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Tenancy Law Reform Act and Length of Tenancy Discount: Heterogenous Effects in a West German Household Sample

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Tenancy Law Reform Act and Length of Tenancy Discount: Heterogeneous Effects in a West German Household Sample*

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Abstract: Compared to other European countries the German housing market is dominated by rental apartments. Policymakers and a large part of the population alike worry about the amount of affordable living space. Especially in metropolitan areas a high demand for living space exists and has been leading to a shortage and, as a consequence, to increasing rents. To restrict the rent increase and to strengthen the tenant's position the German government passed the Tenancy Law Reform Act in 2001. However, the efficacy of this reform has not been examined on a national level so far. A further point of interest is the identification of a length of tenancy discount. The existing literature confirms such a discount where long-term tenants have to pay a lower real valued rent than short-term tenants. Our empirical analysis exploits data from the German Socio-Economic Panel (SOEP) that offers the unique advantage of a large and representative sample. We find that the Tenancy Law Reform Act in 2001 appears to have been successful in the restriction of exorbitant rents. Further, we identify a significant tenancy duration discount that is significantly larger in the upper part of the conditional rent distribution.

Keywords: rental apartment, rent index, quantile regression

JEL: C 21, C 23, R 30

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1 Introduction

Compared to other European countries the German housing market is dominated by rental apartments. In 2010 about 53% of German households were tenants¹. Policymakers and a large part of the population alike worry about the amount of affordable living space. Especially in metropolitan areas a high demand for living space exists and has been leading to a shortage and, as a consequence, to increasing rents. The German government passed the Tenancy Law Reform Act in 2001 to restrict the increase in rents and to strengthen the tenant's position in the rental market. The efficacy of this reform, however, has not been examined on a national level so far.

A further point of interest is the identification of a so called "length of tenancy discount". This term describes that deflated rental prices decrease with the length of a tenancy. The existing literature confirms such a discount where long-term tenants have to pay a lower rent than their counterparts with a shorter tenancy length². Various factors may contribute to this result. Hoffmann and Kurz (2002) justify this discount as an adjustment to compensate for the quality of an apartment that diminishes over time. Schlicht (1983) interprets the discount as a landlord's concession trying to keep good tenants, especially when the tenant's preferences change over time and the landlord wants to avoid turnover costs, e.g. forgone rents and search costs for a new tenant. Besides the interpretation of the discount Guasch and Marshall (1987) decompose it into a "sit discount" and a "length of residency discount". The former discount is offered by the landlord when the contract is renegotiated, the latter one for each additional year the tenant spent in the unit. Using the Annual Housing Survey (AHS) data from 1974 to 1977 they estimate multiple specifications and find a sit discount of 6% to 13% and an annual discount of 0.2% to 0.8%. Barker (2003) models a relationship between the level of turnover costs and the price discrimination between long-term and newly moved in tenants. He assumes that landlords of apartments with low turnover costs raise rents for existing tenancies while short-term tenants obtain a discount because of a higher demand inelasticity of long-term tenants ('these tenants like where they live and are unlikely to move because of a rent increase'³). Using data of 102 apartment complexes in US-American metropolitan areas he finds that discounts for short-term

¹Information from the Federal Statistical Office of Germany, destatis (accessed on 2013, April 25).

²See Barnett (1979), Follain and Malpezzi (1980), Goodman and Kawai (1985) and Noland (1980).

³See Barker (2003), p.10.

tenants are more common. Because rent payments have risen faster than turnover costs he hypothesize that discounts for newly moved in tenants will become more frequent.

A substantial part of the existing literature identifies effects of apartment and house characteristics only on the conditional mean of rent. Quantile regression, however, allows to obtain a more complete picture about the dependence of the conditional distribution of the dependent variable on the covariates and possible heterogeneous effects can be detected. More precisely, quantile regression makes it possible to uncover the influence of a certain characteristic on a dependent variable y at any points of the conditional distribution (and therefore the impact of a explanatory variable on the shape of the distribution) and varying effects can be observed. A small but rising number of studies use quantile regression to capture the varying pricing of housing characteristics depending on the level of rent payments or house prices, respectively. Zietz, Zietz and Sirmans (2007) use multiple listing service (MLS) data with 1,366 home sales from mid-1999 to mid-2000 in Orem/Provo, Utah. They find considerable variations of the estimated coefficients across quantiles. For instance, the effects of an additional square footage on house price at the 10th and at the 90th percentile differ significantly by more than 50%. Further, they find significant spatial correlation that is dominated by the quantile effect and contributes only modestly to the result. Liao and Wang (2012) use manually collected data of 46,356 housing transactions from August 2008 to September 2009 in Changsha, China. They show that besides observable characteristics spatial autocorrelation varies by quantiles, too. Their results exhibit a U-shape pattern of the spatial dependence, meaning that in the upper and lower part of the conditional house price distribution significant positive spatial dependence exists. Uematsu, Khanal and Mishra (2013) try to interpret various effects at various quantiles economically. Using data on farmland values in the USA they find that natural amenities like temperature and hours of sunlight play an important role in the determination of farmland prices where they interpret stronger effects at upper quantiles as a signal for a “luxury” characteristic and stronger effects at lower quantiles as a signal for a “necessary” attribute. In sum, quantile regression becomes more and more an essential technique. In this paper we concentrate on the effects of apartment characteristics at the 16th and 83rd percentile of the conditional rent distribution to identify the effects at the margins of a two-third span as it is customary for a German rent index.

Our empirical analysis exploits data from the German Socio-Economic Panel (SOEP) that offers the unique advantage of a large and representative sample. The

panel structure of the SOEP allows us to identify the length of a tenancy as well as to control for tenancy specific effects. We focus on West German households who live in rental apartments between 1984 and 2011. This paper is organized as follows. In the next two sections we describe our survey data and the methodology. In the fourth section we present descriptive statistics, the estimation results as well as the result of two robustness checks. Concluding remarks are presented in the final section.

