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UNCERTAINTY IN COLLEGE-TOWN HOUSING MARKET: A CASE OF THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

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Uncertainty in College-Town Housing Market:[1]
A case of the University of Illinois at Urbana-Champaign

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Abstract: College students face mainly two kinds of uncertainty when making a housing decision; the first uncertainty emerges when they first come to campus as incoming students, and the other comes when they search for a better housing in subsequent years. This paper investigates empirically the cost that arises as a consequence of such uncertainties in the college-town housing market by using 777 housing units across 30 landlords in the Champaign-Urbana Metropolitan Area. First, I find that some first-year-graduate students are willing to pay 25~35% more to insure a feeling of security by living in housing provided by the University of Illinois. I also find that the rental price of housing, managed by landlords with more than 10 claims made in the past 5 years, is 7~12% lower than the rental price of others. These results show that landlords play a substantial role in college-town housing market, and suggest the importance of revealing information about housing providers for the efficiency of college-town housing market.

Introduction

Accommodation is one of the major concerns for any incoming college student. Since the dwelling environment is considerably important as part of campus life, first-year college students and their parents have a strong incentive to insure against risks of housing problems. In many universities in the United States, first-year students have no choice and are forced into dormitories. Although a dormitory, in general, may be expensive, it can provide a feeling of security to first-year students and their parents. In this sense, there may be some rationality for them to choose a dormitory even though it is considerably more expensive. We can regard this cost as the "university premium" which arises as a consequence of uncertainty in housing market in an unfamiliar location.

College students usually move out from dormitories in the second or the third year. By this time, they have made more friends and been more familiar with the campus and community environment, and thus they are in a much better (more informed) position to start looking for a place that enhances their living utility while reducing their costs. In searching for new housing, however, they will face different kinds of uncertainties such as the relationship with a future landlord and the matching with new roommates.

This paper investigates empirically the costs of uncertainty in a college-town housing market, in this case Champaign-Urbana home of the University of Illinois. The housing data at Champaign-Urbana has two desirable properties that will enable an examination of the issues raised earlier. First, there exists a data of

[1] I am thankful to participants of seminars in Regional Economics Applications Laboratory (REAL) at University of Illinois, and Regional, Population, Health, and Environmental Economics Summit (RPHE) at Purdue University,

claims about landlords in Urbana-Champaign. If the number of claims does matter to renters, the rent of housings of landlords with many claims should be lower than the rent of others. Otherwise, no rational person would be expected to make a leasing contract with a risky landlord by paying the same rent that they might pay to a good landlord. Note that this story holds only if renters have some information of risk about landlords.

Secondly, the University Housing, a university property management agency, provides properties for two types of students, first-year undergraduate students and graduate or upper-level undergraduate students (herein after referred as undergraduate university housing and graduate university housing, respectively). In principle, all undergraduate freshmen are obliged to live in dormitories unless they live with their families in neighborhood, while graduate students are not required to do so. Therefore, the rental price of graduate university housing can be taken as a market price, while the rent of undergraduate university housing is not, since it is determined by the university. This distinction enables us to identify two kinds of costs, one is the additional "university premium" that students are willing to pay to obtain a sense of security, and the other is the "freshman cost" that undergraduate students are forced to pay to the University Housing.

The estimation result shows that the rent of housing of landlords with more than 10 claims is significantly lower; the rental price of housing of private landlords with more than 10 claims in the past 5 years is 7~12% lower than the rental price of others. Furthermore, University housing for graduate and undergraduate students is, respectively, 25~35% and 80~120% more expensive than the housing owned by private landlords, implying that some graduate students are willing to pay 25~35% more to obtain a certain security of dwelling environment, while the university is extracting more rent than what undergraduate students would expect to pay. These results shed light on the indispensability of uncertainty in college-town environments and highlight the importance of disclosure of information in college-town housing market.

This paper is organized as follows. I review related studies in the section 2, and describe data in section 3. Section 4 introduces the empirical model and describes variables. In section 5, the estimation results are demonstrated, and finally, section 6 summarizes the results.

