving for the probability π , equation 5 can be expressed as;

$$\pi = \frac{e^{(\beta_o + \beta_H R + \beta_D D + \beta_H Q * D)}}{1 + e^{(\beta_o + \beta_H R + \beta_D D + \beta_H Q * D)}} \quad [6]$$

Thus, in presenting the data both the odds $\left(\frac{\pi}{1-\pi} \right)$ and the probabilities are used and all interpretations are based on the 95% confidence limit although

confidence limits up to 90% are provided in the output Tables.

Predictions from the two models were then combined in a linear mixed effect model with occupation type (Occtype) nested in risk type (Risktype) yielding six groups (2*3) as shown in Figure 3. The Occupation strategies are estimated as interaction in purchase price i.e. . Given the hierarchical nature of the data, a conditional three level hierarchical model was employed. The model can be represented as in equations 7 - 9:

$$\text{Level 1} \quad \text{Risk}_{ijk} = \beta_{0jk} + \beta_{1jk} P + \beta_{2jk} Y + \epsilon_{ijk} \quad k=1,2,\dots,6... \quad [7]$$

$$\begin{aligned} \text{Level 2} \quad & \beta_{0jk} = \gamma_{00} + \gamma_{01k} \text{occtype}_{jk} + u_{0jk} \\ & \beta_{1jk} = \gamma_{10} + \gamma_{11k} \text{occtype}_{jk} + u_{1jk} \\ & \beta_{2jk} = \gamma_{20} + \gamma_{21k} \text{occtype}_{jk} + u_{2jk} \end{aligned} \quad [8]$$

$$\begin{aligned} \text{Level 3} \quad & \gamma_{01k} = \delta_{010} + v_{0k} \\ & \gamma_{11k} = \delta_{110} + v_{1k} \\ & \gamma_{21k} = \delta_{210} + v_{2k} \end{aligned} \quad [9]$$

With

$$\begin{pmatrix} u_{0jk} \\ u_{1jk} \end{pmatrix} \sim N \left(\begin{pmatrix} 0 & \tau_{00}^2 & 0 \\ 0 & 0 & \tau_{10}^2 \end{pmatrix}, \begin{pmatrix} v_{0jk} \\ v_{1jk} \end{pmatrix} \right) \sim N \left(\begin{pmatrix} 0 & \varphi_{00}^2 & 0 \\ 0 & 0 & \varphi_{10}^2 \end{pmatrix}, \text{ and } \epsilon_{ijk} \sim N(0, \sigma^2) \right)$$

Where; $Risk_{ijk}$ is purchaser i 's predicted log odds of perceiving type j risk when buying plot k ; β_{1jk} is the price fixed effect which is different for the two risk types, while β_{2jk} is the acquisition year (YPAC) fixed effect; α_{ijk} are the occtype*risktype random effects with γ_{01k} being the random effect comprising within (v_{jk}) and between group variance (δ_{i10}); ϵ_{ijk} is the random error term which is assumed random normal. All the random within group effects are assumed to be normally distributed around their respective zero mean and constant variances. The analysis further assume a polynomial relationship between risk (log odds) and the natural log of price given the possibility for higher risk when prices are very low and opportunism at very high price.

RESULTS OF ANALYSIS

Based on the above models, the collected data were analysed and the analysis results are presented in the following subsections.

DESCRIPTIVE STATISTICS

Descriptive statistics for the variables used in the analysis are provided in Table 2. Plot purchase prices was as low as Tshs 200/= in those old good days of 1960s to around Tshs 50,000,000/= with an average lot size based on 2010 constant price of Tshs 758,000/=. Title induced transaction failure risk was perceived by 46% of all respondents while seller's credibility risk was perceived by only 34% of all respondents. Thus, despite the low levels of formality in the municipality, the perceptions are in favour of both lower transactions failure risks as well as purchase price. In terms of access modality, it can be observed that 63.1% of occupiers had access to housing plots through some informal mechanism while only 12.7% accessed land plots through formal titles. Social connection is slightly below 50% i.e. 43% while perceived illegal expropriation is perceived by 33% of all respondents. Responses on enforceability provide some indication that "effective occupation" is the most preferred way to protect newly acquired rights and is implemented by some 71.5% while 24% conducted "frequent visitation" (includes other mechanisms) and only 4.5% relied on formal title. Information on the other variables is as shown in Table 3. It is evident here that some purchasers of formal plots utilised informal mechanism to enforce their rights rather than relying on the title as a means of protection.