Our main findings are as follows. Households in the lower tertile of the unconditional rent distribution have a significantly longer length of tenancy than households in the upper tertile, 13 years vs. 8.34 years. In addition, higher priced apartments tend to be better equipped and rather be located in metropolitan areas and in the neighborhood of various amenities. Lower priced apartments, in contrast, tend to be located in older apartment buildings and rather hired out by non-private landlords like local governments or co-ops. Controlling for other factors we find a significant and negative effect of the Tenancy Law Reform Act on rent payment that is stronger (however not significantly) for higher priced apartments. Thus, the reform has been (at least partially) successful in the regulation of exorbitant rents. Also possible is to interpret the results as a failure because ‘rich’ tenants living in higher priced apartments benefits more from the reform than ‘needy’ tenants in lower priced apartments. Further, we identify a length of tenancy discount. The largest discounts can be found in the first years of a tenancy which are significantly larger for apartments in the upper part of the conditional rent distribution. The annual discount diminishes after some years and its difference between apartments at the 16th and 83rd percentile becomes insignificant. However, the cumulated discount is significant and larger for households living in higher priced apartments from the first year onwards.

2 Data and Analysis Sample

Our empirical analysis uses data from the German Socio-Economic Panel Study (SOEP), a representative annual household panel survey covering more than 11,000 households in Germany⁴. It comprises detailed information on the size and the equipment of rental apartments, the household composition as well as the year of construction, the type of the building and various geographical information like

⁴We use the data distribution 1984-2011, <http://dx.doi.org/10.5684/soep.v28>. See Wagner et al. (2007) and Wagner et al. (2008) for further information.

the distance to amenities and the populations size of the city where the apartment building is located. The longitudinal nature of the SOEP gives us the possibility to control for the length of a tenancy, for unobservable tenancy specific effects as well as to detect the effect of the Tenancy Law Reform Act in 2001 on rent payments. We concentrate on private households that living in a rental unit. We exclude East-German households because of the lack of information before the German reunification and because of the rent regulation of East-German rental units in the first half of the 1990's. In addition, we exclude tenancies with a reported apartment size of more than 250 m² and less than 20 m² as well as observations with a reported rent-payment of less than nominal €50. The final data set consists of 93,157 observations with 13,694 households living in 21,401 different tenancies (about 1.56 tenancies per household).

Our main interest is the identification of a length of tenancy discount as well as the effect of the Tenancy Law Reform Act that has been in force since September, 1st 2001. The reform affects all tenancies that started on this date or later. The termination period for tenants was reduced to three months, previously it depended on the tenancy length with three months as minimum. Further, the rent increase was limited. Under the new regime landlords are allowed to increase rents only by 20% within three years⁵ (previously 30% within three years). In our analysis we define a dummy variable equals one if a tenancy started on September, 1st 2001 or later to identify the effect of the reform. In addition, our model captures tenancy length nonlinearly by using linear splines. We position the knots equally at the 3rd, 34th, 66th and 97th quantile of the unconditional tenancy length distribution. Because the 3rd quantile is equal to the minimum, namely zero, we use only the other three knots to control for the nonlinear effect of tenancy length on rent payment.

3 Strategy

3.1 Hedonic model

We apply a standard hedonic price model:

$$\ln(\text{rent})_{it} = f(X_{it})$$

⁵Exceptions are rent increases due to modernization and increasing running costs, see §558(3), §559 and §560 BGB - German Civil Code.

where $\ln(\text{rent})_{it}$ is the natural logarithm of the deflated rent for tenancy i at tenancy length t and X_{it} is a matrix of various apartment characteristics. The motivation of a hedonic price model is to decompose the full price of a product into prices of its characteristics. Thus, one doesn't pay the price of a product but the sum of prices of each characteristic of a product. Waugh(1929) and Court (1939) were the first ones who applied these technique, where Court was the first who labeled these implicit prices as hedonic prices. Griliches (1961 and 1971) and Rosen (1974) introduced the hedonic price model to a wider audience of economists. With an econometrician model we are able to estimate these implicit or hedonic prices by using the deflated rent as dependent and apartment characteristics as independent variables. The estimated coefficient of the corresponding characteristic denotes its hedonic price. Court (1941) note that hedonic prices can be interpret as a consumer's marginal willingness to pay if the consumer is able to choose between a sufficient number of units with various combinations of attributes ⁶. A challenge in the estimation of hedonic prices is the possible segmentation of the rental apartment sector. Zietz, Zietz and Sirmans (2007) elaborate this pitfall. Due to a heterogeneous supply and demand each housing market segment can be identified by an own supply and demand curve that leads to segment-specific prices. Thus, quantile regression is a more suitable regression method than ordinary least squares because of taking the this heterogeneity into account.

3.2 Quantile regression

While ordinary least squares regression minimizes the sum of squared residuals quantile regression bases on the minimization of the sum of weighted absolute residuals. The objective function is

$$\min_{\{\beta(\tau)\}} \sum_{t=1}^T \sum_{i=1}^N \rho_{\tau} |Y_{it} - X'_{it}\beta(\tau)|$$

The weighting function ρ_{τ} is defined as

$$\rho_{\tau} = \tau \cdot I(Y_{it} > X'_{it}\beta(\tau)) + (1 - \tau) \cdot I(Y_{it} < X'_{it}\beta(\tau))$$

where Y_{it} is a vector of the dependent variable, X_{it} is a matrix of independent variables, $\beta(\tau)$ is a vector of corresponding regression coefficients depending on

⁶While properties and apartments are seldom identical and therefore a selection of units with varying attributes is possible, search and mobility restrictions, however, may reduce the actual choice.

regression quantile τ , N is the number of tenancies, T is the length of a tenancy and $I(.)$ is an indicator function equals one if the condition within the parentheses is fulfilled. Hence, in quantile regression positive residuals are weighted by the quantile of interest while negative residuals are weighted by the complementary quantile.

A main advantage of quantile regression, see Koenker and Basset (1978) as well as Koenker and Hallock (2001), is that we can draw a more detailed picture of how independent variables affect the dependent variable not only on its conditional mean but at different positions on its entire conditional distribution. As a result varying effects of an explanatory variable on a dependent variable depending on the conditional quantile of interests can be detected. Another point is that outliers (which by definition are positioned at the margin of a distribution) lose their dangerousness for our estimation because we run quantile-specific estimations.

In our analysis we obtain standard errors and confidence bands for our estimated coefficients through bootstrapping based on 250 resamples. We resample tenancies to account for serial correlation within a tenancy.