2. Literature Review

The role of uncertainty in housing market has been studied extensively in both theoretically and empirically.[2] However, there is no existing study that explicitly examines the cost of uncertainty in college-town housing

[2] For instance, see Stigler (1961) and Wheaton (1990) for theoretical descriptions and Anglin (1997) and Robst et al. (1999) for related empirical studies.

market. Rather, previous empirical studies regarding college-town housing market mostly focus on externality of campus on surrounding housing property values.[3] Vandegrift *et al*. (2009), for example, conduct an estimation of the hedonic housing price function by using municipality-level data in the state of New Jersey. They find that the presence of a college in a municipality results in an increase of housing prices by about 11%, and the appreciation rate is larger as the size of college becomes smaller. Johnson (2008) uses housing data in the state of Ohio, and finds that the housing price is appreciated around colleges that have graduate programs and bachelor of music program. These studies imply that a college may have a positive externality on neighborhood, which results in the appreciation of the housing values.[4]

While there have been few papers in economics, some papers have been found in other fields such as sociology and law regarding the issue of the housing market in college towns. Wenner (1999), for example, studies specifically the case of Ithaca, New York, whose rental housing market experienced a crisis due to the shortage of housing supply, a monopolistically competitive housing market, and disorganized forms of leasing contracts. Wenner (1999) proposes landlords to follow a certain format of leasing contracts so that the information provided by landlords will be clarified to renters and thus help to alleviate rental problems.[5] Gumprecht (2003) provides one of the most comprehensive studies that clarifies various aspects and characteristics of college-town environment. By focusing on 59 college towns in which academic institutions are dominant, he demonstrates some principal characteristics of college towns as 1) youthful places, 2) highly educated residents, 3) more likely to work in education, 4) high income and low unemployment, 5) transient places, 6) more likely to rent, 7) unconventional places, and 8) comparatively cosmopolitan. This implies that college town could be an ideal object for studying housing markets, since they primarily have a concentric structure, a high rate of rental housing and less heterogeneity of residents, thus enabling the analyst to control the characteristics of the own and the housing market so as to observe pure effects of issues of interest.

3. Data

3.1. Claims

The Tenant Union[6], one of the nonprofit agencies of University of Illinois, has been recording claims about private landlords in the Champaign-Urbana area. By visiting the Tenant Union, students are able to check

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[3] Also see Fields (2011) and Kashian (2009) for estimations of hedonic housing price functions in college towns. They find a negative correlation between the rental price and the distance from campus to housing.

[4] Another possible explanation of the housing price appreciation in a college town is a spatially-constrained supply in an oligopolistically competitive housing market.

[5] Our empirical study will be the one that provides an evidence of such a need suggested by Wenner (1999).

[6] The homepage of the Tenant Union: http://www.tenantunion.uiuc.edu/

what kinds of claims have been made for each landlord. The Tenant Union provides a sheet of a list of almost all landlords in Champaign-Urbana showing the total number of claims made in the past 5 years about each landlord. This "Claims Record" provides the basis for the development of indices that will be used in this study.

It is noted that claims are recorded by the Tenant Union only if it is about the landlords' obligations under the law or the terms of lease such as neglect of maintenances and inaccurate refunds or failure to refund of deposits. The claims are not about building conditions or about roommates; for instance, a claim will not be recorded as long as the landlords are responsible for the maintenance regardless of the age of an apartment building. In this sense, I assume that a claim is made independently of housing characteristics or the rental price and, therefore, I can regard the claim as an exogenous explanatory factor in the rental price function.

3.2. Rent and Housing characteristics

From websites of each landlord listed in the Claims Records, I collected data on housing rental prices and housing characteristics (collected during February and March in 2011). I collected samples that had the following information: rent, address, floor area, the number of bedrooms and a description about amenities and facilities. The floor area plays the essential role in this analysis since it is necessary to carefully deal with the individual effects/characteristics of housing among different landlords. I exclude samples of which either rental price or floor area is above the 99$^{th.}$ percentile. The total number of samples is 777 across 30 landlords. By using Geographic Information System, I computed distances from housing to the Main Quad, a central location of University of Illinois. The basic statistics and detailed definition about variables are shown in tables 1 and 2, respectively.

<<insert tables 1 and 2 here>>

4. Empirical Model

4.1. Model

I assume the log linearity for the rent function with various independent variables such as a constant term, a claim index (*Claim*), dummy variables for graduate and undergraduate university housing (*UHgrad* and *UHund*), housing characteristics (*X*), and categorical dummies about zip codes and the number of bedrooms (*Y*). We now have:

$$R_i = \alpha_0 + \alpha_1 Claim_i + \alpha_2 UHund_i + \alpha_3 UHgrad_i + X_i\beta + Y_i\gamma + \varepsilon_i$$

where subscript *i* indicates an individual housing unit.

4.2. Variables

Dependent variable: I use a logarithmic value of rent per square foot as a dependent variable. Using a floor area avoids some statistical problems such as multicollinearity and heteroscedasticity. Moreover, our interest in this study is to examine the rent differences across various types of landlords; especially, the floor space relative to the number of bedrooms provides a good proxy for housing quality. Therefore, it is essential to include floor area in order to control landlord's characteristics and avoid statistical problems.

