Measuring the Value of Rent Stabilization and Understanding its Implications for Racial Inequality: Evidence from New York City*

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Abstract

Rent stabilization is valuable for tenants because it limits rent growth. Assessing the magnitude of this discount is challenging because the counterfactual rents that regulated units would command in the unregulated market are not observed. This paper estimates hedonic prices in the unregulated market and uses them to estimate the rent discount implied by rent stabilization, the current dominant policy, for almost two decades in NYC. We implement multiple empirical methods and show that the estimated are notably robust to different methodologies, including propensity score and repeated rents with a panel of de-regulated units. We find mean discounts of $468 per month, $5,616 per year, which correspond to 39% of mean contract rents of rent stabilized units. The aggregate size size of the policy is between 4 to 5.4 billion USD per year, roughly 15% of the federal budget on means-tested housing programs. Furthermore, we document the following stylized facts: (1) the value of rent stabilization increases linearly with housing tenure; (2) rent stabilization is not progressive; (3) rent discounts are consistently larger in Manhattan and increasing in neighborhoods with gentrification. Finally, we apply our estimates to study unequal benefits of the rent stabilization policies and find that they

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have disproportionately benefited white households, although this gap has been closed in recent years.

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JEL Classification: R28, J15, H75, L51

1 Introduction

Despite being widely criticized by economists and the real estate industry alike (Alston et al., 1992; Arnott, 1995; Jenkins, 2009), rent regulation has increasingly gained support by local governments and interest groups that defend it as an effective way to ensure housing affordability to those that need it most. Rent regulation's recent legislative revival (Schuetz, 2019) has been materialized in bills passed in 2019 in Oregon, New York, Minnesota, and California. Furthermore, all over the country activist groups claim rent control is an effective tool to ensure income and racial justice (Shelterforce, 2020; Pratt Center, 2022) despite little evidence in favor of this view (Glaeser, 2003). Support is stronger in larger cities, where the share of renters is high (Logan and Parman, 2017), and renting is frequently not a transition to home ownership but a permanent state. And still, there is little evidence about the magnitude of the resources devoted to and the subsidy implied by rent stabilization, their evolution over time, and their distribution across tenants of different racial and ethnic groups.[1] This paper addresses these questions using the New York City Housing and Vacancy Survey (NYCHVS) from 2002 to 2017. NYC is an optimal laboratory for this examination as rent stabilization has been there for decades, around 70% of its households are renters, and half of renters occupy rent stabilized units.

We estimate the rent discount implied by rent stabilization in New York City (NYC) using a two-step approach: first we estimate a hedonic model that uses observable unit, building, and neighborhood characteristics of the unregulated private market rental units. Then we use the estimated characteristics' prices to forecast the rents that the stabilized units would have commanded in the unregulated market and define rent discounts as the gaps between the predicted rents and the actual contract rents. The rent discounts are unobserved and we cannot directly test the prediction quality. Instead, we implement multiple empirical methods in this two-step process and show that the estimates are notably robust to different methodologies. Besides an OLS hedonic specification

[1] A significant volume of work has measured the static discount of first generation, hard price rent control measures including the seminar work Olsen (1972) and other influential early work by Gyourko and Linneman (1989a); Early (2000) among others. Much less work has been done on quantifying the dynamic discount of the more flexible second generation rent stabilization policies that only limit rent growth rates (Arnott, 1995). We focus on the latter. For excellent reviews, also see Turner and Malpezzi (2003); Pastor et al. (2018).

that allows for non-linearity in effects by discretizing response levels, we also exploit a propensity score strategy to improve the selection of control units of the private market. Furthermore, we take advantage of the unique longitudinal structure of the survey for the period 2002-2008 to control for time invariant unobserved quality at the unit level. We predict an associated discount for each individual unit, so we can make statements about different moments of their distribution.

We estimate a mean unit discount from rent stabilization of $468 per month, $5,616 per year, and about 39% of mean contract rents of rent stabilized units. This mean masks dynamic heterogeneity: the first year mean discount is only $175 per month and each additional year the same household stays in the unit increases this discount nearly linearly by $25. We extrapolate our estimates to the whole NYC housing market and find that the rent stabilization policy is between 3.4 to 5.6 billion per year (2017 USD). This magnitude is pro-cyclical and roughly 15% of the 40 billion dollar federal budget spent on means-tested housing programs (Collinson et al., 2016).

Then, we focus on how the resources involved in the policy are distributed and document a set of stylized facts: (1) rent stabilization is a regressive policy as its benefits increase at the higher end of household income distribution; (2) rent discounts are consistently larger in Manhattan and increasing in gentrifying neighborhoods; (3) policy opacity is correlated with its discount distributions. Around a third of households cannot correctly report their rent stabilization status. Rent discounts are significantly larger for households correctly aware of their benefits, with a mean monthly discount of $645 vs $218 for those unaware.

Finally, we apply our rent discount estimates to analyze heterogeneity in benefits received across races and ethnicity. We find large racial inequalities associated with rent discounts, even after controlling for educational levels. Our results point to the poor focalization of the rent stabilization policy, despite also finding that the discount gap has closed in recent years.

The rest of the paper proceeds as follows: we discuss the contribution to the literature in Section 2. Section 3 describes NYC's rent-stabilization policy and the data used in the empirical analysis. We describe our estimation in Section 4 and present the main results on Section 5. Then, we document stylized facts about the estimated rent discounts in the last two decades in Section 6. Finally, we analyze the racial disctribution of rental discounts in Section 7 and conclude in Section 8.

2 Related Literature

This paper contributes to the literature that measures the value of rent regulation benefits. Papers in this strand measure two different dimensions of rent regulation benefits: the first measures the landlord to tenant transfer of resources, or the differential benefits across families from obtaining rent-stabilized and unregulated units; the second measures the actual welfare impact of the implied rent discounts on tenants. The main difference between the two is the recognition that in the counterfactual of removing rent controls, households can re-optimize their housing consumption. The removal of rent controls could lead tenants to increase the housing quality consumed, if for example the quality of rent regulated units is lower; on the contrary, they could substitute housing consumption for other goods as housing becomes relatively more expensive in the counterfactual regulation removal. The differential benefits received across regimes, the first dimension, do not depend on comparing consumption levels with a counterfactual of no regulation, while calculating the compensating variation implied by the policy removal does require it.

Papers in that first dimension measure the regulation associated rent discount as the difference between the contract rent in the rent-stabilized sector and what a unit would command if rented in the unregulated market. This is often estimated in a two-step approach that first determines hedonic prices for characteristics in the unregulated market and then uses those prices to predict rents for regulated units.[2] Gyourko and Linneman (1989b) estimates the rent discounts associated with the hard price rent control system in NYC in 1968, using this two-step method. Moon and Stotsky (1993) follow the two-step method but estimate the hedonic model using rent controlled and uncontrolled units, modeling market rents as a censored variable for controlled units and estimating the hedonic coefficients using a Tobit regression. Some papers follow a similar approach but only focus on average discount instead of predicting unit level discounts (Marks, 1984; Autor et al., 2014). Gyourko and Linneman (1989b) find that the rent discounts are very poorly targeted, as they are only mildly progressive on income, but racial minorities benefit less. We extend this analysis by including a longer vector of unit, building, and neighborhood characteristics. We also

[2] Svarer et al. (2005) is an exception, as it estimated the rent discount for all controlled units in Denmark by comparing contract rent and the rent estimated by tax authorities using comparable owner-occupied units

update and extend the analysis by using data of the last two decades, and analyzing not only the distribution of benefits, but also identifying stylized facts about the evolution of those discounts over this long period of time. We also implement multiple methodologies to better select controls, like propensity score and a panel of deregulated units in a repeat rents approach, and find stable estimates of the discount. Another important difference is that the majority of papers, like Gyourko and Linneman (1989b), focus on the discount associated with hard price rent controls[3] , a system that caps rent levels. We focus on rent-stabilized units, which only cap rent growth. This has become the dominant type of regulation: between 2002 and 2017, about 50% of all rental units are rent stabilized, while only 2% have hard price rent controls.

Papers in the second dimension measure the welfare impact of rent discounts on tenants. Olsen (1972) measure the compensating variation implied by rent control for 1968 in NYC by assuming a demand function for tenants as a function of demographic characteristics rather than housing unit traits, and estimates that rent control removals would imply an increase in housing services consumed, but a decline in their real income and utility. Benefits are found to be larger in lower income families. Tenants adjust consumption under regulation removal, which implies that the cost of rent control for landlords is larger than the benefit to the tenants. Early (2000) also measure the compensating variation implied by rent control and rent stabilization for 1996 in NYC. They adjust their discount predictions to take into account that rent discounts from the two-step process can be negativeOlsen (1997), and that rent regulation could be associated with a declining supply of rental units (Diamond et al., 2019), resulting in higher prices in the unregulated rental market (Gyourko and Linneman, 1990; Early and Phelps, 1999).

Finally, we contribute to the the literature of racial inequality in the housing sector. Besides racial gaps in homeownership (Logan and Parman, 2017; Boustan and Margo, 2013; Collins and Margo, 2011), partly coming from facing higher prices for similar homes (Akbar et al., 2019; Bayer et al., 2017; Ihlanfeldt and Mayock, 2009; Myers, 2004). Discrimination against African Americans has also been found in mortgage approvals (Charles and Hurst, 2002; Munnell et al., 1996; Hanson

[3]Linneman (1987) estimate the discounts for 1981 data using stabilized units as the benchmark in the two-step approach because those are most comparable to controlled and uncontrolled. It is a mixed approach, as they include demographic characteristics.

et al., 2016). There is less literature that has estimated discrimination in the rental sector. Racial minorities face higher rents coming from discriminatory behavior by real estate agents (Ondrich et al., 2003), appraisals (Hanson and Hawley, 2011; Bosch et al., 2010) and fair-housing audits (Oh and Yinger, 2015; Ondrich et al., 1999). Specifically related to rent control, Gyourko and Linneman (1989b); Sims (2011) find racial minorities and lower income tenants are more likely to get lower discounts and benefit less (Early and Phelps, 1999) from rent control policies. Hendrix (2020) document that white tenants get a 36% discount on market-rate rents, compared with 17% for Hispanic renters and 16% for black renters, when comparing average rents in rent stabilized units and average rents in unregulated markets. Glaeser (2002) documents that informal allocation mechanisms, despite not being part of the policy design, can favor whites, resulting in a mixed record of rent control with regard to race. One exception is Diamond et al. (2019), who show that rent control has a large effect in preventing the displacement of racial minorities in the short run. To the best of our knowledge, this study provides the first evidence on racial disparity in accessing a seemingly fair rent-stabilization regulation in the context of the largest metropolis in the U.S., the NYC.

3 Policy Background and Data

3.1 Rent Stabilization in New York City

In NYC, rent stabilization began in 1969 and generally applies to apartments that are larger and older with subtle nuances.[4] Moreover, relatively smaller and newer apartments with tax benefits when tax abatement is effective may also be subject to rent stabilization.[5]

Rent stabilization benefits tenants first by limiting *rent increases* to a threshold decided annually by the Rent Guidelines Board (RGB).[6] The relative benefits of a rent stabilized unit increase with

[4]On one hand, apartments in buildings with six or more units built between February 1, 1947, and January 1, 1974 are subject to rent stabilization. On the other hand, apartments in buildings with six or more units built before February 1, 1947, and with a tenant who moved in after June 30, 1971 are subject to rent stabilization.

[5]Specifically, apartments in buildings with three or more units constructed or extensively renovated since 1974 with special tax benefits, such as J-51, 421a, or other programs. The tax benefits usually last 10-20 years.

[6]This rent stabilization policy restricts rental *growth* instead of rental *levels* by setting a maximum annual adjustment, a policy commonly identified as second-generation rent regulation (Arnott, 1995).

time in the unit if the rent stabilization is binding, i.e., if the rental price would have increased at a faster rate in the private market for that unit than the maximum increase permitted under rent stabilization. Upon vacancy, rents can be readjusted. In most cases, landlords reset the rental rates much closer to private market rates for incoming tenants. Occupying tenants are also protected against arbitrary evictions with the right to renew their leases, a benefit that can be extended to their children.

The RGB considers housing and financing market conditions, owner costs and revenues, as well as rental vacancy rates to determine the annual rent growth limit in rent stabilized units. Landlords can request extra increases if significant capital improvements are undertaken. This provision matters because it reduces the incentive for landlords to adjust to lower rents by reducing housing quality in rent-regulated properties (Gyourko and Linneman, 1990; Moon and Stotsky, 1993; Diamond et al., 2019). Whether this provision prevents severe quality penalties remains an empirical question.

Rent stabilized units can be deregulated if rent reaches the deregulation rent threshold (DRT)[7] and *simultaneously* one of following two conditions is met: (1) there is a vacancy, or (2) the household's income is above the deregulation income threshold (DIT).[8] A rent-stabilized unit may also be deregulated upon vacancy during the conversion to a co-op or condo. Lastly, deregulation may occur when tax benefits (i.e. J-51 or 421 tax benefits) expire. We use the small number of deregulated units to measure rent changes during regime-changing.