TABLE 2 DESCRIPTIVE STATISTICS

Variable name	N	Min	Max	Mean	Std. Dev	Skewness	
						Statistic	Std. Error
Dependent variables							
Transaction failure risk at purchase (1=High; 0= low)	1246	0	1	0.34	0.47	0.66	0.07
Seller or Agent was doubtful at purchase (1=doubtful; 0= Not doubtful)	1246	0	1	0.46	0.50	0.17	0.07
Natural log of purchase price in Tshs (2010 constant prices)	1246	5.32	17.72	13.54	1.75	-0.89	0.07
Personal characteristics of the respondent							
Gender of household head (1=Male; 0= Female)	1246	0	1	0.84	0.37	-1.85	0.07
Acquisition age (years)	1246	-28.00	66.00	27.08	13.43	-0.39	0.07
Age at purchase (years)	1246	19.00	103.00	49.37	13.21	0.43	0.07
Natural log of income of the household head at purchase in Tshs (2010 constant prices)	1246	5.03	16.42	12.34	1.47	-0.61	0.07
Neighbourhood characteristics							
Number of neighbours at relocation (1=2 or below; 2=between 2 - 5; 3= between 5 - 10 and 4 = 10 and above)	1246	1	4	2.26	0.90	0.34	0.07
Purchase ward category	1246	0	1	0.23	0.42	1.29	0.07
Mobility after purchase within ward	1246	0	1	0.95	0.22	-4.07	0.07
Ward age (years)	1246	19.00	85.00	52.59	17.84	0.67	0.07
Distance to CBD and time variables							
Distance to CBD in Km	1246	3.17	30.94	14.29	7.36	0.30	0.07
Duration of stay in current house (years)	1246	0.50	85.50	18.62	13.92	0.91	0.07
Acquisition-to-residency years	1246	-42.00	50.00	4.17	7.15	0.09	0.07
Acquisition year categories (interval of 5)	1246	1955.00	2015.00	1993.73	13.82	-0.68	0.07
The policy era of property acquisition (1=Before 1985; 2= 1985 - 2000 and 3= 2000 and beyond)	1246	1	3	2.05	0.80	-0.08	0.07
Title and risk specific predictors							
Mode of access to rights (1=Legal; 2=extralegal and 3= Others)	1246	1	3	2.12	0.60	-0.04	0.07
Capacity to transfer rights	1246	0	1	0.30	0.46	0.89	0.07
Title document at purchase (1=Title, 2=other documents, 3=Undocumented evidence)	1246	1	3	2.21	0.59	-0.09	0.07
Social connections of the buyer (1 = consulted family members and friends; 0 = did not consult family members and friends)	1246	0	1	0.43	0.50	0.28	0.07

Assignability of rights (1 = Owner believe temporarily assign held rights;0=otherwise)	1246	0	1	0.96	0.20	-4.64	0.07
Owner is a credible seller (1 = owner believe other owners can credibly transact in property; 0=otherwise)	1246	0	1	0.19	0.40	1.55	0.07
Expropriability of rights (1 = Owner believe held rights can be illegally expropriated by other; 0 = otherwise)	1246	0	1	0.33	0.47	0.71	0.07
Recoverability of rights (1 = owner believe held rights can easily be recovered once assigned; 0= otherwise)	1246	0	1	0.45	0.50	0.20	0.07
Enforceability of traded rights (1 = relied on title to enforce newly acquired rights; 2 = relied on effective occupation to enforce newly acquired rights; 3= Relied on Visitation to enforce newly acquired rights)	1246	1	3	2.20	0.50	0.35	0.07
Valid N (listwise)	1246						

MODEL RESULTS FOR PREDICTORS OF TRANSACTION FAILURE RISKS AND PRICES

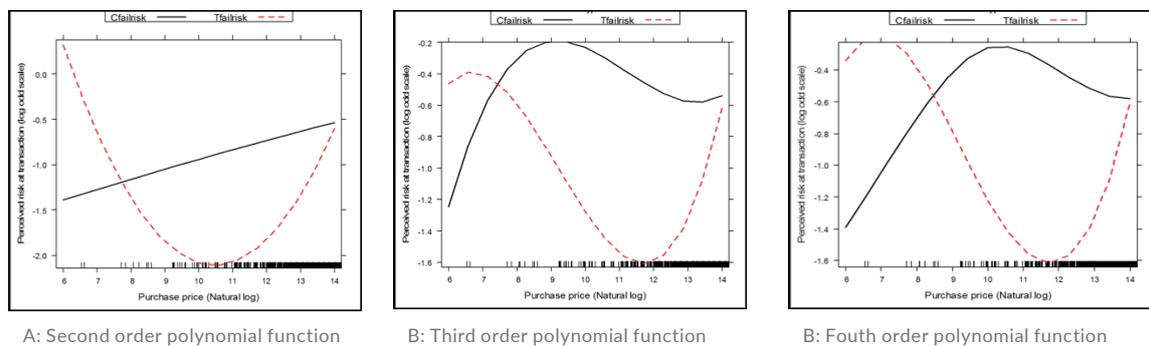
The significant predictors of both transaction failure risks based on logistic regression and OLS results for prices are summarised in Appendix 1, 2 and 3. Two variables were found to be significant predictors of both transaction failures risks and prices i.e. income and time of purchase. Both credibility and title induced transaction failure risks increases with income while title risk was significantly lower before the 2000 land reforms than thereafter and credibility risk was significantly higher during liberalisation era than after 2000 land law reforms. In terms of plot prices, it seems the rich and the poor would pay higher as their income increases but those with moderate income tend to pay significantly lower price as their income increases. In addition to income and year of purchase, the likelihood of doubting a title at purchase is higher if a formal title was used than if extralegal documents are used. In the price model, legal access has a significantly higher price only if accompanied with occupation delays while other forms of access have higher prices when the purchase is within residency ward and have lower price if accompanied by occupation delays. The title induced transaction failure risk also responds to gender where male perceive a higher risk and age of the purchaser which is significantly lower at lower age and turns out to increase with age at higher ages.

The sellers' credibility model suggest that credibility risk is significantly lower in undeveloped than developed areas and declines as occupation delays increases. A buyer who is not socially connected can face a lower credibility risk if the occupation strategy adopted after purchase is visitation but the same strategy tends to have a higher risk perception if rights purchased are not assignable. The effect of being not socially connection by itself is higher seller's credibility risk but can be moderated by recoverable rights and visitation. Visitation by itself has lower but statistically insignificant credibility risk and turns out to be a significant moderator of credibility risk for socially not well connected buyers. In effect, this translates into a higher price paid by those implementing visitation as a strategy to protect rights as shown in Appendix 3. When held rights are not assignable, buyers perceive a lower seller's credibility risk but when such rights are also not expropriable, the credibility risk increases.