Claim: The coefficient of *Claim*, an index of claims, in the rent function measures renters' evaluation toward the index. Since we would like to test how renters respond to the information that is available in the Claims Records, I compute following 4 indices as candidates of an explanatory variable. [7]

I. *lnClaim* : a logarithmic value of one plus the number of claims in the past 5 years: =log(#claims+1).

II. *Claim5* : a dummy variable indicating that the number of claims in the past 5 years exceeds 5 times.

III. *Claim10* : a dummy variable indicating that the number of claims in the past 5 years exceeds 10 times.

IV. *Claim_perUnit* : the number of claims in the past 5 years divided by the approximate total number of units managed by a landlord.

If renters are aware of the Claims Records and hesitate to live in housing provided by landlords with frequent claims represented in some of these indices above, then their coefficients in the rent function are expected to have negative signs. It is noted that the Claims Records tells us only total numbers of claims by landlords made in the past 5 years, which do not take the number of properties managed by the landlords into account. Some people may argue that the number of claims tends to be larger as the size of a landlord becomes larger and, hence, it is not appropriate to use the absolute numbers as an explanatory variable. To examine this claim, I asked landlords by email about the total number of units that they manage, based on which I computed *Claim_perUnit*, the ratio of the number of claims relative to the size (the total number of units) of a landlord. I received replies from 23 landlords, which account for 493 samples.

However, this index does not seem to be appropriate for our analysis because of the following reasons. First, we are interested in how renters' choice over the house leasing can differ given the rent and the information in the Claim Records from which they cannot tell the exact size of each landlord. If the size is not observable, the index, *Claim_perUnit*, is not available to prospective renters, either. Thus, the coefficient of *Claim_perUnit* indicates something different from what we are interested in. Moreover, it is natural to imagine that a landlord with good management skills would receive none or a few claims no matter how many properties the landlord managed. On the other hand, a landlord with a bad management continuously receives complaints from tenants and is likely to have recorded more than 5 or 10 claims. As a matter of fact,

[7] Claim Records is only available for students of the University of Illinois. In this sense, "renters" in this context can be taken as "students."

the correlation coefficient between the number of units and the number of claims is -0.0939, which does not support the evidence of having positive relationships between them. Therefore, I argue that using an index based on the absolute value of claims is more appropriate rather than using the ratio, *Claim_perUnit*. In fact, as will be seen in the estimation result, we do not observe a significant negative effect of *Claim_perUnit* on housing rental price.

UH: UH is a dummy variable indicating a housing unit managed by the University Housing. In the empirical analysis, I use two dummy variables, *UHgrad* and *UHund*, which indicate University Housing's units for graduate students and for undergraduate students, respectively. This separation is intended to identify two kinds of cost. Recall that first-year undergraduate students are forced to live in university housing, while the graduate and upper-level undergraduate students are not required to do so. Because of the choice availability between the University Housings and other private companies for graduate and upper-level undergraduate students, the coefficient of *UHgrad* can be interpreted as a "university premium," that students are willing to pay to obtain a feeling of security and to avoid the cost of searching for other options. On the other hand, the coefficient of *UHund* is not determined in the market but by the university; all freshmen are forced to contract with the University Housing with a fixed housing rent. Thus, the coefficient of *UHund* could be larger or smaller than the coefficient of *UHgrad*, according to the university's policy.

X: For control variables that explain the rental price, we have floor space, distance to the Main Quad, and dummy variables about type of building, furnished room, central A/C, free internet, pool, clubroom, tennis court, fitness room, renovated room, balcony and whether pets are allowed.[8] I use logarithmic values for continuous variables, floor space and distance to the Main Quad, since this allows us to observe elasticities of rental price to the variables by looking at their coefficients. The coefficient for floor space is expected to have a negative sign because of an economy of scale about floor area that lowers the average cost as floor area increases due to fixed construction costs of kitchen, restroom and bathroom. The distance to the Main Quad, the center of the university, can be regarded as a proxy of dis-accessibility to the university, whose coefficient is expected to show a negative sign. All dummy variables, except that of pets, are expected to have positive effects on rental price.

Y: I also include categorical dummy variables about zip code and the number of bedrooms. There are 6 zip codes and the number of bedrooms ranges from 0 to 5, where 0 indicates studios. Although we could also use the number of bedrooms as an explanatory variable, I introduce categorical dummy variables in order to carefully control housing quality whose room types may have some correlation with types of landlords.

[8] See Table 1 and Table 2 for basic statistics and definitions.