Importantly, rent stabilization is not a means-tested program, which makes it distinct from other federal housing assistance policies such as public housing and housing vouchers.[9] Ex-ante, the rent stabilization policy is not designed to be allocated to specific groups. This paper investigates whether this balanced allocation is indeed satisfied in practice.

[7]For example, in 2019, the DRT was $2,774.76.
[8]For example, since 2011, the DIT has been $200,000.
[9]For more comparison between rent stabilization and other federal housing policies, see Jiang et al. (2022).

3.2 The New York City Housing and Vacancy Survey (NYCHVS)

The NYCHVS is unique in answering questions about rent regulation for several reasons. First, as part of NYC regulation, the survey is complemented by administrative sources to add the official rent regulation status of each unit, avoiding measurement error. To the best of our knowledge, this is the *only* data set that contains true rent regulation status in the U.S. housing market.[10] Second, the NYCHVS contains a representative sample of the entire housing stock of NYC, and is conducted every three years. We use all the recent waves since 2000.[11] Third, the NYCHVS contains detailed information about housing quality at the unit, building, and neighborhood levels, which improve the predictive capacity of hedonic approaches, conditional on this data being of high quality (Wei et al., 2022). The full list of characteristics used are reported in the online appendix.[12]

As shown in Appendix Table B4, each wave of NYCHVS contains a representative sample of all different types of housing units across 55 sub-boroughs in NYC, with roughly two-thirds being rental units. Among the rental units, roughly 30-45% are unregulated market units, 45% are rent-stabilized units, and the rest are rent-controlled, public housing, or other types of renter-occupied units. On average about 50% of all housing units in New York City are rent stabilized.[13] There is also spatial heterogeneity in the fractions of rental units being rent-stabilized. As shown in Appendix Figure B2, the share of rent-stabilized units in rental units ranged between 3-88% across sub-boroughs, with a mean of 44% and a standard deviation of 19%.

For our empirical analysis measuring rent discount for each rent-stabilized unit, we restrict our analytic sample to only include rent stabilized units and private market-rate units between 2002 and 2017. Therefore, owner-occupied, public housing, rent-controlled, and other types of regulated but not rent stabilized units are excluded from our analytic sample.

[10] The 2002 and 2005 NYCHVS also allow us to compare the official rent regulation status to self-reported rent regulation status, and confirm that self-reporting is notoriously bad.

[11] We exclude 2014 because important variables in this year are codified differently, rendering them incomparable to other waves of NYCHVS. Results are robust to analyses that remove the inconsistent variables or include 2014.

[12] Please see Table A1 for a list of unit quality variables, Table A2 for building quality variables, and Table A3 for neighborhood characteristics.

[13] For example, in 2017, there were almost 1,000,000 rent stabilized apartments among the 2,000,000 rental occupied units in New York City. In contrast, there are only about 180,000 public housing units and 22,000 rent-control units in New York City.

In Appendix Table B5, we document the basic demographic characteristics differences between rent stabilized tenants and private market-rate tenants.[14] Overall, rent stabilized tenants are more likely to be female and older. Tenants in rent stabilized units are slightly less likely to be white, although white households still occupy around 37% of the rent stabilized units. The average monthly contract rent is around $400 lower among rent-stabilized units (equivalent to 42% lower). Tenants in unregulated units have 46% higher total income but 5 years fewer in housing tenure.

4 Measuring Rent Discount

Our main objective is to quantify the resources devoted to discounting rents in the rent stabilized market. We define the *rent discount* at each housing unit level as the difference between what the regulated unit charges as contract rent and what it could command in the counterfactual if it was moved to the unregulated market.

Following Olsen (1972); Gyourko and Linneman (1990), we estimate the *counterfactual rent* for a rent stabilized apartment using a hedonic rent function. First, we estimate rents for a unit j in the private market p, R_{ip}, as a function of characteristics, including unit and building traits, X_{jp}, and the characteristics of the neighborhood n where the unit is located, $N_{n(j)p}$,

$$R_{jp} = f(X_{ju}, N_{n(j)p}; \theta_p) + \epsilon_{jp} \tag{1}$$

θ_p refers to the estimated parameter vector and ϵ_{jp} is an error term.

The rent discount for a unit in the rent stabilized regime s is calculated as the difference between the contract rent of that unit and the rent predicted when equation 1 is evaluated at the stabilized unit vectors $X_{js}, N_{n(j)s}$,

$$\text{Subsidy}_{js} = f(X_{js}, N_{n(j)s}; \hat{\theta_p}) - R_{js} \tag{2}$$

Several considerations apply to this method. First, this calculation approximates the resources that landlords miss from not being able to lease a rent-stabilized unit in the private market. This

[14] For more details about who live in rent stabilized units using regression analysis and the underlying self-selection issues, see Jiang et al. (2022).

approach assumes that private market rents are unaffected in the counterfactual situation, which is reasonable when considering moving one rent-stabilized unit into the unregulated market. However, rent regulation can reduce the incentives to provide rental housing (Diamond et al., 2019). In addition, Early and Phelps (1999) finds removing rent control reduces prices in the private market [15] and incorporate this adjustment in estimating the distribution of tenant benefits (Early, 2000). Our aggregate discount measure could be affected by this omission. In the absence of current estimates of this factor, we focus on the most conservative hypothetical scenario that each landlord be moving their units singly.

Second, our calculation is a good approximation of the welfare change for tenants from rent stabilization, i.e. of the compensating variation, only in the very short run *if* households do not change the amount of housing services consumed when moving from rent stabilized to private markets.[16] We estimate a propensity score for being rent stabilized based on all observable characteristics, and find a common support along all ranges of the propensity distribution. This suggests units of similar quality can be found in both market, albeit not necessarily in the same proportions. Actual counterfactual consumption could vary in the magnitude of housing services. On one end, there is evidence that rent-stabilized units could have lower unit (Gyourko and Linneman, 1990) or neighborhood quality (Diamond et al., 2019) and that landlords may neglect on their maintenance (Downs, 1988).[17] In this case, the counterfactual deregulation of rent-stabilized units would imply higher consumption of quality services on average. On the other end, rent regulation reduces the price of housing services relative to non-housing goods, so that households under rent stabilization could decide to consume more housing services. This source of distortion can be increased as households' housing needs change, for example when households size changes, while the implied discount keeps growing, making re-optimization costly. Glaeser and Luttmer (2003) finds that incumbent beneficiaries of rent control keep larger units than would be leased under the private market. There is then a measurement error associated with this assumption. Thus, we focus on the amount of

[15] Still, this analysis relies on variation between areas with large and small shares of regulated units and not on the observation or modeling of full removal of rent regulation

[16] Under this assumption, our measure gives the total increase in consumer surplus when moving a tenant from the private market to the regulated market.

[17] The rent stabilization provision of allowing rent increases following landlord investments reduce the incentives for landlords to reduce unit qualities to capture some of the subsidy.

rents foregone by landlords and their relative distribution across households, while being careful not to interpret our aggregates as counterfactual welfare measurements. Another interpretation is that we measure the contemporaneous differential discounts of households residing in rent-stabilized units relative to those in private market units.[18]

Third, some of the true rent discount may be dissipated through increased transaction costs in allocating rent-stabilized rental units, for example, through increased searching costs, key money, or waiting time (Barzel, 1974). In the opposite direction, we have that subsidies are larger than the estimate because they are not taxed.

The f function is not observed. Choosing the optimal functional form that best fits both the private and stabilized market in not feasible because the counterfactual rent of a rent-stabilized unit in the private market is unobservable. We test multiple forms of f. First we begin with an OLS linear model in which all variables are discretized into response categories to flexibly capture potential non-linearities. We add controls sequentially. Our estimation increases significantly the number of quality characteristics used to predict rent in the private market, compared to similar analyses like Olsen (1972). Quality controls include unit, contract, building, and neighborhood attributes as well as sub-borough fixed effects. Estimation is done separately for every year, effectively allowing implicit prices of the characteristics to vary over time. All variables included in estimation are reported in Table 1.

Common Support and Propensity Scores A major concern of using a single set of parameters $\hat{\theta}_p$ to predict counterfactual rents for rent stabilized units is whether there is common support for the testing and the prediction samples, i.e. whether the attributes used to train the model in equation 1 and those used in predicting with equation 2 overlap. Out-of-sample prediction outside of the training data range is faulty, especially in highly parameterized models.

To address this concern, we re-estimate rent discounts using sub-samples of private market and rent-stabilized rental units that share common support based on propensity scores to ensure higher

[18]The true compensating variation is affected by the final change in quality consumed, as well as by the rent discount. We believe the welfare measurement is a different question in its own right that would require observation of households transitioning between regimes. Our data, or any publicly available representative one for NYC, does not provide longitudinal identifiers for households. Our estimates are a more accurate description of the overall resources devoted to the policy and the cost to landlords.

comparability in terms of their housing attributes in the spirit of Crump et al. (2009); Bailey and Goodman-Bacon (2015).[19] Propensity scores measure how likely it is for a rental unit to be rent-stabilized, conditional on its housing attributes. We estimate propensity scores using a logit model, in which the dependent variable is the rent stabilization status, using only rental units. Buildings' year of construction, number of units, and number of stories are excluded from the logit model because they are the institutional criteria for rent stabilization while do not directly measure the unobserved quality (see Section 3.1).[20] As Appendix Figure C4 shows, there is significant overlap in propensity scores between rent-stabilized and market rental units.

We perform the same hedonic model procedure discussed previously with three different subsamples determine by this propensity score analysis. First, we drop units that have a very small propensity to be rent-stabilized, thereby removing unique units with no comparators in the rent-stabilized group. Second, we drop units with very high or low propensity scores to remove outliers that have little comparability across rental regimes. Trimming units with very low or high propensity scores prevents OLS from assigning weights to units outside of common support. Third, we follow the spirit of more traditional propensity score matching and divide the sample by propensity scores. We follow the two-step prediction approach only using stabilized and private market units in the propensity quantile. We report the results when dividing in half-percentiles. Results for other quantiles are virtually equal and are available upon request.

Panel Data and Repeat Rents Despite a large number of characteristics used in the hedonic rent function, the concern of unobserved quality remains. To address this issue, we exploit the unique panel data feature of NYCHVS and the availability of unit level identifiers for 2002, 2005, and 2008.[21] This panel data structure allows us to identify 280 rent-stabilized housing units that were deregulated between 2002 and 2005, and 424 between 2005 and 2008, effectively giving us access to repeated rents or leases for the same unit.[22]

[19] One benefit of using propensity scores is that they summarize the vector of housing characteristics into one statistic and provide a easy way for identifying market and rent-stabilized units with similar characteristics and their combinations.

[20] Adding them would, thus, significantly reduce the overlap in propensity scores between free-market and rent-stabilized housing units (i.e., the shrinkage of common support).

[21] The unit level panel identifier is no longer available from 2011 and onward.

[22] As mentioned in section 3.1, a rent-stabilized unit can be deregulated for a variety of reasons, such as rent reaches DRT, converted to co-op or condo, and tax benefits expire.

We estimate rent discounts for these units as changes in the observed contract rents before and after deregulation, allowing us to control for time invariant unit quality. This approach for controlling for unobserved quality is inspired in Eichholtz et al. (2012); Ambrose et al. (2015), who use new leases to estimate a repeat rent estimator to track rental market dynamics, replicating the repeat sales estimator of Case and Shiller (1989). The short time between observed contract rents, reduces somewhat the concern of the constant-quality assumption not being satisfied. This method requires less data than the hedonic approach, but suffers similarly from a reduced sample of units.

Aggregated Rent Discount in NYC Finally, the aggregate magnitude of the resources devoted to the policy are obtained by

$$\int_{j \in JS} \text{Subsidy}_j \omega_j \, dj \tag{3}$$

where JS denotes the set of rent stabilized units. Survey weights ω_j are used to extrapolate estimated totals to citywide aggregates. Subsidies estimated for all years are deflated to 2017 $USD and pooled.