Furthermore, the effect of holding recoverable rights is to increase the sellers' credibility risk at purchase which is moderated when the buyer is not well connected or owners are generally perceived not credible. Lack of credibility among sellers induces a higher credibility risk among buyers but can be moderated by recoverable. In effect, plots

whose rights recoverable end-up selling at a lower price than if they were not associated with recoverable rights. In terms of prices, apart from the joint predictors which are summarised in Appendix 1 and 2, Older settlements (ward) seem to have lower overall prices than new ones. A part from that, within ward plot purchases that are perceived expropriatable or were accessed through methods other than effective occupation tend to sell at a higher price. Age of the purchaser has a positive effect on price at lower prices but such effect turns out negative at higher purchaser's age. Distance to CBD has a positive and significant effect on seller's credibility risk. In the periphery credibility risk seems to be higher than in the inner city which translates into lower prices as evidenced in Appendix 3. While seller's credibility risk escalates towards the periphery, prices fall.

Figure 3: Transaction failure risks and land parcels prices at purchase



THE RELATIONSHIP BETWEEN PRICE AND PERCEIVED TRANSACTION FAILURE RISKS

The prediction from the just described models were used as input in a linear mixed effect models to generate the potential behaviour of price paid in response to pre-transfer transaction failure risks. The results of the analysis are presented in Appendix 4. It can be observed that parcel price is a significant predictor of perceived transaction failure risk in the 3rd and 4th order polynomials where risk increases with price paid. The model suggests that plot price is an increasing function of risk. The risk effect of purchasing a "titled property" is positive yielding negative price increments on additional money spent on plots. Both "frequent visitation" and effective occupation have on average lower risk and positive price increment. That is formal plot prices are inversely related to informal ones as far as responses to title risks is concerned. Introducing the two types of risks into the analysis reveals that a titled property purchase has lower credibility risk perception but higher title risk perception compared to informal occupation strategies. Formal plot purchase will therefore have a higher risk-price premium if the purchaser faces credibility risk than when it faces title risks while informal plot purchases are likely to fetch a higher price if the purchaser faces a higher title induced risk than when facing sellers' credibility risk.

Figure 4: Transaction failure risk and land prices across occupation strategies

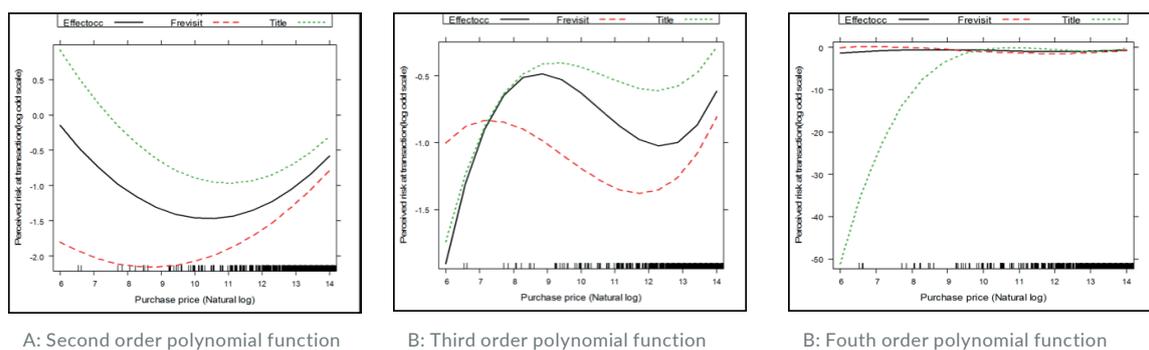


Figure 3 visualises the relationship between purchase price and pre-transfer transaction failure risks. As predicted in the theoretical exposition, risk is a declining function of price. This observation is however, relevant only when the purchaser faces title induced transaction failure risk. Even under this risk, at very high prices, risk perceptions are likely to increase. For transaction failure risk, there are potential for multiple prices, one being paid by risk averse (when the “Tfailrisk” is declining) and the one paid by risk lovers (when the “Tfailrisk” is increasing). Under this risk type, “risk aversity” dominates at lower plot prices while risk loving dominates at higher price. In terms of credibility risk the reverse is true; risk loving dominates at lower risk while risk “adversity” dominates at higher price. Combined with the previous observations it can be argued that cheaper plots have serious title related problems while expensive plots have serious sellers’ credibility problems. Figure three suggest that the safest margin of prices exists between approximately Tshs 22,000 and Tshs. 163,000 (2010 constant prices).