5. Estimation Results

5.1. OLS estimates

The results of the OLS estimates are shown in table 3a and 3b. Although the coefficients in these two tables are the same, the standard errors are different; the entries in table 3a are based on White's (1980) correction, while those in table 3b are based on cluster-robust standard errors assuming correlation within the same address building.

<<insert tables 3a and 3b here>>

Claim: A different index about *Claim* is used in each column. Table 3a shows negative significant signs regarding all indices of *Claim* except *Claim_perUnit*. However, in table 3b with cluster-robust standard errors, significant levels drop and only coefficients of *Claim5* and *Claim10* are negatively significant at 10% and 1% levels respectively. These estimates indicate that the rental price of housing provided by landlords, who have more than 5 claims and 10 claims, is lower by 5.5% and 9.7%, respectively, relative to the rent of a housing managed by a landlord having less claims.

UH: Regarding *UHgrad* and *UHund*, all coefficients are significantly positive at the 1% level. These coefficients show that housing rents charged by the University Housing for graduate and undergraduate students are, respectively, about 35% and 120% higher than the rent of other housings managed by private landlords.[9] The coefficient of *UHgrad* implies that the "university premium" in the Champaign-Urbana housing market accounts for more or less 30% of the total rent for graduate students living in the units of the University Housing.[10] To interpret this result in other words, there exist a huge cost associated with the uncertainty, the searching for other housings and the asymmetric information in the market. Indeed, because there are many foreign students in the graduate school at the University of Illinois, their searching cost and willingness to pay for the insurance against the uncertainty can be substantially large.

Notwithstanding some endogenous statistical problems, we can roughly estimate the total excess revenue of the University Housing. According to the homepage of the University Housing,[11] it is estimated that the University Housing manages 1,249 units for graduate students and 3,961 units for undergraduate students. By using estimated coefficients and variances of *UHgrad* and *UHund*, based on a model (3b-3) in table 3b and their mean values of the floor space (514.9 sq.ft and 198.3 sq.ft, respectively), it is estimated that the

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[9] The cost of meals has been subtracted to yield housing costs only

[10] However, this is not the "university premium" for the whole graduate students, because there exits a selection bias between graduate students who choose the University Housing and who choose private landlords. We can expect that graduate students with stronger risk adverse preference and with higher searching cost are more likely to choose the University Housing. Furthermore, the market price of graduate university housing depends crucially on the supply; the rental price decreases as the supply increases.

[11] http://www.housing.illinois.edu/

University Housing earns about $23.54 millions[12] extra during an academic year (9 months). This total cost includes the total value of the "university premium" that first-year students are willingly to pay as insurance against the uncertainty, and the total value of "freshman cost" that undergraduate students unwillingly pay. While we cannot precisely identify the total amount of the "university premium" because of a selection biased problem as noted in footnote 10, let us assume the homogeneous preference of students, whose "university premium" and "freshman cost" are characterized in the estimation results from (3b-3). Then, it is approximately estimated that $11.58 millions account for "university premium" and the $11.96 millions for "freshman cost".

Other variables (X): The rent is high if the Main Quad is close and if the housing is furnished with a central air conditioner and a tennis court. The estimation results also show that the rent per square foot is higher as the floor area decreases given that the number of bedrooms stays constant. This indicates that there is a scare economy in terms of the size of the floor space: in other words, there is a fixed cost regardless of the unit size, such as a bathroom, a kitchen and so on. Some coefficients show unexpected signs: for example, the rent is lower when housing is provided with free internet and a pool. One possible explanation for this observation is that availabilities of free internet and a pool represent an economic apartment project where many housing units are compactly clustered in one place.

5.2 Robustness check

For robustness checking, we consider the possibility of multicollinearity and spatial autocorrelation.

Multicollinearity: In table 4a and 4b, I run the regression on the same models but with limited variables in the following way. First, I use the logarithmic value of the number of bedrooms, ln(#bedrooms + 1), as an explanatory variable, instead of using categorical dummy variables about the number of bedrooms, because these dummy variables are expected to have high correlation with the floor area. Secondly, I exclude control variables that do not show the significant sign in table 3a, such as *Club*, *Gym*, *C/A*, *Renovated* and *Furnished*.