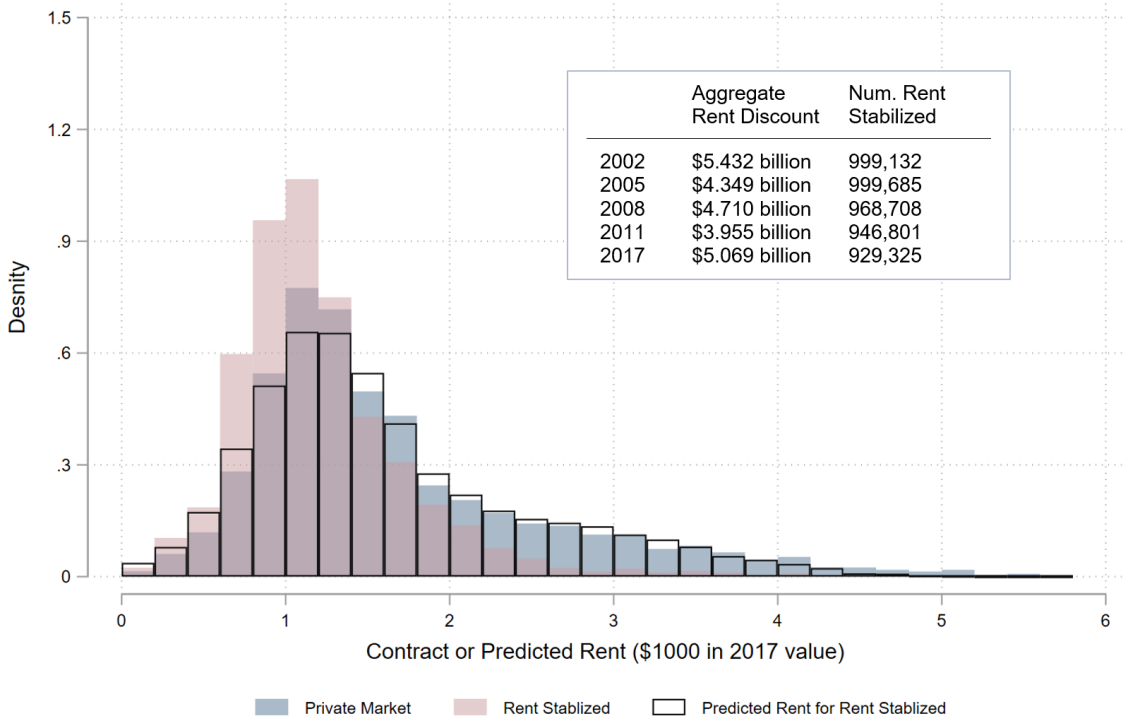
5 Estimated Rent Discounts

Table 1 documents the estimated rent discounts using different methods detailed in section 4. In Panel A, we present the results amount to different definitions of the hedonic rent function f. First, we estimate a baseline regression model used in the seminal Olsen (1972) article and report the predicted rent discounts in the first row. This model uses: number of bedrooms, number of rooms, overall building quality, building construction year, number of units in the building, number of stories interacted with elevator availability, and borough dummies. As mentioned in section 4, all variables are discretized to capture potential non-linearities. The average rent discount is about $622 per month in 2002. Next, we gradually add a rich set of extended housing unit characteristics, building, and neighborhood characteristics in rows 2-6. The estimated rent discounts decline as we include more housing attributes, especially with the inclusion of sub-borough fixed effects. We use the results in the more extended model in row 6 as the preferred estimate: in 2002, the estimated

average rent discount is $468 per month , $5,616 per year, and about 39% of mean contract rents of rent stabilized units. The distribution of rent discounts is right-skewed, with the median discount ($343, see Appendix Table C12) below the mean by about $125 per month.

Our method allows us to predict a rent discount for every unit. The predicted rents by the hedonic function that rent-stabilized units would command in the private market overlap closely the observed rents of units in the private market (Figure 1). This confirms the large overlap in their quality as determined by observed characteristics.

Figure 1: Histogram of Monthly Contract/Predicted Rent: Private Market vs. Rent-Stabilized (2002-2017)



Notes: Predicted rents for rent stabilized housing units are estimated using the hedonic model shown in Row 6 of Table 1. Rent discounts for rent stabilized housing units are computed as the difference between predicted rents and contract rents, as discussed in Section 4. Aggregate rent discount is in thousand 2017 USD and is the weighted sum of rent discount of all stabilized units. Aggregate rent discount and number of rent stabilized units are calculated using sample weights. Units with top and bottom 1% of contract rents are dropped to avoid outliers. *Source*: 2002, 2005, 2008, 2011, 2017 NYCHVS.

In Panel B, we use the model of row 6 but change the units used in training and forecasting samples to make them more comparable in their estimated propensities to the rent-stabilized units.

Table 1: Mean of Estimated Rent Discounts (2002-2017)

	2002	2005	2008	2011	2017
	Panel A: Hedonic Models				
Baseline Model *a la* Olsen (1972)	0.6219	0.5396	0.5645	0.5615	0.6732
	(0.0101)	(0.0094)	(0.0100)	(0.0088)	(0.0115)
+ Extended Characteristics	0.6026	0.5280	0.5605	0.5309	0.6387
	(0.0097)	(0.0091)	(0.0098)	(0.0085)	(0.0112)
+ Unit Quality Issues	0.6040	0.5247	0.5450	0.5194	0.6227
	(0.0097)	(0.0091)	(0.0099)	(0.0088)	(0.0113)
+ Building Characteristics	0.5995	0.5257	0.5456	0.5238	0.6185
	(0.0098)	(0.0091)	(0.0099)	(0.0088)	(0.0114)
+ Neighborhood Characteristics	0.5880	0.5183	0.5277	0.5130	0.5998
	(0.0097)	(0.0090)	(0.0099)	(0.0088)	(0.0113)
+ Sub-borough FE	0.4680	0.3765	0.3871	0.3699	0.4518
	(0.0088)	(0.0086)	(0.0094)	(0.0083)	(0.0112)
	Panel B: Common Support and Propensity Score				
P-Score Trimmed (≥ 0.1)	0.4641	0.3720	0.3876	0.3710	0.4501
	(0.0089)	(0.0086)	(0.0094)	(0.0083)	(0.0113)
P-Score Trimmed ($\in [0.1,0.9]$)	0.4681	0.3893	0.3874	0.3869	0.4757
	(0.0108)	(0.0095)	(0.0097)	(0.0086)	(0.0118)
P-Score Split (cutoff = 0.5)	0.4443	0.3373	0.4190	0.3708	0.4307
	(0.0092)	(0.0093)	(0.0097)	(0.0088)	(0.0121)
	Panel C: Panel Data and Repeated Rents				
Repeated Rents	0.3176	0.4352			
	(0.0420)	(0.0407)			

Note: SE of the mean are reported in parentheses. Data comes from 2002, 2005, 2008, 2011, and 2017 NYCHVS. Sample contains only rent-stabilized and market rental units. Units with zero and topcoded monthly contract rents are dropped. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017.

The baseline model *a la* Olsen (1972) has the following controls: number of bedrooms and other rooms, overall building quality (sound, deteriorating, or dilapidated), year built, number of units in the building, number of stories interacted with elevator availability, and borough dummies.

Extended characteristics are: building owner presents; lease length; rent includes electricity, gas, other fuels; heating type; additional heating source; plumbing completeness; kitchen completeness.

Unit quality issues are: presence of mice and rats; exterminator service; cracks/holes in interior walls; holes in floors; broken plaster or peeling paint; water leakage; number of heat breakdown; toilet breakdown.

Building characteristics are: sidewalk to elevator without using steps; sidewalk to unit without using steps; any issue of building in terms of external walls, windows, stairs, floors.

Neighborhood characteristics are: presence of buildings with broken or boarded-up windows on the same street; self-rating of structures in neighborhood.

Propensity scores are estimated using logit regression of rent-stabilization dummy on all but three unit, building, and neighborhood characteristic in model shown in row 6. Year built, number of units, and number of stories in building are excluded from logit regression because they are determinants of rent-stabilization status. We then trim the sample by dropping housing units with propensity scores below certain thresholds (row 7& 8). We also split sample of market and rent-stabilized units into two sub-samples based propensity scores (row 9) and estimate Hedonic model for each sub-sample.

Private market and rent stabilized units that are very unlikely to be stabilized are removed in the results of row 7 and the predicted mean discounts change negligibly. Results in row 8 further remove those units with *too high* of a probability of being stabilized, barely moving the mean prediction. Finally, row 9 shows the summary statistics of the predicted rent discounts when predictions are made separately for units above and below a propensity score of 0.5. Results are remarkably stable.

Panel C of Table 1 shows the estimated rent discounts using the repeat rents approach using the units that become de-regulated to control for unobserved quality. This method can only be applied to 2002, 2005, and 2008, the years for which the NYCHVS includes unit identifiers across time. The average rent discounts of 635 recently deregulated rental units is $390 (see Appendix Table C15). This estimate is very similar in magnitude to the results that control for quality with a hedonic function.

The mean estimated discount weakly trace a U-shaped curve, decreasing in the early 2000s until 2005 and staying at lower levels until picking up again in 2011. The median discount has a similar evolution[23] This U pattern does not follow rents in the private market, which have been steadily increasing since 2002, nor the composition of rental units, which have slowly but steadily declined as a share of both rental units and total units since 2002.

Finally, we aggregate rent discounts of each rent-stabilized housing units using their survey weights. The aggregates roughly oscillating between $4 and $5.4 billion (in 2017 value) per year, as is shown in Figure 1. To provide some benchmark, this magnitude is around 15% of the 40 billion dollar federal spending on means-tested housing programs[24], and roughly 18-25% of the 22 billion 2019 federal budget on tenant-based housing voucher program (US Department of Housing and Urban Development, 2020). The magnitude is comparable the $6 billion annual federal tax expenditures on Low Income Housing Tax Credit (LIHTC) (Collinson et al., 2016) and the 7 billion dollar 2019 federal budget on public housing.[25]

[23]However, they differ in that the median rent discount in 2017 is about $14 higher than in 2002, while the mean rent discount in 2017 is below that of 2002.

[24]Means-tested housing programs include public housing, government subsidized private housing, and tenant-based housing vouchers.

[25]Our baseline estimates of rent discount use the model in row 6 of table 1 predict negative rent discounts for some units. A negative rent discount is most likely the product of unobserved quality that is overlooked by our hedonic model. It could also be the consequence of landlords of rent-stabilized units preemptively trying to re-coup

Additional Robustness Checks

In the online appendix, we conduct a battery of additional robustness checks. First, we include the rental units whose contract rents are top-coded in our analytic sample, and re-estimate the hedonic model. Second, we restrict our sample to the sub-set of housing units with completely valid housing unit and building characteristics. That is, we exclude the units whose housing and building characteristics may be either not reported or unknown. And re-estimate our hedonic model. The results are both quantitatively similar and qualitatively unchanged.

6 Some Stylized Facts About Rent Discounts 2002-2017

Rent Discounts and Tenure Duration Rent stabilization works by limiting the growth of rent. If the policy is binding in every period, the discount provided should grow with a tenant's duration in the unit. We regress rent discount on tenure duration and find a positive association (Panel A of Table 2). We also fit a Locally Weighted (LOWESS) curve (see Appendix Figure D5) that allows flexible curvature, but find that the relationship is surprisingly close to linear for the relevant range. An additional year of housing tenure is associated with approximately a $20 per month or $240 per year. Estimates can be interpreted as evidence of a binding rent stabilization policy over time.[26]

Rent Discounts and Income: Is the Policy Progressive? The rent-stabilization policy is income neutral by design, but has often been championed as a way to ensure housing affordability for low income households and prevent their displacement from expensive but productive cities. Just like Olsen (1972); Ault and Saba (1990) find for older hard-price rent controls in NYC and

future foregone rents (see discussion in section **??**). Our aggregates are a conservative measure because we include any estimated negative rent discounts with positive weights in the sum. The aggregate rent discounts increase if we change all rent discounts with a negative point estimate to zero (). A similar thing happens when rent discounts with negative point estimates and a confidence interval that includes zero are set to zero (see appendix Table **??**). **FINISH THE FOOTNOTE AFTER THE DISCUSSION ON NEGATIVE DISCOUNTS IS ADDED. TBDB LUIS**

[26] Tenure is endogenous to factors that may also affect rent discount. The literature has instrumented tenure with predicted tenure estimated using the private market, in an approach similar to that from equations 1 and 2 for rents (see Gyourko and Linneman (1989a) for an early application). Our results, like theirs, are not sensitive to using this prediction. Still, for a distributional analysis it is more accurate to use the observed duration. Ault et al. (1994) focuses on the opposite direction, the effect of rent control on tenure, finding that it is strong and attributable to efficiency losses.

Table 2: Relationship between Rent Discounts and Housing Tenure, Income, and Geography

	Dependent Variable: Monthly Rent Discount (in thousand 2017$)					
	All	2002	2005	2008	2011	2017
	Panel A: Housing Tenure					
Housing Tenure	0.021***	0.021***	0.020***	0.023***	0.019***	0.023***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.181***	0.259***	0.167***	0.149***	0.164***	0.152***
	(0.005)	(0.012)	(0.011)	(0.012)	(0.010)	(0.014)
	Panel B: Total Household Income					
Total household income	0.000	0.000**	0.000**	0.000**	-0.000	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	Panel C: Geography					
Bronx	0.169***	0.255***	0.162***	0.131***	0.120***	0.184***
	(0.005)	(0.011)	(0.012)	(0.012)	(0.011)	(0.015)
Brooklyn	0.232***	0.203***	0.154***	0.215***	0.226***	0.370***
	(0.006)	(0.011)	(0.011)	(0.012)	(0.012)	(0.017)
Manhattan	0.894***	0.961***	0.836***	0.905***	0.854***	0.903***
	(0.009)	(0.018)	(0.018)	(0.022)	(0.018)	(0.029)
Queens	0.198***	0.203***	0.153***	0.154***	0.191***	0.327***
	(0.006)	(0.011)	(0.011)	(0.012)	(0.013)	(0.017)
Staten Island	0.127***	0.101**	0.230***	0.138**	0.175***	0.013
	(0.029)	(0.049)	(0.072)	(0.066)	(0.054)	(0.076)
$\overline{Y}$	0.409	0.468	0.377	0.387	0.370	0.452
N	24043	5177	5015	5268	4684	3899
	Panel D: Awareness					
Correctly Aware	0.289***	0.304***	0.265***			
	(0.013)	(0.018)	(0.018)			
Constant	0.313***	0.346***	0.282***			
	(0.007)	(0.010)	(0.010)			
N	10192	5177	5015			

Note: The dependent variable of the OLS regressions shown in panels above is monthly rent discounts (in thousand 2017 US$). Monthly rent discounts are estimated using the linear model with extended housing characteristics, Sub-borough FE, and all discretized variables, as shown in row 6 of Table 1. Housing tenure in Panel A is the number of years a household has stayed in the same rent-stabilized unit. Total annual household income in Panel B is in thousand 2017 US$. In Panel D, the correctly aware dummy equals one for households who live in rent-stabilized units and correctly report that they live in rent-stabilized units and zero otherwise. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS. Units with zero and top-coded monthly contract rents were dropped. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017.