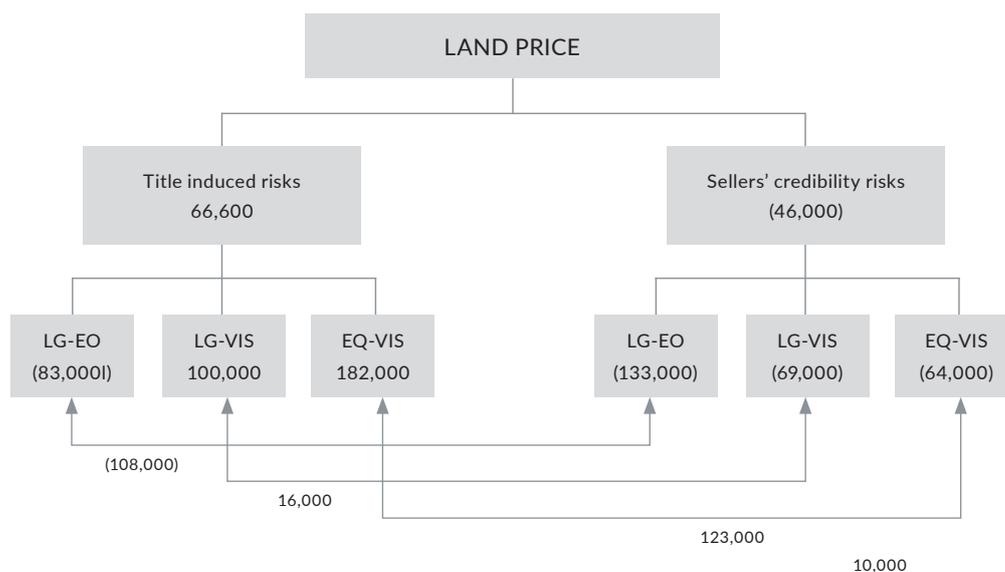
Table 3: Purchase risk-price premia in Tshs (2010 prices)

Risk		LG-EO	LG-VIS	EO-VIS
Title induced risk price premia in Tshs (2010 constant prices)				
<50 (Low)	MIN	205,709.94	212,156.05	6,446.11
	AVG	-218,711.38	-177,686.04	41,025.34
	MAX	-485,841.66	-360,571.34	125,270.32
>50 (High)	MIN	264,228.84	-312,240.96	-576,469.80
	AVG	-136,171.47	-277,545.85	-141,374.39
	MAX	13,736.80	-2,763.88	-16,500.69
	DIFF	-82,539.91	99,859.81	182,399.72
Sellers' credibility induced risk price premia in Tshs (2010 constant prices)				
<50 (Low)	MIN	127,116.35	109,097.90	-18,018.44
	AVG	13,863.73	76,235.11	62,371.39
	MAX	70,206.95	177,912.02	107,705.07
<50 (High)	MIN	399,679.13	369,469.52	-30,209.61
	AVG	146,441.37	144,817.78	-1,623.59
	MAX	-93,334.41	-87,823.20	5,511.21
	DIFF	-132,577.64	-68,582.67	63,994.97
Risk reduction price premia in Tshs (2010 constant prices)				
<50 (Low)	MIN	166,413.14	160,626.97	-5,786.17
	AVG	-102,423.83	-50,725.47	51,698.36
	MAX	-207,817.35	-91,329.66	116,487.69
<50 (High)	MIN	331,953.99	28,614.28	-303,339.71
	AVG	5,134.95	-66,364.03	-71,498.99
	MAX	-39,798.80	-45,293.54	-5,494.74
	DIFF	-107,558.78	15,638.57	123,197.35
Total				10,425.71

NB: by June 2017, USD 1 is equivalent to approximately Tshs 2200

Across occupation strategies there is strong indication that plot prices are positively correlated with risk. Figure 4 portrays the relationship between price and transaction failure risks for the three occupation strategies. In the 2nd order polynomial function, those relying on title as a mens to protect rights seem to face the highest risk. This is however moderated in higher order polynomials. In both the 3rd and the 4th order polynomial functions, it can be observed that, at lower price, title induced risk is relatively lower compared to other types of risks but tend to dominate when purchase price is higher. Since titled plots have generally a higher price, it can be argued here that formal title to plots induces a higher risk perception at transaction than if effective occupation or other informal access to land is implemented. This conclusion is well supported by the results in Appendix 4.

Given the above notable observations, it is imperative to examine the estimated risk-price differentials between formal and informal traded land parcels in the municipality. Table 3 show that the net purchase price for LG over EO plots is on average lower by around Tshs. 108,000/= if the perceived overall transaction failure risk is high than when it is low; it is around Tshs. Tshs 16,000/= higher for LG over VIS plots and is Tshs 123,000/= higher for EO over VIS plots under the general risk considerations. When risk type is incorporated, such risk-price premia are around Tshs 83,000/= lower for LG over EO transactions when perceived title risks is high than when it is low; It is around Tshs 100,000/= higher for LG over VIS transactions; and is around Tshs 182,000/= for EO over VIS plots under the title transaction failure risk considerations. Under the seller credibility risk perceptions, it is around Tshs. 133,000/= lower for LG over EO plots purchases; Tshs 69,000/= lower for LG over VIS plot purchases; and around Tshs 64,000 higher for EO over VIS transactions when perceived credibility risks is high than when it is low.



The overall net purchase prices for LG over non-LG land are on average lower by around Tshs 10,426/= if the perceived transaction failure risk is high than when it is low (risk aversity). At the general level it is appropriate to suggest that risk averse purchasers of land pay a relatively higher price for formal properties because such purchases also entails a lower transaction failure risk. Such lower risk is however, relevant when the available options for plot purchases are predominantly informal. That is purchasers are often times faced with choosing between effective occupation and visitation. When confronted with legal rights in their purchases, a title does not reduce transaction failure risk and purchasers in turn would demand a discount in the price in order to moderate the perceived risk. For purchasers of plots, it is the risk reduction effect that is associated with social connectivity that has a strong influence on the purchase decision rather than the title. Therefore the data just presented suggest that, price-risk premium among plot purchasers, is dependent on the anticipated occupation strategy. Legal titles have a small risk-price premium of only around Tshs. 5,000/= over “effective occupation” at higher perceived risk but have a relatively higher discount for VIS plot at high than low perceived risk yielding a positive net risk-price premium of around Tshs. 16,000/=. These marginal values however suggest that plots do fetch the same price regardless of whether they have a formal or informal.