4 Empirical Results

4.1 Descriptive Statistics

Table 1 shows the mean and standard deviation (in parenthesis) of variables we use in the estimation. The column labeled ‘Full sample’ reports the descriptive statistics for the full sample, columns labeled ‘1st Tertile’ and ‘3rd Tertile’ show the values for observations in the first and third tertile of the unconditional rent distribution, respectively. The last column ‘Difference’ reports the mean difference and its significance of the before mentioned tertiles.

— Insert table 1 here. —

As expected, the mean rent in the first tertile is significantly lower than in the third tertile sample (€236.54 against €616.99). The same pattern holds for apartment size (58.27 m² against 88.46 m²). Households living in lower priced apartments exhibit a significantly longer tenancy length than households living in higher priced units (12.99 years against 8.34 years). Figure 1 shows the average and median length of tenancy for each year. Until 1994 the mean for the total sample is relatively constant and amounts to eleven years. From 1995 to 2004 it declines to roughly ten

years and rises thereafter to its earlier level. The median tenancy length per year shows a similar pattern. Until 1994 the it is constant and amounts to seven years. After 1994 it declines to its minimum value of five years between 1999 and 2006. Afterwards it increases to six years and remains stable until the end of our sample.

— Insert figure 1 here. —

We find further significant differences in characteristics of apartment buildings where the rental units are located.

Lower priced apartments tend to be located in older buildings built before 1971. Buildings with higher priced units are rather 1-2 family houses (detached and row houses, respectively) as well as apartment buildings with nine and more units (including high rises). In addition, more expensive apartments are on average better equipped. The proportion of units with a central heating (78.9% versus 97.1%), a balcony or terrace (49.8% vs. 83.8%) or with a garden (30.3% vs. 37.2%) is significantly larger for apartments in the third tertile.

Besides physical characteristics location plays an important role for the determination of rent payments, too. Higher priced apartments are rather located in cities with more than 500,000 inhabitants than their lower priced counterparts. Further, they are rather located in new residential and mixed areas⁷. In addition, higher priced apartments tend to be located closer to various amenities like parks (50.5% versus 58.3%), sports complex (34.4% versus 39.4%) or public transport (83.7% versus 88.1%) in comparison to rental units in the first tertile.

A further category consists of intangible attributes. The share of observations of apartments rented out by a private landlord⁸ is significantly larger for higher priced units (38.7% versus 47.5%). In line with this finding is the significantly larger proportion of observations living in subsidized housing in the first tertile of the unconditional rent distribution (21% versus 8.2%). Moreover, in the third tertile we find a significantly higher share of observations living in tenancies started on September, 1st 2001 or later (11.2% versus 20.5%). Overall 16% of our observations lives in such tenancies. Figure 2 shows the share of these household per year. The

⁷Mixed areas are areas with residential and commercial buildings.

⁸Alternatives are local governments or co-ops as landlords as well as company housing. They offer rental apartments to satisfy the demand for affordable units and are less strived for pecuniary returns while private landlords offer apartments as an alternative investment with rent payment as their return.

fraction increases over the last years; however, in 2011 about 40% of the households in our sample still lives in tenancies where the old legal situation is valid.

— Insert figure 2 here. —

In sum, higher priced apartments are rather located in newly constructed buildings, in metropolitan areas and exhibit a smaller distance to various amenities. They are better equipped and tend to be rented out by a private landlord. Households in higher priced apartments stay a shorter time in a tenancy than households living in lower priced units.

4.2 Estimation results

Table 2 reports the results of our estimation for tenancy length as well as for the Tenancy Law Reform Act for the 16th, 50th and 83rd percentile of the conditional rent distribution. The second last column shows the difference (and its significance) of the estimated effects between the lower and the upper quantile. The last column reports OLS estimates.

— Insert table 2 here. —

We identify a negative and high significant reduction in rent payment due to the reform that amounts to 3.3% at the 16th percentile, 5.3% at the 83rd percentile and 5% at the conditional mean. Thus, the reform has its desired impact and seems to be successful in regulating rent increases. The difference between the higher and lower quantile amounts to roughly 1.9%-points and is insignificant.

The panel ‘Length of tenancy’ reports the estimated effects of an additional year a tenancy lasts. Using linear splines we identify varying effects depending on the duration. The knots are equally located at the 34th (corresponds to three years), 66th (eleven years) and 97th (41 years) percentile of the unconditional tenancy length distribution.

For the first 41 years of a tenancy we identify a significant but declining annual discount that is stronger at larger quantiles. In the first three years, an additional year decreases rent payments significantly by 0.7% at the 16th percentile and by 2.1% at the 83rd percentile. We find a considerable difference in both estimated annual discounts. Thus, in the first three years of a tenancy households living in higher

priced apartments benefit significantly more from the duration discount than their counterparts living in lower priced apartments. From the fourth year to the 11th year the effect of an additional year is equalized across both quantiles and amounts to roughly 1%. Afterwards the annual discount shrinks to 0.2% and 0.4% at both quantiles until the 41st year. From the 42nd onwards the discount changes the sign and becomes insignificant at each conditional quantile of interest as well as at the conditional mean. By now, we have estimated the effect of an additional year of tenancy on rent payment. Now, we examine the cumulated discount at the 16th and 83rd percentile and check whether the difference in the sum of the estimated discounts between both quantiles is significant or not. Figure 3 illustrates the result. It shows the cumulated discount estimated at both conditional quantiles as well as for the conditional mean. In the 11th year of a tenancy we find a cumulated discount of 9.7% at the 16th percentile and of 13.4% at the 83rd percentile. The difference of 3.7%-points is highly significant. Thus, households living in higher priced apartments benefit more, not only in relative but also in absolute terms because the same percentage change leads to a higher absolute change in rent payment at the upper quantile and the ‘surplus’ for these households is significantly larger than for households in lower priced rental units at any moment.

— Insert figure 3 here. —

In addition to the tenancy length and the 2001 reform other rental unit characteristics determine rent payments significantly, too. Table 3 shows the estimated effects. As expected, size has a positive and significant effect on rent. The elasticity ranges from 0.746% at the 16th percentile to 0.785 at the 83rd percentile⁹. Year of construction and city size have the expected signs and patterns for each quantile. Rental units in newer apartment buildings are more expensive than their counterparts in earlier built buildings. The number of inhabitants of a city has a significant positive effect on rent payment. Rental units in metropolitan areas are costlier than in small towns with a lower population. In addition, high rises are the most expensive building types. Under ceteris paribus the premium amounts to 16.8% at the lower quantile and 11.9% at the upper quantile. Further, the type of landlord plays an important role for the determination of rent payments. Having a private landlord instead of a non-private landlord, like local governments or co-ops, increases the rent payment significantly by 4.5% at the 16th percentile and by 6.4% at the 83rd percentile.