Glaeser (2003) for rent stabilization, we find that households in rent-stabilized units have lower income than those in the free market. The policy seems progressive in its initial allocation. Our estimated rent discounts allows us to further evaluate the distribution of the rent discounts across households conditional on being a beneficiary. And we reach the opposite conclusion. We find that households' rent discounts are positively, albeit weakly, associated with their annual income (see Panel B of Table 2). Although the coefficients on total household income are statistically significant, the magnitudes of these point estimates are close to zero. More importantly, in all cases we reject the hypothesis that they are negative: rent stabilization seems to be a regressive policy that gives higher discounts to richer households.

Rent Discounts Spatial Distribution There are sizable rent discounts in all boroughs. However, the largest mean discounts are concentrated in Manhattan, as shown in Panel C of Table 2. The mean Manhattan rent discount premium is $894 per month, or $662 more than the average discounts in Brooklyn. This pattern is consistent with high private market rents growth in Manhattan, making rent-stabilization caps constantly binding there. Despite being higher, Manhattan discount premia have remained stable since 2002, while mean discounts in Brooklyn and in Queens have grown by nearly 80% and 60%, respectively. This is consistent with increasing private market prices occurring during gentrification in these two boroughs (Lees, 2003; Barton, 2016; Timberlake and Johns-Wolfe, 2017).

Appendix Figure C3 shows the spatial distribution of rent discounts across 55 different sub-boroughs, and confirm the main results that there are sizable rent discounts in Manhattan and neighborhoods experiencing gentrification.

Rent Discounts and Policy Awareness Following Jiang et al. (2022), we measure policy awareness using the 2002 and 2005 NYCHVS, which include both self-reported and official rent regulation status of units.

Surprisingly, less than 35% of the households living in rent-stabilized housing units are *correctly aware* of their rent-regulation status (know correctly whether they are benefiting from the policy). In contrast, there are almost 25% of rent-stabilized tenants who are *incorrectly aware*, i.e. they believe their units are private market rate! In contrast, less than 5% of private market tenants are

incorrectly aware, i.e., believe their units are rent-regulated. This illustrates the policy opacity, which may prevent lower educated and newcomers to the city to benefit from it, and provide room for landlords to control who they advertise the rent-stabilized status to, which can reduce the potential integrationist effects of the policy (Glaeser, 2003).[27]

Panel D of Table 2 shows households that are correctly aware of the rent-stabilization status of their housing units enjoy much larger rent discount on average – $290 more discounts per month compared to all other rent-stabilized tenants. In addition, Appendix Table E30 contrasts rent discounts of that households who are correctly aware versus households who are incorrectly aware of their rent-stabilization status and shows that the correctly aware group enjoys $600 or roughly twice the amount in rent discounts per month than the incorrectly aware group. Furthemore, correctly aware households have spent on average 5 years more living in their units. Longer duration can be associated with both learning about the correct policy status and a higher associated rent discount. Unsurprisingly, households that are correctly aware of the rent-stabilization status also have higher average total household income. These factors combined help to make the policy more regressive as previously discussed.

7 The Implications for Racial Inequality

Despite seemingly racially neutral, policies often have de facto discriminatory consequences. We apply our estimated rent discounts to analyze the differential access to discounts for households of different racial and ethnic groups: White, Black, Hispanic, and Asian Americans and Pacific Islanders (AAPI)[28].[29]

Table 3 shows racial disparity in rent discounts estimated with a regression on the rent estimated

[27] Appendix table E30 shows the difference in the demographics of tenants that are aware and those beneficiaries that cannot correctly identify their status.The latter are significantly more likely to be part of a racial minority and be younger.

[28] This category also includes American Indian, Alaskan Natives, and tenants of two or more races.

[29] A related but not identical issue is the allocation of rent stabilized units to begin with. When we pool renters and home owners, we find that African Americans are as likely as white tenants to occupy rent stabilized units (see Appendix Tables E32 and E33). However, this is mainly explained by the higher propensity of African Americans to be renters. When considering only renters, African Americans are much less likely to occupy a rent stabilized unit than whites, after controlling for a large vector of demographic characteristics. This could suggest discriminatory behavior of landlords in unit assignment (Glaeser, 2003).

rent discount in each unit using the model in row 6 of Table 1, on a set of dummies for races. Estimates in Panel A suggest that, on average, white households living in rent-stabilized rental units enjoy $490 monthly rent discounts. In comparison, the monthly rent discounts in rent stabilized units occupied by African American households are about $150 smaller than white households during the study period. This gap in monthly rent discounts translates into a $1,800 annual difference in rent discounts between African American households and white households. This racial gap in rent discounts is also apparent for Hispanic households, who on average receive $135 less rent discounts than whites. However, we do not see significant differences in rent discounts between different race and ethnicity groups when we measure discounts as a fraction of contract rent, as is shown in Appendix Table E26.

Averages hide interesting dynamic patterns. African American negative discount premia is significantly large in the early 2000s and becomes smaller after 2008. Starting in 2011, the racial gap is not only statistically insignificant, but also negligible in the magnitudes. The racial gap in rent discounts for Hispanics and AAPI has also declined since 2011.

Furthermore, Panel A of Table 3 shows that the closing of the racial gap between African American and White households are driven by two trends. First, the rent discounts of White households have declined over the years from about $559 per month in 2002 to $474 per month in 2017. Simultaneously, the average rent discounts of African American households increased from $340 per month in 2002 to $442 per month in 2017.

Policy awareness can be a determinant factor of differential access to rent discounts across racial groups. White households are much more likely to be correctly aware of the rent-stabilization status (see Panel B of Table 3). Roughly 75% are correctly aware of their rent-stabilization status, relative to 57% of African American households, 53% of Hispanic households, and 51% of Asian households. As we saw before, being aware of the policy status correlated with higher rent discounts. The disparity goes beyond awareness though. Even among those correctly aware, white households on average enjoy the largest monthly rent discounts of about $ 705 (in 2017 values), which is roughly 71% and 37% more than the rent discounts of the African American and Hispanic households. Interestingly, we do not observe similarly large racial gaps in rent discounts amongst households

Table 3: Racial Inequality in Rent Discounts

Panel A: Racial Inequality in Rent Discounts over Time

	Dependent Variable: Monthly Rent Discounts (in thousand 2017$)					
	All	2002	2005	2008	2011	2017
African American	-0.150***	-0.209***	-0.188***	-0.242***	-0.032	-0.032
	(0.011)	(0.022)	(0.023)	(0.025)	(0.022)	(0.030)
Hispanic	-0.135***	-0.150***	-0.124***	-0.236***	-0.068***	-0.063**
	(0.010)	(0.021)	(0.020)	(0.023)	(0.020)	(0.027)
AAPI	-0.043**	0.027	-0.050	-0.158***	-0.030	0.045
	(0.017)	(0.041)	(0.034)	(0.037)	(0.033)	(0.042)
Constant	0.490***	0.559***	0.461***	0.534***	0.402***	0.474***
	(0.008)	(0.016)	(0.015)	(0.019)	(0.015)	(0.020)
N	24043	5177	5015	5268	4684	3899

Panel B: Racial Inequality in Rent Discounts By Awareness

	Correctly Aware			Incorrectly Aware		
	Avg. Discount	N	Pct.	Avg. Discount	N	Pct.
White	0.705	1892	48.94	0.220	630	27.24
African American	0.412	704	18.21	0.249	529	22.87
Hispanic	0.514	1026	26.54	0.295	914	39.52
AAPI	0.723	244	6.31	0.375	240	10.38
Total	0.604	3866	100	0.276	2313	100

Note: Rent discount in both panels is in thousand 2017 US dollars and is estimated using the linear model with extended housing characteristics, Sub-borough FE, and all discretized variables, as shown in row 6 of Table 1. APPI stands for Asian American and Pacific Islanders. This race category also includes American Indian and Alaskan Native.

Panel A shows coefficients from OLS regression of rent discount on race dummies and a constant term, without controls and fixed effects. The omitted race group is white. Units with zero and top-coded monthly contract rents were dropped. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Panel B summarizes average rent discount by race and by households' awareness of rent stabilization policy. Since households' self reported rent regulation status is only available in the 2002 and 2005 NYCHVS, Panel B only uses a subset of household that have reported their rent regulation status in these two waves of NYCHVS.

who are incorrectly aware of the rent-regulation status of their housing units. However, We do not see the same disparity in the size of rent discounts when we measure rent discounts as fractions of contract rents. As is shown in Appendix Table E31, although African American households have smaller rent discounts as fractions of their monthly contract rent among households who are correctly aware of their rent regulation status, the difference between races and ethnicities are much smaller.

8 Conclusion

We are facing a context of rising popularity of rent regulation in the national affordable housing policy debate, but we do not have recent estimates of the magnitudes of this important policy. Assessing the costs and benefits of this policy is challenging because true market rents are not observed for regulated units. An initial wave of literature estimated the magnitudes of rent regulation a few decades ago, mainly focusing on hard price rent controls. Following a two step approach, we estimate the rent discount implied by the dominant policy, rent stabilization that only caps rent growth, in NYC for the last two decades using a similar approach. The rent discounts are unobserved and we cannot directly test the prediction quality. Instead, we implement multiple empirical methods and show that the estimates are notably robust to different methodologies. In particular, we increase significantly the number of unit, building and neighborhood characteristics used, use propensity score matching to improve the selection of comparable units in the unregulated market, and take advantage of longitudinal unit identifiers for 2002-2008 to control for time invariant unobserved quality at the unit level in a repeat rent approach. We only find negligible changes in the prediction based on the method, but high prediction stability in all models that use the same controls in the hedonic model.

We estimate a mean unit discount from rent stabilization of $410 per month in 2017 USD. We estimate discounts for every unit so can also comment on the distribution: the first year mean discount is only $175 per month and each additional year the same household stays in the unit increases this discount nearly linearly by $20. Using survey weights we calculate the

implied aggregate size of the annual discounts of rent stabilization in NYC. We find that the rent stabilization policy is between 4 to 5.4 billion USD per year, and that it moves pro-cyclically in the real state cycle. To give some context on the magnitude, this is roughly 15% of the 40 billion dollar federal budget spent on means-tested housing programs (Collinson et al., 2016).

We report a set of stylized facts using our estimated discounts for the last two decades: (1) rent stabilization is a regressive policy as its benefits increase at the higher end of household income distribution; (2) rent discounts are consistently larger in Manhattan and increasing in gentrifying neighborhoods; (3) policy opacity is correlated with the discount distributions, with rent discounts being three times larger for households correctly aware of being rent stabilization beneficiaries.

Finally, we apply our rent discount estimates to analyze heterogeneity in benefits received by racial minorities. We find large racial inequalities associated with rent discounts, even after controlling for educational levels. Our results point to the poor focalization of the rent stabilization policy, despite also finding that the discount gap has closed in recent years.

In current work we are exploring the mechanisms behind this closing of the gap between the rent discounts observed for African Americans and other households. Our work would distinguish between pure discrimination and sorting and displacement mechanisms. Pure discrimination would show households that stay in similar units and for the same tenure duration receive a lower rent discount just because of their race. We are exploring this discrimination effect by decomposing the racial rent discount gap in unit and demographic household characteristics other than race using Blinder–Oaxaca decomposition methods, and measuring discrimination as different discounts not explained by observables.