DISCUSSION AND CONCLUSION

The above noted observation has important implications in terms of strategies adopted by occupiers of informal land. The legal titles price premia over and above informal ones could be a decisive factor in the decision of whether to purchase an informal or a formal property. To examine the choices available to purchasers, Table 5 defines different informal occupation strategies based on anticipated risk-price premia. The discussion that follows details out these strategies as implemented by risk averse and risk lovers (risk neutral) purchasers. Risk averse purchasers do pay increasing amounts to reduce risk hence face a positive risk-price premia while risk lovers pay higher amount for increasing risk hence face a negative risk-price premia.

If the source of risk is a doubtful title documents; a risk lover purchaser would pay a risk-price premium for a formally titled property over "effective occupation" and if the source of risk is doubtful seller's credibility, it is the risk averse who pay a risk-price premium. The net effect is negative (108,000) suggesting that risk loving will dominate in the purchase of formally titled plots against those for which "effective occupation" is anticipated as an enforcement mechanism. When formally titled plots purchases are compared with "frequent visitation" it is observed that, if the source of risk is a doubtful title documents; a risk averse purchaser would pay a risk-price premium while if the source of risk is doubtful seller's credibility, it is the risk lover purchaser who pay a risk-price premium. The net effect is positive (16,000) suggesting that risk aversion will dominate in the purchase of formally titled plots against those for which "frequent visitation" is anticipated. Therefore, if the anticipated informal enforcement mechanism is "effective occupation" then, formally-titled finished housing purchase is the best strategy among risk lovers and if the enforcement mechanism is "frequent visitation" acquisition of formally titled plots is the best strategy among risk averse households

The risk-price premia with regard to vacant plots are however marginal, suggesting that there are no good reasons for formal and informal plots to be purchased at different prices. Potentially three reasons can explain this pattern of behaviour in the municipality. The first is related to the moderating effect of government plot allocations in inner city wards which were conducted in early post independence and in the 1970s (Kironde L. , 2006; Kyessi & Sekiete, 2014). The effect of government allocation is to make prices lower at the time of allocation since the governments provide land the cost of which is covered through budgetary allocation. There are also major government allocations projects which have been conducted recently though many such projects were implemented in the outskirts (Kironde J. , 2015). In these recent projects cost recovery was implemented where by government allocation prices were slightly higher though not in line with market prices.

The marginal risk-price premia of formal over informal plots can also be linked to rapid increase in the prices of informal properties over time. That is informal property prices may be increasing faster than formal ones. Although evidence in this study is scanty on this matter, it is anticipated that as long as formal prices are increasing slowly and are above informal ones, convergence of prices will be the ultimate outcome. Therefore marginal formal-informal price differential can be attributed to the dynamic convergence proposition. The last reason that can explain the limited formal-informal plot price differentials is the undeveloped secondary markets for plots following government allocations. Although plots can cheaply be gotten through government allocation, a well developed secondary market would have pulled formal prices away from informal one. When the formal plot sales in the secondary market are doomed speculations dominates. Given the limited options for investment in developing countries, Tanzania inclusive, the majority rely on land speculations as the most profitable investment option (Jimenez, 1984; Buckley & Kalarickal, 2005; Fekade, 2000). Prices are set artificially too high to deter immediate purchase. As a result the majority of plot seekers cluster in informal areas where given the availability and willingness to trade, prices are generally lower. As noted above, the increased competition has however, increased informal property prices faster than formal ones.

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APPENDIX 1: Binomial logistic regression model results for title induced transaction failure risk model

Model coefficients:	(B)	Std. Error	z value	Pr(> z)	Exp (B)	Sig.
(Intercept)	0.26	0.42	0.63	0.53	1.30	
Demographic control variables				1.00		
HhGenderMale	-0.65	0.20	-3.30	0.00	0.52	***
poly(AGEP, 3)1	-7.83	3.05	-2.56	0.01	0.00	*
poly(AGEP, 3)2	5.43	2.68	2.03	0.04	227.57	*
poly(AGEP, 3)3	1.44	2.45	0.59	0.56	4.21	
poly(Income, 3)1	18.73	6.00	3.12	0.00	135886155.33	**
poly(Income, 3)2	12.63	3.03	4.17	0.00	306135.78	***
poly(Income, 3)3	4.98	3.08	1.62	0.11	145.87	
Neighbourhood variables		1.00				
Neighthabc2 or less	-0.14	0.28	-0.50	0.62	0.87	
NeighthabcBtn 2-5	-0.24	0.25	-0.94	0.35	0.79	
NeighthabcBtn 5-10	0.04	0.26	0.17	0.87	1.04	
NeighthabcBtn 5-10	-0.30	0.45	-0.68	0.50	0.74	
PuchwcatPW_Within	0.13	0.50	0.26	0.80	1.14	
MobafterpStayed	-0.05	0.40	-0.13	0.89	0.95	
Distance/Time control variables				1.00		
poly(DistCBD, 3)1	-3.13	3.54	-0.88	0.38	0.04	
poly(DistCBD, 3)2	-3.53	2.90	-1.22	0.22	0.03	
poly(DistCBD, 3)3	-1.90	2.73	-0.70	0.49	0.15	
poly(ARY, 3)1	-4.52	6.88	-0.66	0.51	0.01	
poly(ARY, 3)2	-3.49	3.72	-0.94	0.35	0.03	
poly(ARY, 3)3	-1.36	4.02	-0.34	0.73	0.26	
YPAC4Liberalisation_Age	-1.08	0.19	-5.74	0.00	0.34	***
YPAC4Prereform_Age	-1.80	0.43	-4.13	0.00	0.17	***
Title Quality and risk specific predictors		1.00				
AccessmodeLG_Access	1.76	0.43	4.07	0.00	5.84	***
AccessmodeLG_Access:ARY	0.01	0.04	0.24	0.81	1.01	
AccessmodeOR_Access:ARY	0.01	0.03	0.44	0.66	1.01	
AccessmodeLG_Access:PuchwcatPW_Within	-0.43	0.54	-0.79	0.43	0.65	
AccessmodeOR_Access:PuchwcatPW_Within	0.27	0.41	0.65	0.52	1.31	
AccessmodeLG_Access:SocconnectNotConnected	0.35	0.45	0.78	0.44	1.42	
AccessmodeOR_Access:SocconnectNotConnected	-0.43	0.36	-1.18	0.24	0.65	
AccessmodeOR_Access	0.11	0.32	0.33	0.74	1.11	
SocconnectNotConnected	0.38	0.29	1.33	0.18	1.47	
CaptransIncapable	-0.19	0.28	-0.69	0.49	0.83	
CaptransIncapable:ARY	0.01	0.03	0.54	0.59	1.01	
CaptransIncapable:PuchwcatPW_Within	-0.32	0.39	-0.82	0.41	0.73	
CaptransIncapable:SocconnectNotConnected	-0.12	0.32	-0.38	0.71	0.89	
Verifp2Verifiable	0.41	0.29	1.40	0.16	1.50	
Verifp2Verifiable:ARY	-0.02	0.03	-0.66	0.51	0.98	
Verifp2Verifiable:PuchwcatPW_Within	-0.05	0.38	-0.12	0.90	0.95	
Verifp2Verifiable:SocconnectNotConnected	-0.17	0.32	-0.52	0.61	0.85	