⁹These results are APE’s because we included interactions between size and the existence of a balcony/terrace as well as an interaction of size with the existence of a basement. Both equipments increase the elasticity significantly.

— Insert table 3 here. —

4.3 Robustness of Effects to Alternative Modeling Strategies

In a first sensitivity analysis, we examine the robustness of our estimates by including further control variables. We add control variables for performed renovations¹⁰ and dummy variables for various household compositions. Table 4, figure 4 and figure 5 show that the estimates of the length of tenancy discount and its cumulation as well as the reform effect hardly change. These findings demonstrate that the before mentioned variables are not driven by unaccounted differences in renovation and household composition.

— Insert table 4 here. —

— Insert figure 4 here. —

— Insert figure 5 here. —

As a second sensitivity analysis we include tenancy fixed effects to account for unobservable tenancy specific characteristics that may play an important role in the determination of rent payments. We exclude 6,591 tenancies (roughly 7.1% of our total sample) with only one observation and estimate the baseline model with this restricted sample once again. Then we calculate for each tenancy mean residuals and subtract these ones from the corresponding actual rent payment¹¹. Then we repeat the estimations with this modified rent payment as a new dependent variable. Table 5, figure 6 and figure 7 show the results. The estimated discounts of the restricted sample are quiet similar to those of the total sample. After controlling for tenancy fixed effects the coefficients are still similar to the ones of the unrestricted sample except for the annual discount between year four and eleven at the 83rd percentile. It amounts to 0.6% (in comparison to 0.9% in the unrestricted sample and 0.8%

¹⁰In a first step we identify renovations that were performed within the last year. Then we count the number of renovations within a tenancy and for each number of renovation (1st, 2nd, ...) we define 2 variables, first a dummy variable equals one in the year (and in the subsequent years) when the renovation was performed within the last year and second an interaction between this dummy and a continuous variable that declines linearly with years after the renovation was performed. The first type of variable captures the total effect of a renovation while the second type of variable covers the declining effect of a renovation on rent payment the longer it already date back.

¹¹For each quantile we do this calculation separately. Thus, we obtain quantile specific mean residuals for each tenancy for our quantile regressions

in the restricted sample) and leads to a significant difference in the estimated discounts between the lower and upper quantile. The cumulated discount after eleven years in a tenancy amounts to 10.86% at the 16th percentile and is quite similar to the estimates of the other models. At the 83rd percentile, however, the cumulated discount after eleven years amounts to 9.77% and is considerably smaller than in the alternative models. Thus, unobservable tenancy specific attributes lead to an adjustment of cumulated discounts at the lower and upper quantile after four years. However, the significant difference in the discount in the first three remains, even after controlling for unobserved heterogeneity.

— Insert table 5 here. —

— Insert figure 6 here. —

— Insert figure 7 here. —

5 Conclusion

This paper observes how physical, locational and intangible characteristics of a rental apartment affect its rent. We focus on the effect of the length of a tenancy on rent payment to identify annual discounts. Further, we evaluate the efficacy of the Tenancy Law Reform Act in 2001 in reducing rents. Our empirical analysis exploits data from the German Socio-Economic Panel (SOEP) that offers the unique advantage of a large and representative sample. Its panel structure allows us to control for the length of a tenancy and for not observable tenancy specific characteristics that may influence rent payments.

In order to estimate the *ceteris paribus* effects we apply quantile regressions. Our approach allows us to find quantile specific effects of apartments' characteristics. The regression model yields a consistent and efficient estimation if the conditional expectation of rent is correctly specified. It can easily be modified to assess the robustness of results to alternative modeling strategies.

Our main findings are as follows. As expected higher priced apartments are significantly larger and tend to be located in newly constructed apartment buildings. They are rather in metropolitan areas, are better equipped and are closer to various amenities like parks, sport facilities and public transport. Further, households of

lower priced units show a significantly larger tenancy length. We identify a significant annual discount. In the first three years this discount is significantly larger at the upper quantile, even after using alternative modeling strategies and controlling for unobserved heterogeneity. The annual discount diminishes from the fourth year onwards but remains significant. The cumulated discount after eleven years amounts to 9.7% at the 16th percentile and 13.4% at the 83rd percentile in the baseline model. Thus, households living in higher priced apartments benefit more from the length of tenancy discount, in relative and absolute terms. The Tenancy Law Reform Act benefits tenants. It reduces the rent-payment significantly where the effect is larger (but not significantly) at the upper quantile. Overall, our results suggest that a tenancy length discount exists with the largest amount in the first three years. Further, the reform of the German tenancy law in 2001 has been effective in the restriction of rent increases. The stronger effects at the upper quantile can be interpreted as a (at least partially) successful reduction of exorbitant rents.

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Tables

Table 1: Descriptive Statistics

	Full sample	1 st Tertile	3 rd Tertile	Difference
Rent (deflated to 2005 €)	408.919 (195.404)	236.537 (52.544)	616.985 (189.963)	380.448***
Apartment size (in m ²)	72.136 (25.268)	58.270 (20.484)	88.456 (25.456)	30.186***
Length of tenancy (in years)	10.922 (11.973)	12.991 (13.412)	8.340 (9.684)	-4.651***
Year of construction				
Before 1918	0.110 (0.313)	0.142 (0.349)	0.091 (0.288)	-0.051***
1918 to 1948	0.168 (0.374)	0.221 (0.415)	0.116 (0.320)	-0.106***
1949 to 1971	0.436 (0.496)	0.487 (0.500)	0.345 (0.475)	-0.142***
1972 to 1980	0.168 (0.374)	0.106 (0.308)	0.231 (0.422)	0.125***
1981 to 1990	0.055 (0.227)	0.026 (0.158)	0.093 (0.291)	0.068***
As of 1991	0.064 (0.245)	0.018 (0.134)	0.124 (0.330)	0.106***
City size by population (in 1,000 inhabitants)				
>= 500 (central location)	0.417 (0.493)	0.381 (0.486)	0.459 (0.498)	0.078***
>= 500 (suburb)	0.095 (0.293)	0.076 (0.265)	0.122 (0.327)	0.046***
100 to 500 (central location)	0.150 (0.357)	0.168 (0.374)	0.129 (0.335)	-0.039***
100 to 500 (suburb)	0.064 (0.244)	0.062 (0.241)	0.062 (0.241)	0.000
50 to 100 (central location)	0.029 (0.168)	0.036 (0.186)	0.020 (0.140)	-0.016***
50 to 100 (suburb)	0.024 (0.154)	0.024 (0.153)	0.021 (0.143)	-0.003**
20 to 50	0.074 (0.262)	0.078 (0.268)	0.067 (0.249)	-0.011***
5 to 20	0.093 (0.290)	0.106 (0.308)	0.073 (0.260)	-0.033***
< 5	0.054 (0.227)	0.069 (0.254)	0.048 (0.213)	-0.021***