Tables 4a and 4b show the estimation results based on White's (1980) robust standard errors and cluster-robust standard errors, respectively. It turns out that *Claim10* is the only index with a significant impact on rental price. The coefficient of *Claim10* is now -0.074, slightly higher than the value in the previous results. This tendency of having a higher coefficient can be also observed in terms of *lnClaim* and *Claim5*, but coefficients are not statistically different from zero. This implies that there are positive correlations between indices of *Claim* and adjusted variables that address the relationship of *Claim* on the

[12] The 95% level confidence interval is between $15.22 and $31.85 millions under the assumption that there is no vacant room. By taking the vacancy rate into account, the total revenue should be smaller by the estimated rate. It can be expected that the annual excess revenue is more or less $20 million.

rental price.[13] Regarding coefficients of *UHgrad* and *UHund*, we observe little difference compared to the previous estimations.

<<insert tables 4a and 4b here>>

Spatial autocorrelation: Let us suspect that rental prices and error terms are spatially correlated. A modified model is proposed as:

$$R = \alpha_0 + \lambda WR + Claim\ \alpha_1 + UHund\ \alpha_2 + UHgrad\ \alpha_3 + X_i\beta + Y_i\gamma + \rho Wu + \varepsilon_i$$

where W is a spatial weight matrix, λ and ρ are, respectively, partial lagged autoregressive correlations of dependent variable and errors, and ε_i is an error term distributed independently. Elements of the weight matrix, w_{ij}, are calculated based on distance (miles) between two samples, D_{ij}, as following[14];

$$\begin{cases} w_{ij} = 0 & if\ i = j \\ w_{ij} = 1/\left(1 + D_{ij}\right) & if\ i \neq j \end{cases}$$

Table 5 shows the maximum likelihood estimates. We find that the autocorrelation of dependent variables are not significant and, therefore, ensures that the OLS estimates still remain unbiased. Contrary to the previous estimates with limited explanatory variables, coefficients of *lnClaim*, *Claim5* and *Claim10* become even lower compared to the original estimates in table 3a and 3b, and their signs are statistically significant. After taking the spatial autocorrelation into account, the coefficients of *UHgrad* and *UHund* becomes approximately 0.25 and 0.95, respectively, smaller than OLS estimates that range between 0.35 and 1.20.

<<insert tables 5 here>>

For the robust checks, two main facts are confirmed. First, students at the University of Illinois care about landlords, especially those with more than 10 claims in the past 5 years, when they make a housing decision among private landlords. Secondly, there exist "university premium" as well as "freshman cost" in the housing market.

6. Conclusion

Using data of 777 housing units across 30 landlords in the Champaign-Urbana metropolitan area, I investigate two kinds of costs that arise as a consequence of uncertainties in the college-town housing market. One of the uncertainties for renters is about relationships with a prospective landlord. I examine whether renters

[13] Note that this robustness test is based on the assumption that all removed variables have no influence on rental price, and also that *ln(#bedrooms+1)* is correctly specifies in the model. However, if these assumptions are not true, then the estimation results are biased.

[14] The reason of adding 1 in the denominator is because some samples have the same addresses and we cannot define the inverse of the distance between these samples without adjusting denominator.

concern about the claims against landlords is considered when they make leasing contracts. The estimation results show that the rental price of housing managed by landlords with more than 10 claims in the past 5 years is about 7~12% lower than the rental price of housings managed by other landlords who have fewer claims.

The other uncertainty in college-town housing market arises when incoming students arrive from outside of the campus. Since the rental price of graduate university housing reflects the market price, its appreciation rate can be considered as a "university premium" that first-year students are willing to pay in order to obtain the sense of security about their dwelling environments. I estimate the implied price premium associated with university housing. The results show that the graduate university housing and undergraduate university housing are, respectively, 25~35% and 90~120% more expensive than housing managed by private landlords. The annual total excess earning of the University Housing is more or less $20 million.

This study highlights the fact that students face indispensable uncertainties in the college town at University of Illinois at Urbana-Champaign. Housing provided by the university and the information about landlords play a significant role in the housing market to alleviate its uncertainty. The empirical results indicate the importance of revealing information so as to achieve the market efficiency. Further transparency of the college-town housing market could be pursued by the disclosure of housing information through a university website as well as by constructing a template for a leasing contract as proposed by Wenner (1999).