AssignofrightsNotAssignable	0.32	0.36	0.88	0.38	1.38	
OwnercreNotCredible	0.10	0.18	0.54	0.59	1.10	
		df				
AIC	1324.50					
Null deviance	1601.90	1245.00				
Residual deviance	1244.50	1206.00				
glm(formula = Ttransfail ~ HhGender + YPAC4 + Mobafterp + Neighathabc + poly(AGEP, 3) + poly(Income, 3) + poly(DistCBD, 3) + poly(ARY, 3) + Assignofrights + Ownercre + Accessmode * ARY + Accessmode * Puchwcat + Accessmode * Socconnect + Captrans * ARY + Captrans * Puchwcat + Captrans * Socconnect + Verifp2 * ARY + Verifp2 * Puchwcat + Verifp2 * Socconnect, family = binomial, data = datat)						

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

APPENDIX 2: Binomial logistic regression model results for sellers' credibility induced risk

Model coefficients:	(B)	Std. Error	z value	Pr(> z)	Exp (B)	Sig.
(Intercept)	-1.39	0.48	-2.89	0.00	0.25	**
Demographic control variables						
HhGenderMale	-0.13	0.17	-0.73	0.47	0.88	
poly(AGEP, 3)1	0.00	0.01	-0.31	0.76	1.00	
poly(AGEP, 3)2	2.33	2.51	0.93	0.35	10.32	
poly(AGEP, 3)3	-3.71	2.41	-1.54	0.12	0.02	
poly(Income, 3)1	6.88	4.70	1.46	0.14	972.73	
poly(Income, 3)2	7.76	2.54	3.05	0.00	2342.45	**
poly(Income, 3)3	3.05	2.53	1.21	0.23	21.05	
Neighbourhood variables						
NeighathabcBtn 2-5	-0.53	0.26	-2.07	0.04	0.59	.
NeighathabcBtn 5-10	-0.41	0.23	-1.81	0.07	0.66	
NeighathabcBtn 5-10	-0.13	0.24	-0.56	0.58	0.88	
PuchwcatPW_Within	-0.66	0.45	-1.48	0.14	0.52	
MobafterpStayed	0.52	0.36	1.44	0.15	1.68	
Distance/Time control variables						
poly(DistCBD, 3)1	-2.54	3.00	-0.85	0.40	0.08	
poly(DistCBD, 3)2	0.63	2.45	0.26	0.80	1.88	
poly(DistCBD, 3)3	5.35	2.42	2.21	0.03	209.81	*
poly(ARY, 3)1	-10.69	5.07	-2.11	0.04	0.00	*
poly(ARY, 3)2	-2.34	2.58	-0.91	0.36	0.10	
poly(ARY, 3)3	-1.85	2.54	-0.73	0.47	0.16	
YPAC4Liberalisation_Age	0.31	0.18	1.71	0.09	1.36	.
YPAC4Prereform_Age	0.50	0.34	1.47	0.14	1.65	
Title Quality and risk specific predictors						
Enforcp2Frevisit	-0.42	0.48	-0.89	0.37	0.65	
Enforcp2Title	0.11	0.88	0.13	0.90	1.12	
Enforcp2Frevisit:ARY	-0.01	0.02	-0.27	0.79	0.99	
Enforcp2Title:ARY	-0.04	0.05	-0.75	0.45	0.96	
Enforcp2Frevisit:PuchwcatPW_Within	0.60	0.36	1.64	0.10	1.82	