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Table 1: Descriptive Statistics <continued>

	Full sample	1 st Tertile	3 rd Tertile	Difference
Type of house				
1-2 family detached house	0.131 (0.337)	0.135 (0.342)	0.139 (0.346)	0.004
1-2 Family row house	0.081 (0.273)	0.077 (0.266)	0.106 (0.308)	0.030***
Apt. in 3-4 unit bldg.	0.180 (0.384)	0.177 (0.381)	0.176 (0.381)	0.000
Apt. in 5-8 unit bldg.	0.363 (0.481)	0.373 (0.484)	0.326 (0.469)	-0.048***
Apt. in 9+ unit bldg.	0.211 (0.408)	0.204 (0.403)	0.219 (0.414)	0.015***
High-rise apt. bldg.	0.020 (0.141)	0.017 (0.128)	0.024 (0.153)	0.007***
Other bldg.	0.013 (0.115)	0.017 (0.130)	0.010 (0.098)	-0.008***
Residential area				
Old residential area	0.287 (0.453)	0.337 (0.473)	0.235 (0.424)	-0.101***
New residential area	0.372 (0.483)	0.323 (0.467)	0.425 (0.494)	0.102***
Mixed area	0.313 (0.464)	0.315 (0.465)	0.308 (0.462)	-0.007**
Other areas	0.021 (0.144)	0.022 (0.145)	0.025 (0.155)	0.003**
Federal state				
Schleswig-Holstein	0.038 (0.191)	0.034 (0.182)	0.039 (0.193)	0.005***
Hamburg	0.042 (0.201)	0.038 (0.190)	0.045 (0.206)	0.007***
Lower Saxony, Bremen	0.120 (0.324)	0.126 (0.332)	0.102 (0.303)	-0.024***
North-Rhine Westphalia	0.295 (0.456)	0.295 (0.456)	0.275 (0.446)	-0.020***
Hesse	0.089 (0.284)	0.078 (0.269)	0.099 (0.299)	0.021***
Rhineland-Palatinate, Saarland	0.058 (0.234)	0.065 (0.246)	0.049 (0.216)	-0.016***
Baden-Wuerttemberg	0.133 (0.340)	0.118 (0.323)	0.151 (0.358)	0.033***
Bavaria	0.163	0.172	0.184	0.012***

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Table 1: Descriptive Statistics <continued>

	Full sample	1 st Tertile	3 rd Tertile	Difference
Berlin	(0.370)	(0.377)	(0.387)	
	0.061	0.073	0.056	−0.017***
	(0.240)	(0.260)	(0.230)	
Equipment				
Central heating	0.899	0.789	0.971	0.181***
	(0.302)	(0.408)	(0.169)	
Balcony or terrace	0.678	0.498	0.838	0.339***
	(0.467)	(0.500)	(0.369)	
Basement	0.934	0.904	0.961	0.058***
	(0.248)	(0.295)	(0.193)	
Garden	0.323	0.303	0.372	0.068***
	(0.468)	(0.460)	(0.483)	
Household composition				
One-person household	0.458	0.634	0.277	−0.358***
	(0.498)	(0.482)	(0.447)	
Married couple w/o children	0.239	0.183	0.287	0.104***
	(0.426)	(0.387)	(0.453)	
Single parent	0.073	0.052	0.087	0.034***
	(0.260)	(0.223)	(0.281)	
Married couple with children	0.218	0.120	0.334	0.213***
	(0.413)	(0.325)	(0.472)	
Other combinations	0.012	0.010	0.016	0.006***
	(0.110)	(0.100)	(0.124)	
Amenities reachable within 10 min on foot				
Stores	0.643	0.635	0.658	0.023***
	(0.479)	(0.481)	(0.474)	
Park	0.537	0.505	0.583	0.078***
	(0.499)	(0.500)	(0.493)	
Sport complex	0.362	0.344	0.394	0.051***
	(0.481)	(0.475)	(0.489)	
Public transport	0.860	0.837	0.881	0.044***
	(0.347)	(0.369)	(0.324)	
Intangible characteristics				
Private landlord	0.422	0.387	0.475	0.087***
	(0.494)	(0.487)	(0.499)	
Subsidized housing	0.147	0.210	0.082	−0.128***
	(0.354)	(0.407)	(0.275)	
Tenancy as of Sept. 1, 2001	0.160	0.112	0.205	0.093***
	(0.367)	(0.315)	(0.404)	

Source: SOEP V28 and authors' calculations. Note: Calculations use the SOEP sample weights. Standard deviations in parentheses. The columns labeled 'Full sample', '1st Tertile' and '3rd Tertile' report mean and standard deviation of the full sample, the first and the third tertile of the full sample, respectively. The column labeled 'Difference' reports the mean difference and its significance between the first and third tertile. For categorical variables the reference category is bold printed.

Table 2: Effects of tenancy length and Tenancy Law Reform Act

	16 th	50 th	83 rd	83 rd - 16 th	OLS
Length of tenancy					
0 - 3 years	-0.007* (0.004)	-0.016*** (0.002)	-0.021*** (0.003)	-0.014*** (0.004)	-0.015*** (0.002)
4 - 11 years	-0.010*** (0.001)	-0.009*** (0.001)	-0.009*** (0.001)	0.001 (0.002)	-0.010*** (0.001)
12 - 41 years	-0.002*** (0.001)	-0.003*** (0.001)	-0.004*** (0.001)	-0.001 (0.001)	-0.003*** (0.000)
42 and more years	0.002 (0.002)	0.001 (0.002)	0.000 (0.002)	-0.002 (0.002)	0.001 (0.002)
Tenancy Law Reform Act					
Tenancy as of Sept. 1, 2001	-0.033** (0.013)	-0.039*** (0.010)	-0.053*** (0.013)	-0.019 (0.015)	-0.053*** (0.010)

Source: SOEP V28 and authors' calculations. Note: Calculations use the SOEP sample weights. Standard errors are in parentheses and bootstrapped with 250 replications, clustered at tenancy level. *,** and *** denote significance at the 10%-, 5%- and 1%-level, respectively. Each regression include a set of annual dummies as further control variables.