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Measuring the Value of Rent Stabilization and Understanding its Implications for Racial Inequality: Evidence from New York City (**Online Appendix**)

Appendix A Details on the Data

Table A1: Measures of Unit Quality

Category	Specific Measurement	2002	2005	2008	2011	2014	2017
Basic Information	Number of Rooms	✓	✓	✓	✓	✓	✓
	Number of Bedrooms	✓	✓	✓	✓	✓	✓
	Condo/Coop Status	✓	✓	✓	✓	✓	✓
	Floor of Unit	✓	✓	✓	✓	×	×
Plumbing	Complete Plumbing Facilities	✓	✓	✓	✓	✓	✓
	Exclusive Use of Plumbing Facilities	✓	✓	✓	✓	✓	×
	Toilet Breakdowns	✓	✓	✓	✓	✓	✓
Kitchen	Complete Kitchen Facilities	✓	✓	✓	✓	✓	✓
	Exclusive Use of Kitchen Facilities	✓	✓	✓	✓	✓	×
	Kitchen Facilities Functioning	✓	✓	✓	✓	✓	✓
Heat	Type of Heating Fuel	✓	✓	✓	✓	✓	✓
	Heating Equipment Breakdown	✓	✓	✓	✓	✓	✓
	Number of Heating Equipment Breakdowns	✓	✓	✓	✓	✓	✓
	Additional Source(s) of Heat	✓	✓	✓	✓	✓	✓
Issues	Presence of Mice and Rats	✓	✓	✓	✓	✓	✓
	Exterminator Service	✓	✓	✓	✓	✓	✓
	Cracks or Holes in Interior Walls	✓	✓	✓	✓	✓	✓
	Holes in Floors	✓	✓	✓	✓	✓	✓
	Broken Plaster or Peeling Paint on Inside Walls	✓	✓	✓	✓	✓	✓
	Issue on Ceiling or Inside Walls Larger than 8 1/2 X 11	✓	✓	✓	✓	✓	✓
	Water Leakage Inside Apartment	✓	✓	✓	✓	✓	✓
Lease	Length of Lease	✓	✓	✓	✓	✓	✓
	Monthly Contract Rent	✓	✓	✓	✓	✓	✓
	Whether Electricity is Paid Separately	✓	✓	✓	✓	✓	✓
	Whether Gas is Paid Separately	✓	✓	✓	✓	✓	✓
	Whether Water and Sewer is Paid Separately	✓	✓	✓	✓	✓	✓
	Out of Pocket Rent	✓	✓	✓	✓	✓	✓
	Monthly Gross Rent	✓	✓	✓	✓	✓	✓

Table A2: Measures of Building Quality

Category	Specific Measurement	2002	2005	2008	2011	2014	2017
Basic Information	Number of Stories in Building	✓	✓	✓	✓	✓	✓
	Number of Units in Building*	✓	✓	✓	✓	✓	✓
	Year Built	✓	✓	✓	✓	✓	✓
	Owner Live in the Building	✓	✓	✓	✓	✓	✓
External walls	Missing brick, siding, or other outside wall material	✓	✓	✓	✓	✓	✓
	Sloping or bulging outside walls*	✓	✓	✓	✓	✓	✓
	Major cracks in outside walls	✓	✓	✓	✓	✓	✓
	Loose or hanging cornice, roofing, or other material	✓	✓	✓	✓	✓	✓
Windows	Broken or missing windows	✓	✓	✓	✓	✓	✓
	Rotten or loose windows	✓	✓	✓	✓	✓	✓
	Boarded up windows	✓	✓	✓	✓	✓	✓
Stairways	Loose, broken, or missing stair railings	✓	✓	✓	✓	✓	✓
	Loose, broken, or missing steps	✓	✓	✓	✓	✓	✓
	None of these problems with stairways	✓	✓	✓	✓	✓	✓
	No interior steps or stairways	✓	✓	✓	✓	✓	✓
	No exterior steps or stairways	✓	✓	✓	✓	✓	✓
Floors	Sagging or sloping floors	✓	✓	✓	✓	✓	✓
	Slanted or shifted doorsills or door frames*	✓	✓	✓	✓	✓	✓
	Deep wear in floors causing depressions	✓	✓	✓	✓	✓	✓
	Holes or missing flooring	✓	✓	✓	✓	✓	✓
Overall Building Condition	Dilapidated	✓	✓	✓	✓	✓	✓
	Sound	✓	✓	✓	✓	✓	✓
	Deteriorating	✓	✓	✓	✓	✓	✓
Wheelchair Accessibility	Street Entry	✓	✓	✓	✓	✓	✓
	Elevator	✓	✓	✓	✓	✓	✓
	Residential Unit Entrance	✓	✓	✓	✓	✓	✓
Elevator	Passenger Elevator in Building	✓	✓	✓	✓	✓	✓

* indicates that the answer values associated with the variable may vary across years: the first two categories of external wall and floor conditions were combined in 2017.

Table A3: Measures of Neighborhood Quality

Specific Measurement	2002	2005	2008	2011	2014	2017
Any Buildings with Broken or Boarded up Windows (observation)	✓	✓	✓	✓	✓	✓
Boarded Up Structure in Neighborhood (Respondent/Interviewer)	✓	✓	×	×	×	×
Respondent Rating of Residential Structures in Neighborhood	✓	✓	✓	✓	✓	✓
People willing to help neighbors	✓	×	×	×	×	×
People in neighborhood can be trusted	✓	×	×	×	×	×

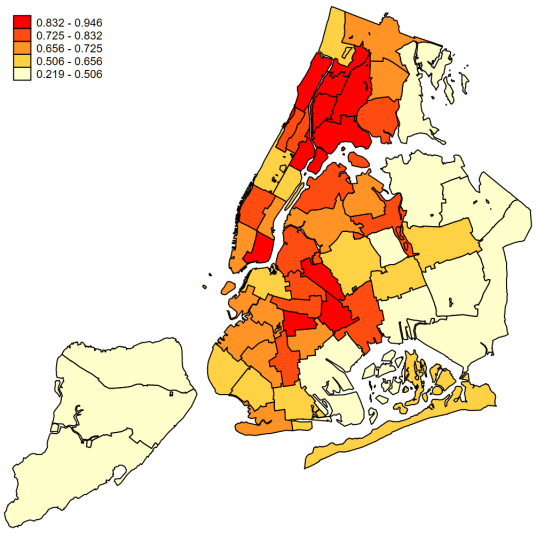
Appendix B Details on NYC Housing Market

Table B4: Composition of Housing Units in New York City

	2002	2005	2008	2011	2017
Owner Occupied	981,814	1,010,370	1,019,345	984,066	1,006,081
	(0.327)	(0.333)	(0.329)	(0.319)	(0.324)
Renter Occupied	2,023,504	2,027,626	2,081,953	2,104,816	2,103,874
	(0.673)	(0.667)	(0.671)	(0.681)	(0.676)
Private Market	620,860	649,993	735,437	782,253	836,168
	(0.314)	(0.327)	(0.359)	(0.380)	(0.410)
Rent Stabilized	999,132	999,685	968,708	946,801	929,325
	(0.505)	(0.502)	(0.473)	(0.460)	(0.456)
Rent Controlled	56,821	41,780	38,844	37,682	19,951
	(0.029)	(0.021)	(0.019)	(0.018)	(0.010)
Public Housing	174,490	167,351	183,651	184,588	183,808
	(0.088)	(0.084)	(0.090)	(0.090)	(0.090)
Other Renter Occupied	172,202	168,818	155,313	153,492	134,622
	(0.057)	(0.056)	(0.050)	(0.050)	(0.043)
Total Housing Units	3,005,318	3,037,996	3,101,298	3,088,881	3,109,955

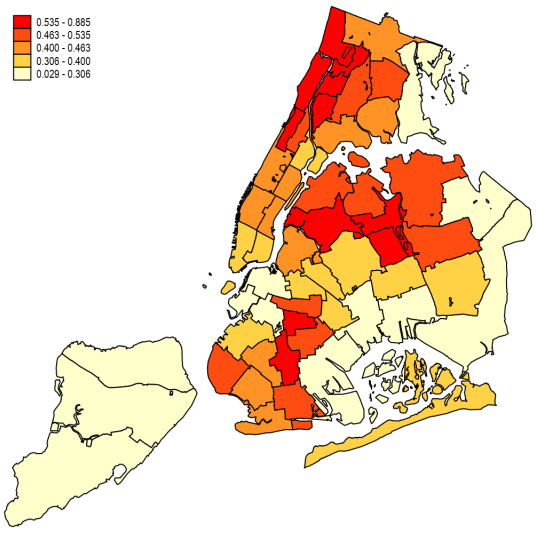
Notes: Fraction of each type of housing units are reported in parentheses. The number and fraction of each type of housing units are calculated using household weights in NYCHVS. Other renter-occupied units include Article 4 or 5 building, HUD regulated, Loft Board regulated building, Mitchell Lama rental or coop, and in REM, etc.

Figure B1: Share of Rental Units as Percentage of All Housing Units (2002-2017)



Notes: The percentage of rental units in all housing units is calculated based on survey weight. *Source*: 2002, 2005, 2008, 2011, 2017 NYCHVS.

Figure B2: Share of Rent-Stabilized Units as Percentage of All Rental Units (2002-2017)



Notes: The percentage of rent-stabilized housing units in rental units (excl. occupying-rent-free units) is calculated based on survey weight. *Source*: 2002, 2005, 2008, 2011, 2017 NYCHVS.

Table B5: Summary Statistics of Household Characteristics

	Rent Stabilized		Private Market		Difference
	mean	sd	mean	sd	
Female	0.550	0.498	0.489	0.500	-0.061***
Age	46.393	16.088	41.784	14.430	-4.609***
White	0.362	0.480	0.437	0.496	0.076***
African American	0.220	0.415	0.203	0.402	-0.018***
Hispanic	0.320	0.467	0.219	0.414	-0.101***
AAPI	0.097	0.297	0.141	0.348	0.043***
Monthly Contract Rent	1.235	0.644	1.794	1.211	0.559***
Total Household Income	63.148	87.807	92.168	136.388	29.020***
Housing tenure	10.977	11.141	5.900	7.293	-5.076***
Observations	29076		21992		

Notes: Gender and race variables in row 1 and rows 3-6 are dummy variables. AAPI stands for Asian Americans and Pacific Islanders and also includes Native Americans and people of two or more races. Monthly contract rent and total household income are in thousand of 2017 U.S. dollars. Housing tenure is defined as the number of years that renters have lived in the same housing unit. Column 6 reports differences in the means between rent-stabilized and private market rental units. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix C Details on Estimated Rent Discounts

Table C6: Aggregate Rent Discounts in New York City

	2002	2005	2008	2011	2017
Aggregate Rent Discounts	5,432,240	4,346,699	4,709,602	3,955,050	5,069,231
Number of Stabilized Units	999,132	999,685	968,708	946,801	929,325

Note: Aggregate rent discounts are in thousands of 2017 USD and are computed as weighted sums of predicted market rents of each rent stabilized housing unit using sample weights. The number of rent-stabilized units are calculated using sample weights and exclude units with zero reported contract rents (these units are classified as "occupying rent free") and units with topcoded rents.

Table C7: Estimated Rent Discounts (2002)

	Mean	Median	SD	SE of Mean	N
	Panel A: Hedonic Models				
Baseline Model *a la* Olsen (1972)	0.6219	0.4464	0.7283	0.0101	5177
+ Extended Characteristics	0.6026	0.4375	0.6980	0.0097	5177
+ Unit Quality Issues	0.6040	0.4419	0.7010	0.0097	5177
+ Building Characteristics	0.5995	0.4400	0.7055	0.0098	5177
+ Neighborhood Characteristics	0.5880	0.4356	0.6963	0.0097	5177
+ Sub-borough FE	0.4680	0.3431	0.6357	0.0088	5177
	Panel B: Propensity Score Trimming				
P-Score Trimmed (≥ 0.1)	0.4641	0.3358	0.6372	0.0089	5159
P-Score Trimmed ($\in [0.1,0.9]$)	0.4681	0.3284	0.6535	0.0108	3691
P-Score Split (cutoff = 0.5)	0.4443	0.3384	0.6631	0.0092	5177
	Panel C: Repeated Rents				
Repeated Rents	0.3176	0.1371	0.6594	0.0420	246

Note: Data comes from 2002 NYCHVS. Sample contains only rent-stabilized and market rental units. Units with monthly contract rents of zeros and 3,500$ (the topcode value) are dropped.

The baseline model *a la* Olsen (1972) has the following controls: number of bedrooms and other rooms, overall building quality (sound, deteriorating, or dilapidated), year built, number of units in the building, number of stories interacted with elevator availability, and borough dummies.

Extended characteristics are: building owner presents; lease length; rent includes electricity, gas, other fuels; heating type; additional heating source; plumbing completeness; kitchen completeness.

Unit quality issues are: presence of mice and rats; exterminator service; cracks/holes in interior walls; holes in floors; broken plaster or peeling paint; water leakage; number of heat breakdown; toilet breakdown.

Building characteristics are: sidewalk to elevator without using steps; sidewalk to unit without using steps; any issue of building in terms of external walls, windows, stairs, floors.

Neighborhood characteristics are: presence of buildings with broken or boarded-up windows on the same street; self-rating of structures in neighborhood.

Propensity scores are estimated using logit regression of rent-stabilization dummy on all but three unit, building, and neighborhood characteristic in model shown in row 6. Year built, number of units, and number of stories in building are excluded from logit regression because they are determinants of rent-stabilization status. We then trim the sample by dropping housing units with propensity scores below certain thresholds (row 7& 8). We also split sample of market and rent-stabilized units into two sub-samples based propensity scores (row 9) and estimate Hedonic model for each sub-sample.