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Table 1: Basic Statistics

	min	median	max	mean	s.d.	obs.
Claim	0	1	48	16.467	21.684	777
Claim5	0	0	1	0.390	0.488	777
Claim10	0	0	1	0.358	0.480	777
Claim_perUnit	0	0	0.071	0.004	0.010	493
Rent ($/mth)	280	700	2199	809.822	386.569	777
FloorArea (sq.ft)	103	744	1929	760.223	320.806	777
Distance (miles)	0.138	0.750	4.747	1.177	0.874	777
UHund	0	0	1	0.046	0.210	777
UHgrad	0	0	1	0.023	0.151	777
House	0	0	1	0.028	0.166	777
Internet	0	0	1	0.302	0.460	777
Pool	0	0	1	0.149	0.357	777
Club	0	0	1	0.035	0.183	777
Tennis	0	0	1	0.023	0.151	777
Gym	0	0	1	0.103	0.304	777
Pet	0	0	1	0.125	0.331	777
C/A	0	0	1	0.372	0.484	777
Renovated	0	0	1	0.023	0.151	777
Balcony	0	0	1	0.340	0.474	777
Furnished	0	0	1	0.393	0.489	777
#Bedrooms	0	2	5	2.051	1.070	777

Table 2: Variable Descriptions

Dependent Variable		
	R	Logarithmic value of rent per square foot = ln(Rent/sq.ft)
Independent Variable		
	Claim	Indices of claims based on Claim Records; *lnClaim*, *Claim5*, *Claim10* and *Claim_perUnit*
	UHund	Dummy variable indicating university housing for first-year undergraduate students
	UHgrad	Dummy variable indicating university housing for graduate and upper-level undergraduate students
X		
	ln(FloorArea)	Logarithmic value of floor area (sq.ft) of a unit
	ln(Distance)	Logarithmic value of distance (miles) to the Main Quad, a central location of the university
	House	House dummy (apartment = 0)
	Internet	Free internet availability dummy
	Pool	Pool facility dummy
	Club	Club house/room dummy
	Tennis	Tennis court dummy
	Gym	Fitness room dummy
	Pet	Pet allowed dummy (pet is allowed = 1)
	C/A	Central A/C dummy
	Renovated	Recently renovated dummy
	Balcony	Balcony dummy
	Furnished	Furnished dummy
Y		
	ZipCode dummies	61801, 61802, 61820, 61821, 61822 and 61874
	BedRoom dummies	Studio dummy and from 1 to 5 bedrooms dummies

Table 3a: OLS estimates with all variables [White (1980)'s standard errors]

	(3a-1)	(3a-2)	(3a-3)	(3a-4)
lnClaim	-0.015			
	(0.009)			
Claim5		-0.055*		
		(0.029)		
Claim10			-0.097***	
			(0.029)	
Claim_perUnit				1.108
				(1.990)
ln(Floor area)	-0.487***	-0.485***	-0.486***	-0.496***
	(0.042)	(0.042)	(0.042)	(0.050)
ln(Distance)	-0.212***	-0.214***	-0.207***	-0.102***
	(0.026)	(0.026)	(0.025)	(0.039)
UHund	1.227***	1.230***	1.238***	1.251***
	(0.084)	(0.084)	(0.084)	(0.100)
UHgrad	0.355***	0.357***	0.360***	0.290***
	(0.076)	(0.076)	(0.075)	(0.095)
House	0.179***	0.177***	0.183***	0.210***
	(0.034)	(0.034)	(0.033)	(0.043)
Internet	-0.063*	-0.066**	-0.074**	-0.050
	(0.034)	(0.033)	(0.033)	(0.033)
Pool	-0.157***	-0.160***	-0.167***	-0.136***
	(0.038)	(0.037)	(0.037)	(0.042)
Club	-0.092	-0.083	-0.077	-0.047
	(0.090)	(0.089)	(0.087)	(0.089)
Tennis	0.534***	0.534***	0.518***	0.363***
	(0.100)	(0.099)	(0.096)	(0.107)
Gym	-0.027	-0.025	-0.021	0.034
	(0.035)	(0.035)	(0.035)	(0.055)
Pet	-0.093**	-0.097***	-0.085**	-0.031
	(0.038)	(0.037)	(0.037)	(0.051)
Central_air	0.094***	0.086***	0.093***	0.063
	(0.027)	(0.027)	(0.027)	(0.039)
Renovated	-0.056	-0.057	-0.061	-0.112*
	(0.065)	(0.065)	(0.064)	(0.062)
Balcony	0.072**	0.070**	0.083***	0.056
	(0.030)	(0.030)	(0.030)	(0.038)
Furnished	0.017	0.019	0.034	0.063
	(0.032)	(0.032)	(0.032)	(0.048)
Observations	777	777	777	493
R-squared	0.801	0.801	0.803	0.869

Dependent variable is ln(Rent per square foot of floor area). ***, **, * indicate significant levels of 1%, 5% and 10%, respectively. White(1980)' robust standard errors in parentheses. Categorical dummy variables and constant terms are not shown in the table.