Table 3: Effects of further characteristics

	16 th	50 th	83 rd	83 rd - 16 th	OLS
Size					
Ln size (APE)	0.746*** (0.013)	0.779*** (0.010)	0.785*** (0.012)	0.039** (0.016)	0.750*** (0.009)
Year of construction					
Ref.cat.: Before 1918					
1918 to 1948	0.073*** (0.018)	0.038*** (0.012)	0.018 (0.014)	-0.055*** (0.020)	0.043*** (0.011)
1949 to 1971	0.125*** (0.018)	0.082*** (0.011)	0.057*** (0.013)	-0.068*** (0.019)	0.087*** (0.011)
1972 to 1980	0.221*** (0.020)	0.162*** (0.014)	0.154*** (0.017)	-0.067*** (0.022)	0.171*** (0.014)
1981 to 1990	0.247*** (0.023)	0.207*** (0.016)	0.189*** (0.022)	-0.058** (0.029)	0.215*** (0.015)
As of 1991	0.281*** (0.022)	0.228*** (0.014)	0.199*** (0.016)	-0.082*** (0.024)	0.241*** (0.012)
Missing dummy	0.204*** (0.038)	0.143*** (0.022)	0.094*** (0.023)	-0.110*** (0.038)	0.147*** (0.023)
City size by population (in 1,000 inhabitants)					
Ref.cat.: < 5k					
GE 500 (central location)	0.267*** (0.023)	0.282*** (0.019)	0.285*** (0.018)	0.018 (0.026)	0.279*** (0.016)
GE 500 (suburb)	0.223*** (0.024)	0.230*** (0.020)	0.217*** (0.020)	-0.006 (0.027)	0.217*** (0.017)
100 to 500 (central location)	0.172*** (0.024)	0.155*** (0.019)	0.131*** (0.018)	-0.041 (0.026)	0.144*** (0.016)
100 to 500 (suburb)	0.113*** (0.027)	0.079*** (0.020)	0.061*** (0.021)	-0.052* (0.029)	0.074*** (0.018)
50 to 100 (central location)	0.109*** (0.030)	0.116*** (0.024)	0.109*** (0.025)	0.000 (0.035)	0.090*** (0.021)
50 to 100 (suburb)	0.081** (0.033)	0.105*** (0.024)	0.059*** (0.022)	-0.022 (0.034)	0.085*** (0.021)
20 to 50	0.104*** (0.024)	0.085*** (0.020)	0.056*** (0.019)	-0.048* (0.027)	0.077*** (0.016)
5 to 20	0.050* (0.026)	0.040** (0.020)	0.021 (0.019)	-0.029 (0.027)	0.028 (0.017)
Missing dummy	0.315 (0.449)	0.340*** (0.089)	0.177 (0.120)	-0.138 (0.436)	0.230 (0.154)
Type of house					
Ref.cat.: 1-2 family detached house					

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Table 3: Effects of further characteristics <continued>

	16 th	50 th	83 rd	83 rd - 16 th	OLS
1-2 Family row house	0.045* (0.026)	0.073*** (0.016)	0.066*** (0.016)	0.021 (0.028)	0.068*** (0.015)
Apt. in 3-4 unit bldg.	0.119*** (0.019)	0.068*** (0.012)	0.041*** (0.012)	-0.078*** (0.019)	0.085*** (0.012)
Apt. in 5-8 unit bldg.	0.152*** (0.020)	0.089*** (0.013)	0.056*** (0.012)	-0.096*** (0.019)	0.108*** (0.013)
Apt. in 9+ unit bldg.	0.144*** (0.021)	0.110*** (0.014)	0.082*** (0.015)	-0.062*** (0.021)	0.126*** (0.014)
High-rise apt. bldg.	0.168*** (0.029)	0.136*** (0.022)	0.119*** (0.029)	-0.050 (0.034)	0.150*** (0.022)
Other bldg.	-0.101 (0.067)	0.005 (0.040)	0.028 (0.033)	0.129** (0.065)	-0.011 (0.036)
Missing dummy	0.018 (0.066)	0.042 (0.042)	0.093** (0.038)	0.075 (0.066)	0.046 (0.036)
Residential area					
Ref.cat.: Old residential area					
New residential area	0.019 (0.012)	0.027*** (0.009)	0.021** (0.009)	0.002 (0.013)	0.020** (0.009)
Mixed area	0.005 (0.011)	0.019** (0.008)	0.018* (0.009)	0.012 (0.012)	0.012 (0.008)
Other areas	-0.009 (0.029)	0.040 (0.029)	0.060** (0.025)	0.069** (0.034)	0.031 (0.024)
Missing dummy	-0.033 (0.050)	0.003 (0.025)	-0.034 (0.026)	-0.001 (0.053)	-0.015 (0.023)
Federal state					
Schleswig-Holstein	0.172*** (0.022)	0.185*** (0.018)	0.172*** (0.023)	0.000 (0.027)	0.203*** (0.018)
Hamburg	0.165*** (0.022)	0.173*** (0.020)	0.142*** (0.022)	-0.023 (0.025)	0.175*** (0.019)
Lower Saxony, Bremen	0.074*** (0.018)	0.090*** (0.013)	0.059*** (0.017)	-0.016 (0.023)	0.086*** (0.014)
North-Rhine Westphalia	0.052*** (0.015)	0.075*** (0.012)	0.051*** (0.016)	-0.001 (0.019)	0.073*** (0.013)
Hesse	0.093*** (0.020)	0.148*** (0.016)	0.153*** (0.019)	0.060*** (0.023)	0.146*** (0.016)
Rhineland-Palatinate, Saarland	0.057*** (0.021)	0.074*** (0.017)	0.080*** (0.019)	0.023 (0.023)	0.086*** (0.018)
Baden-Wuerttemberg	0.097*** (0.020)	0.131*** (0.014)	0.134*** (0.018)	0.037 (0.023)	0.135*** (0.015)
Bavaria	0.069***	0.140***	0.213***	0.144***	0.156***