Table C8: Estimated Rent Discounts (2005)

	Mean	Median	SD	SE of Mean	N
	Panel A: Hedonic Models				
Baseline Model *a la* Olsen (1972)	0.5396	0.4002	0.6682	0.0094	5015
+ Extended Characteristics	0.5280	0.3997	0.6455	0.0091	5015
+ Unit Quality Issues	0.5247	0.4056	0.6411	0.0091	5015
+ Building Characteristics	0.5257	0.4066	0.6439	0.0091	5015
+ Neighborhood Characteristics	0.5183	0.4001	0.6388	0.0090	5015
+ Sub-borough FE	0.3765	0.2873	0.6064	0.0086	5015
	Panel B: Propensity Score Trimming				
P-Score Trimmed (≥ 0.1)	0.3720	0.2775	0.6061	0.0086	5004
P-Score Trimmed ($\in [0.1,0.9]$)	0.3893	0.2990	0.6061	0.0095	4085
P-Score Split (cutoff = 0.5)	0.3373	0.2501	0.6616	0.0093	5015
	Panel C: Repeated Rents				
Repeated Rents	0.4352	0.1947	0.8023	0.0407	389

Note: Data comes from 2005 NYCHVS. Sample contains only rent-stabilized and market rental units. Units with monthly contract rents of zeros and 3,500$ (the topcode value) are dropped.

The baseline model *a la* Olsen (1972) has the following controls: number of bedrooms and other rooms, overall building quality (sound, deteriorating, or dilapidated), year built, number of units in the building, number of stories interacted with elevator availability, and borough dummies.

Extended characteristics are: building owner presents; lease length; rent includes electricity, gas, other fuels; heating type; additional heating source; plumbing completeness; kitchen completeness.

Unit quality issues are: presence of mice and rats; exterminator service; cracks/holes in interior walls; holes in floors; broken plaster or peeling paint; water leakage; number of heat breakdown; toilet breakdown.

Building characteristics are: sidewalk to elevator without using steps; sidewalk to unit without using steps; any issue of building in terms of external walls, windows, stairs, floors.

Neighborhood characteristics are: presence of buildings with broken or boarded-up windows on the same street; self-rating of structures in neighborhood.

Propensity scores are estimated using logit regression of rent-stabilization dummy on all but three unit, building, and neighborhood characteristic in model shown in row 6. Year built, number of units, and number of stories in building are excluded from logit regression because they are determinants of rent-stabilization status. We then trim the sample by dropping housing units with propensity scores below certain thresholds (row 7& 8). We also split sample of market and rent-stabilized units into two sub-samples based propensity scores (row 9) and estimate Hedonic model for each sub-sample.

Table C9: Estimated Rent Discounts (2008)

	Mean	Median	SD	SE of Mean	N
	Panel A: Hedonic Models				
Baseline Model *a la* Olsen (1972)	0.5645	0.3960	0.7289	0.0100	5268
+ Extended Characteristics	0.5605	0.3987	0.7147	0.0098	5268
+ Unit Quality Issues	0.5450	0.3869	0.7159	0.0099	5268
+ Building Characteristics	0.5456	0.3926	0.7202	0.0099	5268
+ Neighborhood Characteristics	0.5277	0.3740	0.7181	0.0099	5268
+ Sub-borough FE	0.3871	0.2580	0.6834	0.0094	5268
	Panel B: Propensity Score Trimming				
P-Score Trimmed (≥ 0.1)	0.3876	0.2610	0.6842	0.0094	5263
P-Score Trimmed ($\in [0.1,0.9]$)	0.3874	0.2565	0.6905	0.0097	5024
P-Score Split (cutoff = 0.5)	0.4190	0.3136	0.7073	0.0097	5268

Note: Data comes from 2008 NYCHVS. Sample contains only rent-stabilized and market rental units. Units with monthly contract rents of zeros and 5,700$ (the topcode value) are dropped.

The baseline model *a la* Olsen (1972) has the following controls: number of bedrooms and other rooms, overall building quality (sound, deteriorating, or dilapidated), year built, number of units in the building, number of stories interacted with elevator availability, and borough dummies.

Extended characteristics are: building owner presents; lease length; rent includes electricity, gas, other fuels; heating type; additional heating source; plumbing completeness; kitchen completeness.

Unit quality issues are: presence of mice and rats; exterminator service; cracks/holes in interior walls; holes in floors; broken plaster or peeling paint; water leakage; number of heat breakdown; toilet breakdown.

Building characteristics are: sidewalk to elevator without using steps; sidewalk to unit without using steps; any issue of building in terms of external walls, windows, stairs, floors.

Neighborhood characteristics are: presence of buildings with broken or boarded-up windows on the same street; self-rating of structures in neighborhood.

Propensity scores are estimated using logit regression of rent-stabilization dummy on all but three unit, building, and neighborhood characteristic in model shown in row 6. Year built, number of units, and number of stories in building are excluded from logit regression because they are determinants of rent-stabilization status. We then trim the sample by dropping housing units with propensity scores below certain thresholds (row 7& 8). We also split sample of market and rent-stabilized units into two sub-samples based propensity scores (row 9) and estimate Hedonic model for each sub-sample.

Table C10: Estimated Rent Discounts (2011)

	Mean	Median	SD	SE of Mean	N
	Panel A: Hedonic Models				
Baseline Model *a la* Olsen (1972)	0.5615	0.4542	0.6180	0.0088	4911
+ Extended Characteristics	0.5309	0.4397	0.5925	0.0085	4911
+ Unit Quality Issues	0.5194	0.4296	0.6023	0.0088	4684
+ Building Characteristics	0.5238	0.4360	0.6012	0.0088	4684
+ Neighborhood Characteristics	0.5130	0.4197	0.6005	0.0088	4684
+ Sub-borough FE	0.3699	0.2843	0.5674	0.0083	4684
	Panel B: Propensity Score Trimming				
P-Score Trimmed (≥ 0.1)	0.3710	0.2868	0.5654	0.0083	4672
P-Score Trimmed ($\in [0.1,0.9]$)	0.3869	0.3044	0.5691	0.0086	4381
P-Score Split (cutoff = 0.5)	0.3708	0.3078	0.6052	0.0088	4684

Note: Data comes from 2011 NYCHVS. Sample contains only rent-stabilized and market rental units. Units with monthly contract rents of zeros and 4,800$ (the topcode value) are dropped.

The baseline model *a la* Olsen (1972) has the following controls: number of bedrooms and other rooms, overall building quality (sound, deteriorating, or dilapidated), year built, number of units in the building, number of stories interacted with elevator availability, and borough dummies.

Extended characteristics are: building owner presents; lease length; rent includes electricity, gas, other fuels; heating type; additional heating source; plumbing completeness; kitchen completeness.

Unit quality issues are: presence of mice and rats; exterminator service; cracks/holes in interior walls; holes in floors; broken plaster or peeling paint; water leakage; number of heat breakdown; toilet breakdown.

Building characteristics are: sidewalk to elevator without using steps; sidewalk to unit without using steps; any issue of building in terms of external walls, windows, stairs, floors.

Neighborhood characteristics are: presence of buildings with broken or boarded-up windows on the same street; self-rating of structures in neighborhood.

Propensity scores are estimated using logit regression of rent-stabilization dummy on all but three unit, building, and neighborhood characteristic in model shown in row 6. Year built, number of units, and number of stories in building are excluded from logit regression because they are determinants of rent-stabilization status. We then trim the sample by dropping housing units with propensity scores below certain thresholds (row 7& 8). We also split sample of market and rent-stabilized units into two sub-samples based propensity scores (row 9) and estimate Hedonic model for each sub-sample.

Table C11: Estimated Rent Discounts (2017)

	Mean	Median	SD	SE of Mean	N
	Panel A: Hedonic Models				
Baseline Model *a la* Olsen (1972)	0.6732	0.5789	0.7198	0.0115	3899
+ Extended Characteristics	0.6387	0.5566	0.6991	0.0112	3899
+ Unit Quality Issues	0.6227	0.5464	0.7042	0.0113	3899
+ Building Characteristics	0.6185	0.5459	0.7105	0.0114	3899
+ Neighborhood Characteristics	0.5998	0.5256	0.7062	0.0113	3899
+ Sub-borough FE	0.4518	0.3482	0.7016	0.0112	3899
	Panel B: Propensity Score Trimming				
P-Score Trimmed (≥ 0.1)	0.4501	0.3468	0.7022	0.0113	3892
P-Score Trimmed ($\in [0.1,0.9]$)	0.4757	0.3792	0.7106	0.0118	3610
P-Score Split (cutoff = 0.5)	0.4307	0.3420	0.7530	0.0121	3899

Note: Data comes from 2017 NYCHVS. Sample contains only rent-stabilized and market rental units. Units with monthly contract rents of zeros and 5,995$ (the topcode value) are dropped.

The baseline model *a la* Olsen (1972) has the following controls: number of bedrooms and other rooms, overall building quality (sound, deteriorating, or dilapidated), year built, number of units in the building, number of stories interacted with elevator availability, and borough dummies.

Extended characteristics are: building owner presents; lease length; rent includes electricity, gas, other fuels; heating type; additional heating source; plumbing completeness; kitchen completeness.

Unit quality issues are: presence of mice and rats; exterminator service; cracks/holes in interior walls; holes in floors; broken plaster or peeling paint; water leakage; number of heat breakdown; toilet breakdown.

Building characteristics are: sidewalk to elevator without using steps; sidewalk to unit without using steps; any issue of building in terms of external walls, windows, stairs, floors.

Neighborhood characteristics are: presence of buildings with broken or boarded-up windows on the same street; self-rating of structures in neighborhood.

Propensity scores are estimated using logit regression of rent-stabilization dummy on all but three unit, building, and neighborhood characteristic in model shown in row 6. Year built, number of units, and number of stories in building are excluded from logit regression because they are determinants of rent-stabilization status. We then trim the sample by dropping housing units with propensity scores below certain thresholds (row 7& 8). We also split sample of market and rent-stabilized units into two sub-samples based propensity scores (row 9) and estimate Hedonic model for each sub-sample.

Table C12: Robustness of Estimated Monthly Rent Discounts: Sensitivity to Data Cleaning Decisions

	Mean	Median	SD	SE of Mean	N
Panel A. Baseline Estimates					
All	0.4095	0.3034	0.6405	0.0041	24043
2002	0.4680	0.3431	0.6357	0.0088	5177
2005	0.3765	0.2873	0.6064	0.0086	5015
2008	0.3871	0.2580	0.6834	0.0094	5268
2011	0.3699	0.2843	0.5674	0.0083	4684
2017	0.4518	0.3482	0.7016	0.0112	3899
Panel B. Add Top-Coded Units					
All	0.3948	0.2614	0.7738	0.0050	24095
2002	0.4816	0.3137	0.7882	0.0109	5189
2005	0.3421	0.2166	0.7340	0.0104	5027
2008	0.3831	0.2302	0.7813	0.0108	5275
2011	0.3240	0.2319	0.7106	0.0104	4692
2017	0.4482	0.3261	0.8488	0.0136	3912
Panel C. Full Characteristics					
All	0.4101	0.3135	0.6366	0.0054	13763
2002	0.4854	0.3553	0.6746	0.0119	3211
2005	0.3610	0.3069	0.5693	0.0105	2951
2008	0.3743	0.2580	0.6534	0.0134	2374
2011	0.3850	0.2911	0.5682	0.0107	2816
2017	0.4344	0.3361	0.7076	0.0144	2411

Note: Monthly rent discounts are defined as percentage of contract rent and are estimated using the hedonic model described in Section 4, using the specification in row 6 of Table 1 and includes extended unit characteristics, unit quality issues, building characteristics, neighborhood characteristics, and sub-borough FE. All variables are discretized to allow for non-linearities in characteristics hedonic prices.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS.

Table C13: The Evolution of Estimated Monthly Rent Discounts (% of Contract Rent) Over Time

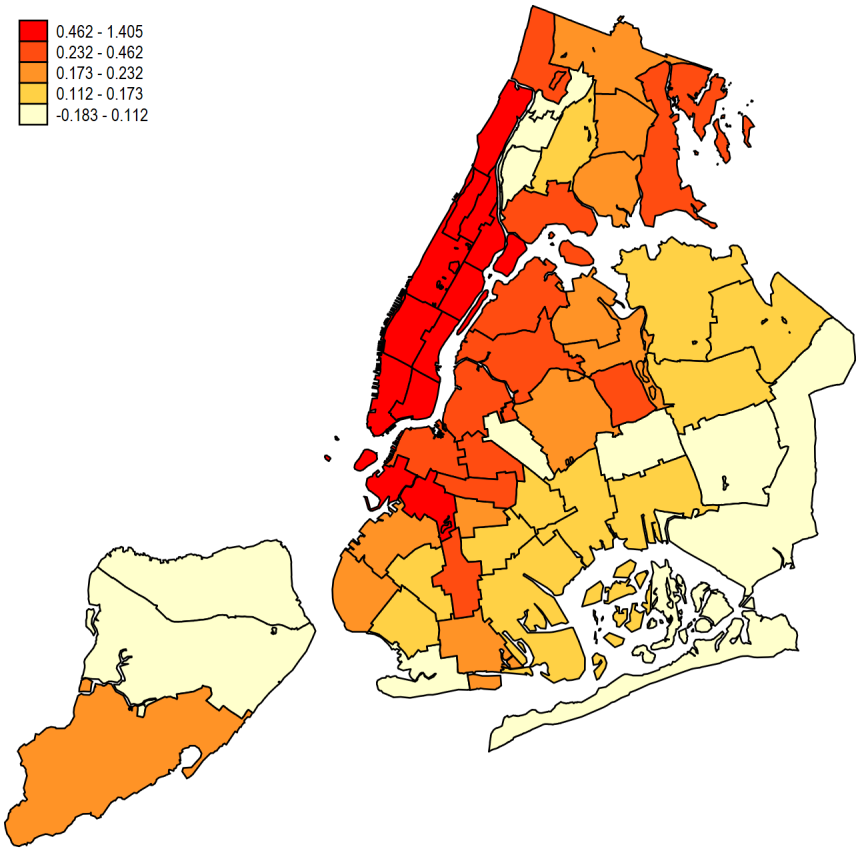
Year	Mean	Median	SD	SE of Mean	N
All	0.5330	0.2631	0.9435	0.0061	24043
2002	0.6205	0.3306	0.9871	0.0137	5177
2005	0.5369	0.2560	0.9827	0.0139	5015
2008	0.5315	0.2361	0.9964	0.0137	5268
2011	0.4421	0.2358	0.7779	0.0114	4684
2017	0.5228	0.2634	0.9305	0.0149	3899

Note: Monthly rent discounts are defined as fraction of contract rent and are estimated using the hedonic model described in Section 4, using the specification in row 6 of Table 1 and includes extended unit characteristics, unit quality issues, building characteristics, neighborhood characteristics, and sub-borough FE. All variables are discretized to allow for non-linearities in characteristics hedonic prices. Units with top and bottom 1% of predicted rent discounts were winsorized.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS.