Table 3b: OLS estimates with all variables (cluster-robust standard errors)

	(3b-1)	(3b-2)	(3b-3)	(3b-4)
lnClaim	-0.015			
	(0.014)			
Claim5		-0.055		
		(0.043)		
Claim10			-0.097**	
			(0.043)	
Claim_perUnit				1.108
				(2.074)
ln(Floor area)	-0.487***	-0.485***	-0.486***	-0.496***
	(0.063)	(0.063)	(0.064)	(0.071)
ln(Distance)	-0.212***	-0.214***	-0.207***	-0.102*
	(0.040)	(0.040)	(0.039)	(0.055)
UHund	1.227***	1.230***	1.238***	1.251***
	(0.131)	(0.131)	(0.130)	(0.120)
UHgrad	0.355***	0.357***	0.360***	0.290*
	(0.124)	(0.123)	(0.121)	(0.150)
House	0.179***	0.177***	0.183***	0.210***
	(0.044)	(0.044)	(0.043)	(0.059)
Internet	-0.063	-0.066	-0.074*	-0.050
	(0.045)	(0.044)	(0.044)	(0.042)
Pool	-0.157***	-0.160***	-0.167***	-0.136**
	(0.057)	(0.055)	(0.055)	(0.056)
Club	-0.092	-0.083	-0.077	-0.047
	(0.115)	(0.113)	(0.106)	(0.130)
Tennis	0.534***	0.534***	0.518***	0.363*
	(0.172)	(0.169)	(0.163)	(0.197)
Gym	-0.027	-0.025	-0.021	0.034
	(0.059)	(0.058)	(0.058)	(0.081)
Pet	-0.093	-0.097	-0.085	-0.031
	(0.070)	(0.068)	(0.068)	(0.095)
C/A	0.094**	0.086**	0.093**	0.063
	(0.040)	(0.042)	(0.040)	(0.051)
Renovated	-0.056	-0.057	-0.061	-0.112**
	(0.099)	(0.099)	(0.098)	(0.052)
Balcony	0.072	0.070	0.083	0.056
	(0.053)	(0.052)	(0.052)	(0.064)
Furnished	0.017	0.019	0.034	0.063
	(0.052)	(0.051)	(0.050)	(0.066)
Observations	777	777	777	493
R-squared	0.801	0.801	0.803	0.869

Dependent variable is ln(Rent per square foot of floor area). ***, **, * indicate significant levels of 1%, 5% and 10%, respectively. Cluster-robust (apartment address) standard errors in parentheses. Categorical dummy variables and constant terms are not shown in the table.

Table 4a: OLS estimates with limited variables [White (1980)'s standard errors]

	(4a-1)	(4a-2)	(4a-3)	(4a-4)
lnClaim	-0.006			
	(0.009)			
Claim5		-0.029		
		(0.029)		
Claim10			-0.074**	
			(0.029)	
Claim_perUnit				1.655
				(1.961)
ln(Floor area)	-0.478***	-0.477***	-0.479***	-0.487***
	(0.041)	(0.041)	(0.041)	(0.047)
ln(#Bedrooms+1)	0.155***	0.155***	0.161***	0.010
	(0.049)	(0.049)	(0.049)	(0.063)
ln(Distance)	-0.239***	-0.241***	-0.244***	-0.148***
	(0.023)	(0.024)	(0.022)	(0.035)
UHund	1.178***	1.178***	1.174***	1.191***
	(0.077)	(0.076)	(0.076)	(0.086)
UHgrad	0.357***	0.357***	0.354***	0.271***
	(0.075)	(0.074)	(0.074)	(0.088)
House	0.170***	0.168***	0.168***	0.230***
	(0.035)	(0.035)	(0.034)	(0.042)
Internet	-0.064**	-0.068**	-0.079**	-0.033
	(0.031)	(0.032)	(0.031)	(0.031)
Pool	-0.178***	-0.180***	-0.187***	-0.136***
	(0.039)	(0.039)	(0.039)	(0.042)
Tennis	0.502***	0.502***	0.487***	0.353***
	(0.060)	(0.059)	(0.058)	(0.069)
Pet	-0.114***	-0.114***	-0.097***	-0.016
	(0.038)	(0.036)	(0.036)	(0.045)
C/A	0.091***	0.088***	0.095***	0.076**
	(0.029)	(0.029)	(0.029)	(0.038)
Balcony	0.058*	0.059*	0.076**	0.048
	(0.032)	(0.031)	(0.031)	(0.039)
Observations	777	777	777	493
R-squared	0.780	0.780	0.782	0.857

Dependent variable is ln(Rent per square foot of floor area). ***, **, * indicate significant levels of 1%, 5% and 10%, respectively. White(1980)' robust standard errors in parentheses. Categorical dummy variables and constant terms are not shown in the table.