Enforcp2Title:PuchwcatPW_Within	-0.06	0.90	-0.06	0.95	0.94	
Enforcp2Frevisit:SocconnectNotConnected	-0.57	0.31	-1.85	0.06	0.57	.
Enforcp2Title:SocconnectNotConnected	-0.47	0.68	-0.69	0.49	0.63	
Enforcp2Frevisit:AssignofrightsNotAssignable	1.57	0.95	1.65	0.10	4.81	.
Enforcp2Title:AssignofrightsNotAssignable	-0.17	1.46	-0.11	0.91	0.85	
Enforcp2Frevisit:OwnercreNotCredible	0.57	0.45	1.26	0.21	1.77	
Enforcp2Title:OwnercreNotCredible	-0.23	0.90	-0.26	0.80	0.79	
SocconnectNotConnected	0.77	0.27	2.86	0.00	2.16	**
SocconnectNotConnected:RecovofrightsRecoverable	-1.36	0.26	-5.14	0.00	0.26	***
AssignofrightsNotAssignable	-1.40	0.69	-2.04	0.04	0.25	*
OwnercreNotCredible	1.91	0.33	5.82	0.00	6.73	***
AssignofrightsNotAssignable:RecovofrightsRecoverable	0.99	0.73	1.35	0.18	2.69	
OwnercreNotCredible:RecovofrightsRecoverable	-1.10	0.37	-2.95	0.00	0.33	**
ExproofrightsNotExpropriatable	-0.60	0.39	-1.53	0.13	0.55	
ExproofrightsNotExpropriatable:ARY	0.05	0.02	2.41	0.02	1.05	*
ExproofrightsNotExpropriatable:PuchwcatPW_Within	0.73	0.32	2.27	0.02	2.07	*
ExproofrightsNotExpropriatable:SocconnectNotConnected	-0.22	0.28	-0.79	0.43	0.80	
ExproofrightsNotExpropriatable:AssignofrightsNotAssignable	1.45	0.69	2.09	0.04	4.28	*
ExproofrightsNotExpropriatable:OwnercreNotCredible	0.06	0.37	0.16	0.87	1.06	
RecovofrightsRecoverable	1.10	0.39	2.81	0.01	3.01	**
RecovofrightsRecoverable:ARY	0.02	0.02	0.86	0.39	1.02	
RecovofrightsRecoverable:PuchwcatPW_Within	-0.41	0.32	-1.29	0.20	0.66	
		df				
AIC	1324.50					
Null deviance	1718.60	1245.00				
Residual deviance	1494.60	1198.00				
glm(formula = Ctransfail ~ HhGender + AGEp + YPAC4 + Mobafterp + Neighathabc + poly(AGEp, 3) + poly(Income, 3) + poly(DistCBD, 3) + poly(ARY, 3) + Exproofrights * ARY + Exproofrights * Puchwcat + Exproofrights * Socconnect + Exproofrights * Assignofrights + Exproofrights * Ownercre + Recovofrights * ARY + Recovofrights * Puchwcat + Recovofrights * Socconnect + Recovofrights * Assignofrights + Recovofrights * Ownercre + Enforcp2 * ARY + Enforcp2 * Puchwcat + Enforcp2 * Socconnect + Enforcp2 * Assignofrights + Enforcp2 * Ownercre, family = binomial, data = data)						

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APPENDIX 3: OLS model results for predictors of land parcel prices

Model coefficients:	(B)	Std. Error	z value	Pr(> z)	Sig.
(Intercept)	-32.90	20.41	-1.61	0.11	
Demographics					
HhGenderMale	0.03	0.11	0.29	0.77	
poly(AGEP, 3)1	3.17	1.63	1.94	0.05	.
poly(AGEP, 3)2	-3.36	1.46	-2.30	0.02	*
poly(AGEP, 3)3	1.57	1.38	1.14	0.25	
poly(Income, 3)1	34.78	3.37	10.32	< 2e-16	***
poly(Income, 3)2	-5.29	1.59	-3.33	0.00	***
poly(Income, 3)3	6.69	1.49	4.50	0.00	***
Neighbourhood variables					
Neighathab	0.01	0.01	0.87	0.38	
WagecOld	-0.24	0.14	-1.74	0.08	.
PuchwcatPW_Within	-0.14	0.29	-0.49	0.62	
MobafterpStayed	-0.33	0.22	-1.51	0.13	
Distance/Time control variables					
poly(DistCBD, 3)1	-3.79	2.04	-1.86	0.06	.
poly(DistCBD, 3)2	0.33	1.79	0.18	0.85	
poly(DistCBD, 3)3	2.22	1.50	1.48	0.14	
poly(ARY, 3)1	0.64	3.43	0.19	0.85	
poly(ARY, 3)2	-0.16	1.51	-0.10	0.92	
poly(ARY, 3)3	-3.17	1.54	-2.06	0.04	*
YPAC4Liberalisation_Age	0.22	0.15	1.50	0.13	
YPAC4Prereform_Age	0.86	0.29	2.97	0.00	**
YPAC	0.02	0.01	2.28	0.02	*
Title Quality and risk specific predictors					
AccessmodeLG_Access	-0.21	0.25	-0.85	0.39	
AccessmodeOR_Access	-0.14	0.17	-0.82	0.42	
AccessmodeLG_Access:ARY	0.00	0.02	0.09	0.93	
AccessmodeOR_Access:ARY	-0.02	0.01	-1.83	0.07	.
AccessmodeLG_Access:PuchwcatPW_Within	0.52	0.30	1.70	0.09	.
AccessmodeOR_Access:PuchwcatPW_Within	0.42	0.21	1.96	0.05	.
AccessmodeLG_Access:SocconnectNotConnected	-0.33	0.26	-1.28	0.20	
AccessmodeOR_Access:SocconnectNotConnected	0.24	0.19	1.24	0.22	
SocconnectNotConnected	-0.01	0.18	-0.04	0.97	
AssignofrightsNotAssignable	-0.21	0.33	-0.65	0.52	
OwnercreNotCredible	-0.10	0.17	-0.59	0.56	
Verifp2Verifiable	0.16	0.16	0.96	0.34	
Verifp2Verifiable:ARY	0.00	0.01	-0.34	0.73	
Verifp2Verifiable:PuchwcatPW_Within	-0.20	0.21	-0.94	0.35	
Verifp2Verifiable:SocconnectNotConnected	0.23	0.18	1.31	0.19	
ExproofrightsNotExpropriatable	-0.07	0.22	-0.32	0.75	
ExproofrightsNotExpropriatable:ARY	0.01	0.01	0.41	0.68	
ExproofrightsNotExpropriatable:PuchwcatPW_Within	0.40	0.19	2.06	0.04	*
ExproofrightsNotExpropriatable:SocconnectNotConnected	-0.08	0.17	-0.46	0.65	
ExproofrightsNotExpropriatable:AssignofrightsNotAssignable	0.08	0.40	0.20	0.84	
ExproofrightsNotExpropriatable:OwnercreNotCredible	0.01	0.20	0.05	0.96	
RecovofrightsRecoverable	-0.56	0.21	-2.64	0.01	**