Appendix C.1 Spatial Distribution of Rent Discounts

Figure C3: Spatial Distribution of Average Rent Discounts in NYC



Notes: Sub-borough average monthly rent discounts shown in map are in thousand 2017 US$. Monthly rent discounts are estimated using the hedonic model shown in Row 6 of Table 1.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS.

Appendix C.1.1 Common Support of Propensity Score

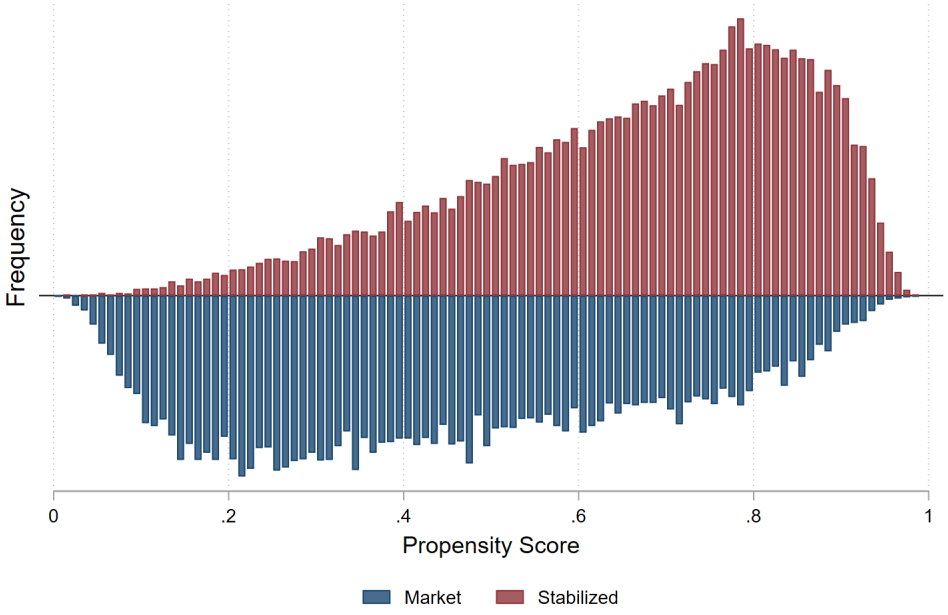


Figure C4: Balance of Propensity Score (2002-2017)

Notes: Propensity scores are estimated using a logit model (see Section 4 for details). The logit model regresses rent stabilization dummy on all but three housing characteristics shown in row 6 of Table 1. The three excluded housing characteristic variables are buildings' year of construction, number of units, and number of stories. These three variables are excluded because they are the institutional selection criteria for rent stabilization (see Section 3.1 for details), and thus adding them would significantly reduce the overlap in propensity scores between private market and rent-stabilized housing units (i.e., the shrinkage of common support). *Source*: 2002, 2005, 2008, 2011, and 2017 NYCHVS.

Appendix C.2 Exploiting the Longitudinal Structure

Table C14: Transition Table: Regulation Status of Previously Rent-Stabilized Units

	2002-2005		2005-2008	
	Freq.	Pct.	Freq.	Pct.
Owner occupied conventional	8	0.16	11	0.23
Owner occupied private cooperative	105	2.14	144	2.99
Owner occupied condo	14	0.28	24	0.50
Vacant not available	115	2.34	139	2.89
Vacant for sale conventional	0	0.00	1	0.02
Vacant for sale private coop	5	0.10	5	0.10
Vacant for sale condo	3	0.06	4	0.08
Vacant for rent	121	2.46	100	2.08
Private Market	280	5.69	424	8.81
Stabilized	4126	83.90	3846	79.93
Controlled	22	0.45	33	0.69
Public housing	32	0.65	69	1.43
Other regulated	87	1.77	12	0.25
Total	4918	100.00	4812	100.00

Note: Other regulated units include HUD regulated, Mitchell Lama rental, Mitchell Lama cooperative, Loft Board Regulating Building, and in Rem. Total does not include none-interview units.

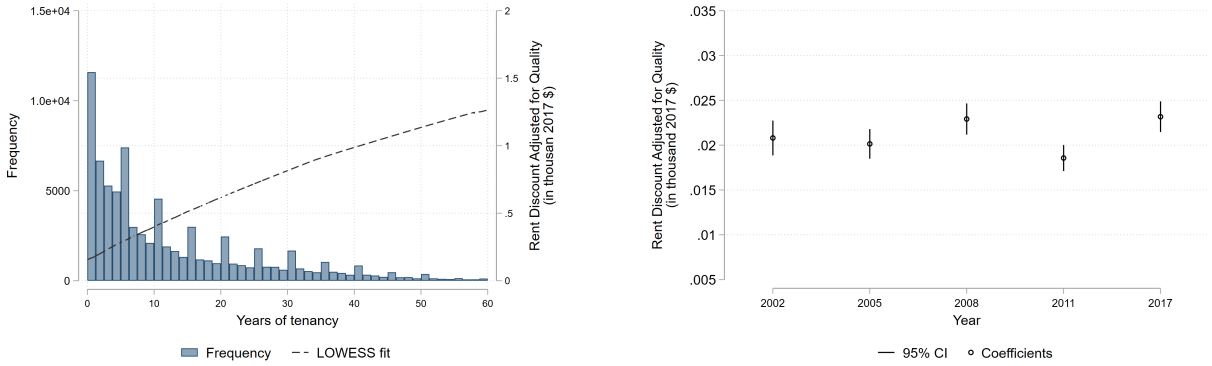
Table C15: Implicit Rent Discounts Based on Panels of Deregulated Units

	Mean	Median	SD	SE of Mean	N
2002-2005	0.3176	0.1371	0.6594	0.0420	246
2005-2008	0.4352	0.1947	0.8023	0.0407	389
All	0.3897	0.1727	0.7518	0.0298	635

Note: Implicit rent discounts are calculated as increases in monthly contract rent (in 2017 USD) of recently deregulated rental units. Deregulated units are occupied rental units that were rent-stabilized in a previous survey but became market units in the next survey. 34 and 35 deregulated units in 2002-2005 and 2005-2008 are dropped, because they report zero or top-coded rents.

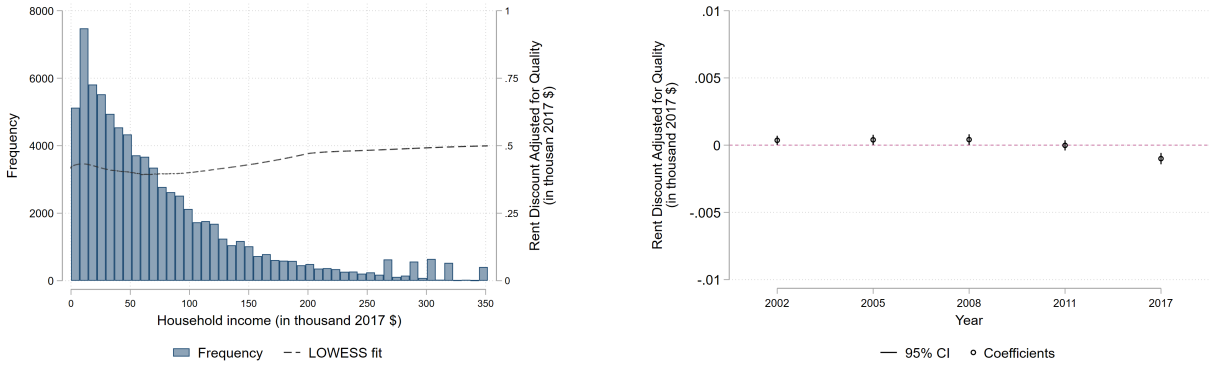
Appendix D Details and Robustness on the Stylized Facts between Rent Discounts, Housing Tenure, Household Income, and Geography

Figure D5: Rent Discounts and Housing Tenure



Notes: Dependent variable is estimated rent discount in thousand 2017 US dollars and estimated using the linear model with extended housing characteristics, Sub-borough FE, and all discretized variables, as shown in row 6 of Table 1. LOWESS fit plot is created using pooled data from the 2002, 2005, 2008, 2011, and 2017 NYCHVS. Bandwidth is 0.8.

Figure D6: Rent Discounts and Household Income



Notes: Dependent variable is estimated rent discount in thousand 2017 US dollars and estimated using the linear model with extended housing characteristics, Sub-borough FE, and all discretized variables, as shown in row 6 of Table 1. LOWESS fit plot is created using pooled data from the 2002, 2005, 2008, 2011, and 2017 NYCHVS. Bandwidth is 0.8.

Table D16: Robustness of the Relationship between Rent Discounts and Housing Tenure, Income, and Geography: Adding Top-Coded Units

	Dependent Variable: Monthly Rent Discount (in thousand 2017$)					
	All	2002	2005	2008	2011	2017
	Panel A: Housing Tenure					
Tenancy	0.025***	0.025***	0.024***	0.024***	0.023***	0.027***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.129***	0.228***	0.096***	0.131***	0.070***	0.097***
	(0.006)	(0.015)	(0.013)	(0.014)	(0.013)	(0.017)
	Panel B: Total Household Income					
Total household income	0.001***	0.001***	0.001***	0.001**	0.001**	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	Panel C: Geography					
Bronx	0.092***	0.200***	0.064***	0.082***	-0.000	0.122***
	(0.007)	(0.013)	(0.014)	(0.013)	(0.014)	(0.018)
Brooklyn	0.173***	0.130***	0.057***	0.174***	0.171***	0.347***
	(0.007)	(0.013)	(0.013)	(0.013)	(0.014)	(0.020)
Manhattan	0.995***	1.122***	0.929***	0.997***	0.897***	1.003***
	(0.011)	(0.022)	(0.021)	(0.025)	(0.023)	(0.034)
Queens	0.133***	0.144***	0.058***	0.105***	0.115***	0.284***
	(0.007)	(0.014)	(0.013)	(0.013)	(0.016)	(0.022)
Staten Island	0.061*	0.070	0.136	0.103	0.074	-0.074
	(0.033)	(0.057)	(0.085)	(0.075)	(0.064)	(0.085)
$\overline{Y}$	0.395	0.482	0.342	0.383	0.324	0.448
N	24095	5189	5027	5275	4692	3912

Note: The dependent variable, monthly rent discount, is estimated using the hedonic model shown in row 6 of Table 1. In Panel A, Housing tenure is measured in years and is defined as the length of a household's stay in the same rent-stabilized units; the constant term measures average monthly rent discounts of households with tenure of zero (i.e. those who moved in less than a year at the time of the survey). In Panel B, total annual household income is in thousand 2017 US dollars. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS. Units with zero monthly contract rents were dropped. Units with top-coded contract rents are added for robustness check. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017.

Table D17: Robustness of the Relationship between Rent Discounts and Housing Tenure, Income, and Geography: Using A Sub-Sample of Units with Full Housing Characteristics

	Dependent Variable: Monthly Rent Discount (in thousand 2017$)					
	All	2002	2005	2008	2011	2017
	Panel A: Housing Tenure					
Housing Tenure	0.021***	0.022***	0.018***	0.023***	0.019***	0.024***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.157***	0.240***	0.145***	0.117***	0.150***	0.101***
	(0.007)	(0.016)	(0.014)	(0.017)	(0.013)	(0.018)
	Panel B: Total Household Income					
Total household income	0.000	0.001***	-0.000	0.000	0.000	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	Panel C: Geography					
Bronx	0.177***	0.237***	0.163***	0.165***	0.138***	0.176***
	(0.007)	(0.014)	(0.015)	(0.019)	(0.013)	(0.018)
Brooklyn	0.234***	0.227***	0.189***	0.239***	0.206***	0.317***
	(0.008)	(0.015)	(0.015)	(0.017)	(0.015)	(0.022)
Manhattan	0.894***	1.005***	0.777***	0.832***	0.903***	0.926***
	(0.012)	(0.025)	(0.024)	(0.031)	(0.022)	(0.034)
Queens	0.201***	0.223***	0.179***	0.131***	0.211***	0.263***
	(0.008)	(0.016)	(0.015)	(0.017)	(0.017)	(0.023)
Staten Island	0.111***	0.046	0.290***	0.132*	0.258***	-0.046
	(0.036)	(0.066)	(0.099)	(0.080)	(0.056)	(0.082)
$\overline{Y}$	0.403	0.474	0.350	0.372	0.380	0.432
N	14062	3236	2957	2475	2870	2524

Note: The dependent variable, monthly rent discount, is estimated using the hedonic model shown in row 6 of Table 1. In Panel A, Housing tenure is measured in years and is defined as the length of a household's stay in the same rent-stabilized units; the constant term measures average monthly rent discounts of households with tenure of zero (i.e. those who moved in less than a year at the time of the survey). In Panel B, total annual household income is in thousand 2017 US dollars. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS. Only units with non-missing and reported values for all housing characteristic variables are used. In addition, units with zero and top-coded monthly contract rents were dropped. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017.