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Table 3: Effects of further characteristics <continued>

	16 th	50 th	83 rd	83 rd - 16 th	OLS
	(0.019)	(0.017)	(0.020)	(0.023)	(0.016)
Equipment					
Central heating	0.202*** (0.014)	0.204*** (0.012)	0.157*** (0.013)	-0.045*** (0.017)	0.188*** (0.010)
Central heating, missing	0.065 (0.065)	0.153*** (0.044)	0.072 (0.084)	0.007 (0.103)	0.113** (0.044)
Balcony or terrace (APE)	0.092*** (0.011)	0.071*** (0.008)	0.062*** (0.008)	-0.030** (0.013)	0.080*** (0.007)
Balcony or terrace, missing	0.092** (0.044)	0.000 (0.032)	-0.006 (0.033)	-0.098** (0.044)	0.031 (0.030)
Basement (APE)	0.078*** (0.022)	0.029** (0.013)	0.017 (0.012)	-0.061*** (0.023)	0.048*** (0.012)
Basement, missing	0.086 (0.061)	0.110** (0.050)	0.135 (0.089)	0.050 (0.099)	0.120** (0.048)
Garden	-0.059*** (0.010)	-0.023*** (0.006)	-0.004 (0.008)	0.055*** (0.011)	-0.030*** (0.007)
Garden, missing	-0.087* (0.052)	-0.045 (0.032)	-0.005 (0.028)	0.083 (0.051)	-0.050 (0.033)
Intangible characteristics					
Private landlord	0.045*** (0.011)	0.065*** (0.008)	0.064*** (0.010)	0.019 (0.012)	0.058*** (0.008)
Private landlord, missing	0.034** (0.017)	0.029*** (0.011)	0.041*** (0.016)	0.007 (0.020)	0.036*** (0.011)
Subsidized housing	-0.066*** (0.009)	-0.093*** (0.008)	-0.112*** (0.009)	-0.046*** (0.011)	-0.092*** (0.008)
Subsidized housing, missing	-0.075* (0.042)	-0.009 (0.023)	0.022 (0.026)	0.097** (0.045)	-0.018 (0.024)
Constant					
const	2.607*** (0.188)	2.697*** (0.110)	3.118*** (0.123)	0.512*** (0.188)	2.893*** (0.114)

Source: SOEP V28 and authors' calculations. Note: Calculations use the SOEP sample weights. Standard errors are in parentheses and bootstrapped with 250 replications, clustered at tenancy level. *, ** and *** denote significance at the 10%-, 5%- and 1%-level, respectively. Each regression include a set of annual dummies as further control variables.

Table 4: Sensitivity check 1 - Further covariates

	Model 1		Model 2		Model 3	
	16 th	83 rd	Difference	16 th	83 rd	Difference
Length of tenancy						
0 - 3 years	-0.007* (0.004)	-0.021*** (0.003)	-0.014*** (0.004)	-0.007** (0.004)	-0.022*** (0.003)	-0.015*** (0.004)
4 - 11 years	-0.010*** (0.001)	-0.009*** (0.001)	0.001 (0.002)	-0.009*** (0.001)	-0.008*** (0.001)	0.001 (0.002)
12 - 41 years	-0.002*** (0.001)	-0.004*** (0.001)	-0.001 (0.001)	-0.002*** (0.001)	-0.004*** (0.001)	-0.002*** (0.001)
41 and more years	0.002 (0.002)	0.000 (0.002)	-0.002 (0.002)	0.001 (0.002)	0.001 (0.002)	-0.001 (0.002)
Tenancy Law Reform Act						
Tenancy as of Sept. 2001	1, -0.033** (0.013)	-0.053*** (0.013)	-0.019 (0.015)	-0.031** (0.013)	-0.053*** (0.013)	-0.022 (0.015)
Renovation		No		Yes		Yes
HH composition		No		No		Yes

Source: SOEP V28 and authors' calculations. Note: Calculations use the SOEP sample weights. Standard errors are in parentheses and bootstrapped with 250 replications, clustered at tenancy level. *, ** and *** denote significance at the 10%, 5% and 1%-level, respectively. In model 2 we include variables for renovation. In model 3 we include dummies for different household compositions.

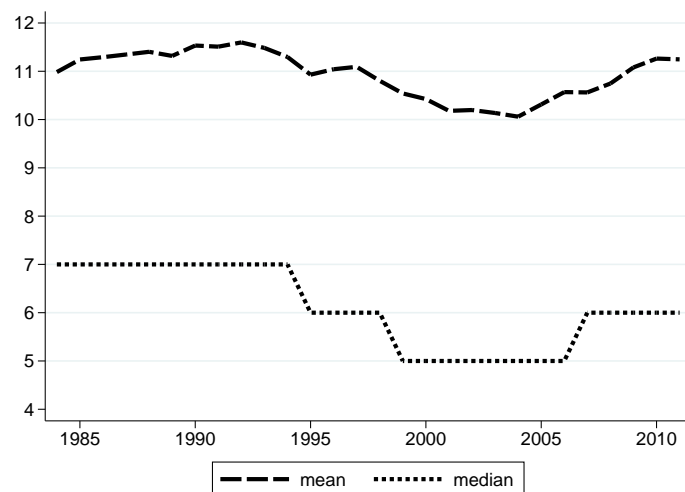
Table 5: Sensitivity check 2 - Fixed effects