RecovofrightsRecoverable:ARY	0.00	0.01	0.33	0.75	
RecovofrightsRecoverable:PuchwcatPW_Within	0.10	0.19	0.51	0.61	
RecovofrightsRecoverable:SocconnectNotConnected	0.06	0.16	0.35	0.72	
RecovofrightsRecoverable:AssignofrightsNotAssignable	0.20	0.41	0.50	0.62	
RecovofrightsRecoverable:OwnercreNotCredible	0.17	0.20	0.81	0.42	
Enforc2Frevisit	0.15	0.09	1.66	0.10	.
Enforc2Title	0.32	0.20	1.61	0.11	
		df	p-value		
Residual standard error	1.323	1196			
Multiple R-squared	0.449				
Adjusted R-squared	0.427				
F-statistic	19.89	49 & 1196	< 2.2e- 16		
lm(formula = Lprice ~ Wagec + poly(DistCBD, 3) + YPAC + Enforc2 + poly(AGEP, 3) + Neighathab + poly(ARY, 3) + YPAC4 + poly(Income, 3) + Puchwcat + Mobafterp + HhGender + Assignofrights + Ownercre + Accessmode * ARY + Accessmode * Puchwcat + Accessmode * Socconnect + Verifp2 * ARY + Verifp2 * Puchwcat + Verifp2 * Socconnect + Exproofrights * ARY + Exproofrights * Puchwcat + Exproofrights * Socconnect + Exproofrights * Assignofrights + Exproofrights * Ownercre + Recovofrights * ARY + Recovofrights * Puchwcat + Recovofrights * Socconnect + Recovofrights * Assignofrights + Recovofrights * Ownercre, data = Ldata)					

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

APPENDIX 4: Risk-price relationships in an LME model

Random effects:				
Groups	Name	Variance	Std.Dev.	Corr
risktype:occtype	Intercept	3.809e+00	1.952e+00	
	Preprice	1.077e-02	1.038e-01	-1.00
occtype	Intercept	9.130e-09	9.555e-05	
	Price	2.658e-11	5.156e-06	-1.00
Residual		1.002e+00	1.001e+00	
		Number of obs		2492
		groups	risktype:occtype	6
			occtype	3
		REML criterion at convergence:	7066.8	
Interaction between risk type and occupation strategies				
	Intercept)	Preprice		
Cfailrisk:Effectocc	0.7977925	-0.04242673		
Cfailrisk:Frevisit	0.1176490	-0.00625659		
Cfailrisk:Title	-0.9154414	0.04868332		
Tfailrisk:Effectocc	-0.9496155	0.05050070		
Tfailrisk:Frevisit	-1.9778819	0.10518407		
Tfailrisk:Title	2.9274974	-0.15568477		
Occupation strategies after purchase				
Effectocc	-5.594182e-10	3.018390e-11		
Frevisit	-4.092542e-09	2.208167e-10		
Title	4.651960e-09	-2.510006e-10		
Fixed effects:				
	Estimate	Std. Error	t value	
(Intercept)	-0.3779	0.3193	-1.184	
poly(Price, 4)1	0.6035	4.2250	0.143	
poly(Price, 4)2	1.0976	1.5480	0.709	
poly(Price, 4)3	5.4660	1.5168	3.604	
poly(Price, 4)4	3.4081	1.4454	2.358	
risktypeTfailrisk	-0.2097	0.4516	-0.464	
poly(Purchaseyear, 2)1	7.7683	1.9993	3.885	
poly(Purchaseyear, 2)2	6.9554	1.4186	4.903	
poly(Price, 4)1:risktypeTfailrisk	22.7545	5.3836	4.227	
poly(Price, 4)2:risktypeTfailrisk	18.9050	2.0047	9.430	
poly(Price, 4)3:risktypeTfailrisk	3.8279	2.0056	1.909	
poly(Price, 4)4:risktypeTfailrisk	-4.6587	2.0189	-2.308	
Linear mixed model fit by REML ['lmerMod']				
Formula: Risk ~ poly(Price, 4) * risktype + poly(Purchaseyear, 2) + (Price occtype/risktype), Data: R3datarx				