Table 4b: OLS estimates with limited variables (cluster-robust standard errors)

	(4b-1)	(4b-2)	(4b-3)	(4b-4)
lnClaim	-0.006			
	(0.014)			
Claim5		-0.029		
		(0.046)		
Claim10			-0.074*	
			(0.044)	
Claim_perUnit				1.655
				(2.270)
ln(Floor area)	-0.478***	-0.477***	-0.479***	-0.487***
	(0.063)	(0.063)	(0.063)	(0.068)
ln(#Bedrooms+1)	0.155**	0.155**	0.161**	0.010
	(0.069)	(0.069)	(0.069)	(0.093)
ln(Distance)	-0.239***	-0.241***	-0.244***	-0.148***
	(0.037)	(0.037)	(0.036)	(0.053)
UHund	1.178***	1.178***	1.174***	1.191***
	(0.122)	(0.122)	(0.122)	(0.110)
UHgrad	0.357***	0.357***	0.354***	0.271*
	(0.122)	(0.121)	(0.121)	(0.145)
House	0.170***	0.168***	0.168***	0.230***
	(0.048)	(0.048)	(0.047)	(0.063)
Internet	-0.064	-0.068	-0.079*	-0.033
	(0.046)	(0.045)	(0.045)	(0.045)
Pool	-0.178***	-0.180***	-0.187***	-0.136**
	(0.063)	(0.062)	(0.061)	(0.063)
Tennis	0.502***	0.502***	0.487***	0.353**
	(0.121)	(0.118)	(0.114)	(0.141)
Pet	-0.114	-0.114	-0.097	-0.016
	(0.072)	(0.069)	(0.069)	(0.089)
C/A	0.091**	0.088*	0.095**	0.076
	(0.044)	(0.046)	(0.044)	(0.055)
Balcony	0.058	0.059	0.076	0.048
	(0.057)	(0.056)	(0.055)	(0.069)
Observations	777	777	777	493
R-squared	0.780	0.780	0.782	0.857

Dependent variable is ln(Rent per square foot of floor area). ***, **, * indicate significant levels of 1%, 5% and 10%, respectively. Cluster-robust (apartment address) standard errors in parentheses. Categorical dummy variables and constant terms are not shown in the table.

Table 5: ML estimates with all variables

	(5-1)	(5-2)	(5-3)	(5-4)
lnClaim	-0.028***			
	(0.008)			
Claim5		-0.083***		
		(0.025)		
Claim10			-0.125***	
			(0.026)	
Claim_perUnit				2.272
				(1.458)
ln(Floor area)	-0.554***	-0.551***	-0.543***	-0.554***
	(0.040)	(0.040)	(0.040)	(0.043)
ln(#Bedrooms+1)	0.191***	0.190***	0.190***	0.001
	(0.041)	(0.041)	(0.041)	(0.047)
ln(Distance)	-0.337***	-0.328***	-0.335***	-0.133***
	(0.051)	(0.050)	(0.051)	(0.033)
UHund	0.927***	0.950***	0.947***	0.972***
	(0.071)	(0.072)	(0.070)	(0.072)
UHgrad	0.264***	0.275***	0.276***	0.246***
	(0.068)	(0.068)	(0.067)	(0.079)
House	0.111**	0.113**	0.108**	0.254***
	(0.049)	(0.049)	(0.048)	(0.046)
Internet	-0.025	-0.023	-0.027	-0.016
	(0.024)	(0.023)	(0.022)	(0.022)
Pool	-0.275***	-0.274***	-0.274***	-0.277***
	(0.038)	(0.038)	(0.037)	(0.044)
Tennis	0.571***	0.588***	0.563***	0.580***
	(0.075)	(0.074)	(0.073)	(0.092)
Pet	-0.083**	-0.099***	-0.081**	-0.158***
	(0.036)	(0.035)	(0.035)	(0.051)
C/A	0.095***	0.081***	0.095***	0.079*
	(0.028)	(0.028)	(0.028)	(0.041)
Balcony	0.019	0.010	0.038	0.045
	(0.031)	(0.029)	(0.029)	(0.051)
lambda	-0.002	-0.002	-0.002	0.000
	(0.002)	(0.002)	(0.002)	(0.002)
rho	-0.105***	-0.105***	-0.105***	-0.201***
	(0.003)	(0.003)	(0.003)	(0.002)
Observations	777	777	777	493

Dependent variable is ln(Rent per square foot of floor area). ***, **, * indicate significant levels of 1%, 5% and 10%, respectively. Categorical dummy variables and constant terms are not shown in the table.