	Model 1			Model 2			Model 3		
	16 th	83 rd	Difference	16 th	83 rd	Difference	16 th	83 rd	Difference
Length of tenancy									
0 - 3 years	-0.007* (0.004)	-0.021*** (0.003)	-0.014*** (0.004)	-0.010*** (0.004)	-0.021*** (0.003)	-0.011** (0.004)	-0.009*** (0.002)	-0.017*** (0.002)	-0.008*** (0.002)
4 - 11 years	-0.010*** (0.001)	-0.009*** (0.001)	0.001 (0.002)	-0.009*** (0.001)	-0.008*** (0.001)	0.000 (0.002)	-0.010*** (0.001)	-0.006*** (0.001)	0.004*** (0.001)
12 - 41 years	-0.002*** (0.001)	-0.004*** (0.001)	-0.001 (0.001)	-0.002*** (0.001)	-0.004*** (0.001)	-0.001* (0.001)	-0.003*** (0.001)	-0.004*** (0.001)	-0.001 (0.001)
41 and more years	0.002 (0.002)	0.000 (0.002)	-0.002 (0.002)	0.002 (0.002)	0.001 (0.002)	-0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.000 (0.003)
Tenancy Law Reform Act									
Tenancy as of Sept. 2001	1, -0.033** (0.013)	-0.053*** (0.013)	-0.019 (0.015)	-0.022 (0.015)	-0.042*** (0.013)	-0.020 (0.018)	-0.023* (0.014)	-0.042*** (0.013)	-0.018 (0.017)
Restricted sample	No			Yes			Yes		
Fixed effects	No			No			Yes		

Source: SOEP V28 and authors' calculations. Note: Calculations use the SOEP sample weights. Standard errors are in parentheses and bootstrapped with 250 replications, clustered at tenancy level. *, ** and *** denote significance at the 10%, 5% and 1%-level, respectively. Model 1 is our full sample model. Model 2 excludes all tenancies with only one observation. Model 3 uses the sample in model 2 and controls for tenancy fixed effects.

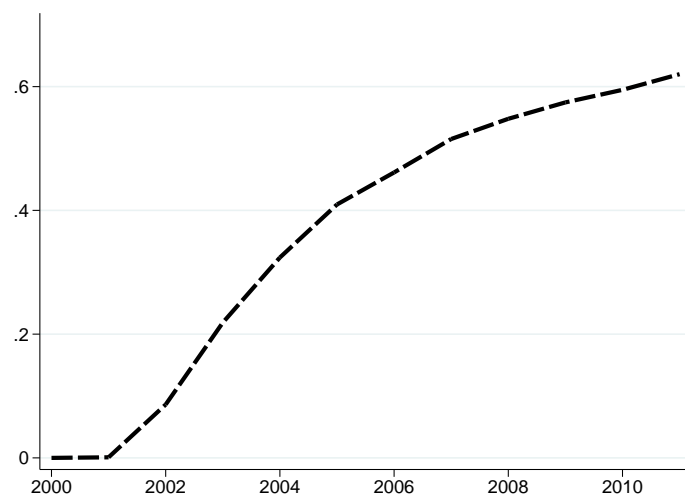
Figures

Figure 1: Tenancy length per year



Source: SOEP V28 and authors' calculations. Calculations use the SOEP sample weights

Figure 2: Share of tenancies started on September 1st 2001 or later



Source: SOEP V28 and authors' calculations. Calculations use the SOEP sample weights

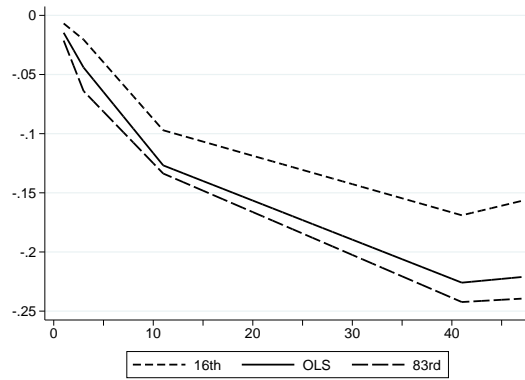


Figure 3: Cumulated tenancy discount - baseline model

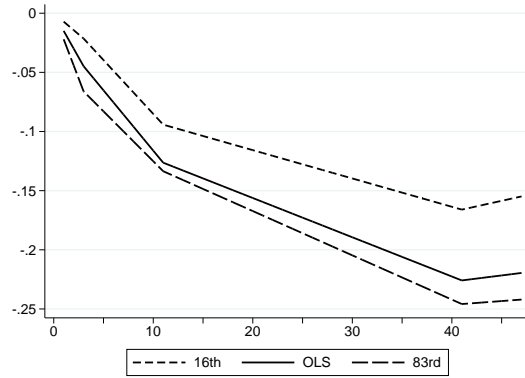


Figure 4: Cumulated tenancy discount - model with renovation

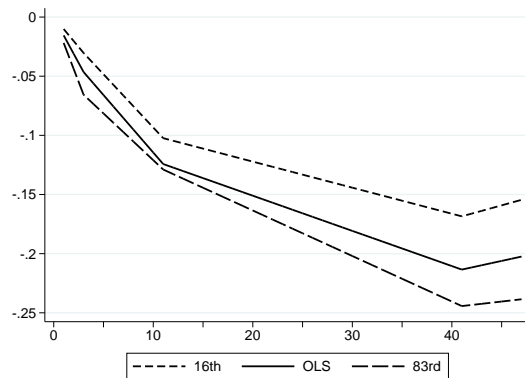


Figure 5: Cumulated tenancy discount - model with renovation and HH composition

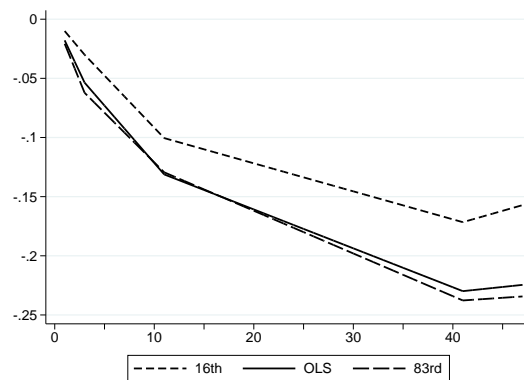


Figure 6: Cumulated tenancy discount - restricted sample

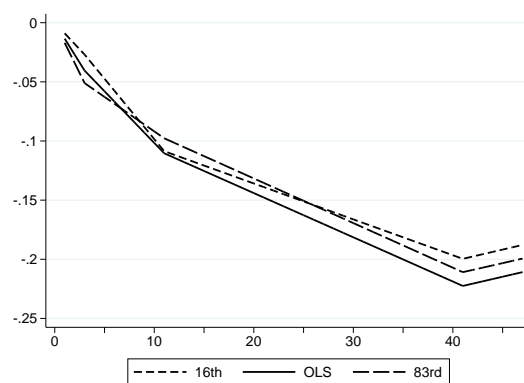


Figure 7: Cumulated tenancy discount - restricted sample and controlling for unobserved tenancy-specific fixed effects