Table D18: Robustness of the Relationship between Rent Discounts and Housing Tenure, Income, and Geography: Rent Discounts as Fractions of Contract Rents

	Dependent Variable: Monthly Rent Discount (% of Contract Rent)					
	All	2002	2005	2008	2011	2017
	Panel A: Housing Tenure					
Housing Tenure	0.018***	0.020***	0.015***	0.018***	0.017***	0.021***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.269***	0.317***	0.258***	0.260***	0.255***	0.237***
	(0.007)	(0.016)	(0.014)	(0.017)	(0.012)	(0.017)
	Panel B: Total Household Income					
Total household income	0.001***	0.001***	0.000	0.001***	0.001***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	Panel C: Geography					
Bronx	0.297***	0.427***	0.325***	0.252***	0.217***	0.263***
	(0.009)	(0.021)	(0.021)	(0.018)	(0.017)	(0.019)
Brooklyn	0.351***	0.349***	0.292***	0.376***	0.315***	0.429***
	(0.008)	(0.018)	(0.019)	(0.020)	(0.015)	(0.020)
Manhattan	0.924***	0.965***	0.917***	0.990***	0.862***	0.845***
	(0.012)	(0.024)	(0.026)	(0.028)	(0.025)	(0.032)
Queens	0.250***	0.274***	0.206***	0.230***	0.227***	0.333***
	(0.007)	(0.015)	(0.014)	(0.016)	(0.015)	(0.020)
Staten Island	0.318***	0.294***	0.472***	0.297**	0.288**	0.245
	(0.064)	(0.111)	(0.180)	(0.138)	(0.122)	(0.158)
$\overline{Y}$	0.491	0.557	0.485	0.497	0.429	0.476
N	23540	5058	4902	5144	4623	3813

Note: The dependent variable is monthly rent discount as a fraction of contraction rent (i.e., rent discounts divided by contract rents). Monthly rent discounts are estimated using the hedonic model shown in row 6 of Table 1. In Panel A, Housing tenure is measured in years and is defined as the length of a household's stay in the same rent-stabilized units; the constant term measures average monthly rent discounts of households with tenure of zero (i.e. those who moved in less than a year at the time of the survey). In Panel B, total annual household income is in thousand 2017 US dollars. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS. Units with zero and top-coded monthly contract rents were dropped. The top-coded monthly contract rents are \$3500 in 2002, \$3500 in 2005, \$5700 in 2008, \$4800 in 2011; \$5500 in 2014; and \$5995 in 2017.

Table D19: Robustness of the Relationship between Housing Tenure, Income, Geography and Rent Discounts: Drop Units with Significantly Negative Discounts

	Dependent Variable: Monthly Rent Discount (in thousand 2017$)					
	All	2002	2005	2008	2011	2017
	Panel A: Housing Tenure					
Housing Tenure	0.018***	0.019***	0.017***	0.019***	0.016***	0.020***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.295***	0.328***	0.273***	0.292***	0.276***	0.301***
	(0.005)	(0.011)	(0.011)	(0.012)	(0.009)	(0.014)
	Panel B: Total Household Income					
Total household income	0.001***	0.001***	0.001***	0.001***	0.000***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	Panel C: Geography					
Bronx	0.256***	0.293***	0.265***	0.225***	0.209***	0.295***
	(0.005)	(0.009)	(0.011)	(0.011)	(0.010)	(0.014)
Brooklyn	0.321***	0.264***	0.234***	0.309***	0.326***	0.485***
	(0.005)	(0.010)	(0.010)	(0.011)	(0.010)	(0.016)
Manhattan	0.971***	1.002***	0.890***	1.040***	0.898***	1.045***
	(0.008)	(0.017)	(0.016)	(0.020)	(0.016)	(0.026)
Queens	0.273***	0.262***	0.219***	0.246***	0.279***	0.388***
	(0.005)	(0.010)	(0.010)	(0.011)	(0.011)	(0.016)
Staten Island	0.208***	0.147***	0.276***	0.254***	0.223***	0.156**
	(0.027)	(0.045)	(0.070)	(0.063)	(0.049)	(0.068)
$\overline{Y}$	0.501	0.522	0.461	0.503	0.463	0.568
N	21868	4877	4533	4709	4231	3518

Note: The dependent variable, monthly rent discounts, is estimated using the hedonic model shown in row 6 of Table 1. In Panel A, Housing tenure is measured in years and is defined as the length of a household's stay in the same rent-stabilized units; the constant term measures average monthly rent discounts of households with tenure of zero (i.e. those who moved in less than a year at the time of the survey). In Panel B, total annual household income is in thousand 2017 US dollars. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS. Units with significantly negative rent discounts are dropped. Units with zero and top-coded monthly contract rents were dropped. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017.

Table D20: Robustness of the Relationship between Housing Tenure, Income, Geography and Rent Discounts: Panel Data

	2002-2005	2005-2008	All
	Panel A: Housing Tenure		
Housing Tenure	0.018***	0.033***	0.027***
	(0.006)	(0.006)	(0.004)
Constant	0.188***	0.194***	0.186***
	(0.054)	(0.040)	(0.032)
	Panel B: Total Household Income		
Total household income	-0.001	0.000	-0.001
	(0.001)	(0.001)	(0.001)
	Panel C: Geography		
Bronx	0.018	-0.012	-0.004
	(0.083)	(0.049)	(0.042)
Brooklyn	0.011	0.078	0.051
	(0.056)	(0.055)	(0.040)
Manhattan	0.516***	0.725***	0.644***
	(0.064)	(0.060)	(0.045)
Queens	0.098*	0.063	0.077*
	(0.050)	(0.057)	(0.040)
Staten Island	0.295	-0.113	0.091
	(0.347)	(0.255)	(0.230)
N	246	389	635

Note: OLS regression results of monthly rent discounts on housing tenure, household income, and borough dummies are reported in Panels A-C above. The dependent variable, monthly rent discounts, is calculated as changes in monthly contract rents (in thousand 2017$) of de-regulated units (see Section 4 for details). Deregulated units are occupied rental units that were rent-stabilized in a previous survey but became market units in the next survey.

Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002 and 2005 NYCHVS. Sample includes 635 recently deregulated rental units. Trimming of outliers are done by dropping units with top and bottom 1% of rent discounts, zero monthly contract rent, or top-coded rents. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017.

Appendix E Details and Robustness of Relationship between Rent Discounts and Race

Table E21: Summary Statistics of Rent Discounts by Race

	White	African American	Hispanic	Asian & Others
Monthly avg. rent discount	0.536	0.287	0.284	0.412
	(0.778)	(0.605)	(0.597)	(0.732)
Rent discount (% of contract rent)	0.538	0.486	0.465	0.491
	(1.045)	(1.564)	(1.539)	(1.158)
N	8484	5254	7648	2229

Note: Average monthly rent discount in 2017 US dollars and are estimated using model shown in Row 6 of Table 1 by pooling the 2002, 2005, 2008, 2011 and 2017 waves of NYCHVS. In the second row, rent discounts are normalized by dividing them by monthly contract rents. Standard deviations are reported in parentheses. Units with the top and bottom 1% of predicted monthly rent discounts are dropped to aviod outliers.

Table E22: Summary Statistics of Rent Discounts by Education

	High Skill	Low Skill
Monthly avg. rent discount	0.502	0.322
	(0.764)	(0.638)
Rent discount (% of contract rent)	0.483	0.507
	(1.173)	1.446
N	8576	15039

Note: Average monthly rent discount in 2017 US dollars and are estimated using model shown in Row 6 of Table 1 by pooling the 2002, 2005, 2008, 2011 and 2017 waves of NYCHVS. In the second row, rent discounts are normalized by dividing them by monthly contract rents. Standard deviations are reported in parentheses. Units with the top and bottom 1% of predicted monthly rent discounts are dropped to aviod outliers.

Table E23: Summary Statistics of Rent Discounts by Race and Education

	White		Non-White	
	High Skill	Low Skill	High Skill	Low Skill
Monthly avg. rent discount	0.601	0.435	0.354	0.289
	(0.814)	(0.708)	(0.657)	(0.612)
Rent discount (% of contract rent)	0.528	0.554	0.416	0.494
	(0.892)	(1.242)	(1.495)	(1.499)
N	5131	3353	3445	11686

Note: Average monthly rent discount in 2017 US dollars and are estimated using model shown in Row 6 of Table 1 by pooling the 2002, 2005, 2008, 2011 and 2017 waves of NYCHVS. In the second row, rent discounts are normalized by dividing them by monthly contract rents. Standard deviations are reported in parentheses. Units with the top and bottom 1% of predicted monthly rent discounts are dropped to aviod outliers.

Table E24: Robustness of Racial Inequality in Estimated Rent Discounts over Time: Adding Top-coded Units

	Dependent Variable: Monthly Rent Discounts (in thousand 2017$)					
	All	2002	2005	2008	2011	2017
African American	-0.222***	-0.357***	-0.256***	-0.281***	-0.108***	-0.045
	(0.013)	(0.027)	(0.027)	(0.028)	(0.028)	(0.037)
Hispanic	-0.220***	-0.285***	-0.211***	-0.282***	-0.159***	-0.115***
	(0.012)	(0.026)	(0.025)	(0.027)	(0.026)	(0.033)
AAPI	-0.083***	-0.079	-0.072*	-0.168***	-0.076*	0.040
	(0.020)	(0.049)	(0.042)	(0.042)	(0.039)	(0.049)
Constant	0.523***	0.655***	0.471***	0.555***	0.408***	0.491***
	(0.009)	(0.020)	(0.019)	(0.022)	(0.020)	(0.025)
N	24095	5189	5027	5275	4692	3912

Note: Above are OLS regression results of monthly rent discounts on African American, Hispanic, APPI (Asian American and Pacific Islanders) dummies. AAPI also includes small numbers of Native Americans and people who reported two or more races. The Dependent variable, monthly rent discounts, is in thousand 2017 US dollars and is estimated using the model in row 6 of Table 1. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS. Housing units with zero rents are dropped. Units with top-coded contract rents are added for robustness check. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017.

Table E25: Robustness of Racial Inequality in Estimated Rent Discounts over Time: Using A Sub-Sample of Units with Full Housing Characteristics

	Dependent Variable: Monthly Rent Discounts (in thousand 2017$)					
	All	2002	2005	2008	2011	2017
African American	-0.147***	-0.239***	-0.162***	-0.174***	-0.084***	-0.044
	(0.014)	(0.030)	(0.028)	(0.034)	(0.029)	(0.038)
Hispanic	-0.144***	-0.234***	-0.101***	-0.197***	-0.104***	-0.050
	(0.013)	(0.028)	(0.025)	(0.033)	(0.026)	(0.035)
AAPI	-0.048**	0.004	-0.060	-0.112**	-0.100**	0.052
	(0.023)	(0.054)	(0.043)	(0.052)	(0.046)	(0.056)
Constant	0.491***	0.605***	0.427***	0.490***	0.446***	0.454***
	(0.010)	(0.022)	(0.020)	(0.026)	(0.020)	(0.026)
N	14062	3236	2957	2475	2870	2524

Note: Above are OLS regression results of monthly rent discounts on African American, Hispanic, APPI (Asian American and Pacific Islanders) dummies. AAPI also includes small numbers of Native Americans and people who reported two or more races. The Dependent variable, monthly rent discounts, is in thousand 2017 US dollars and is estimated using the model in row 6 of Table 1. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS. Only units with non-missing and reported values for all housing characteristic variables are used. In addition, units with zero and top-coded monthly contract rents were dropped. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017.

Table E26: Robustness of Racial Inequality in Estimated Rent Discounts over Time: Rent Discounts as Fraction of Contract Rents

	Dependent Variable: Monthly Rent Discounts (% Contract Rents)					
	All	2002	2005	2008	2011	2017
African American	-0.021	-0.058*	-0.012	-0.133***	0.080***	0.063*
	(0.014)	(0.031)	(0.034)	(0.031)	(0.028)	(0.034)
Hispanic	-0.019	0.007	0.011	-0.117***	0.020	0.009
	(0.012)	(0.028)	(0.028)	(0.029)	(0.024)	(0.029)
AAPI	-0.024	0.025	-0.016	-0.149***	0.023	0.050
	(0.020)	(0.048)	(0.045)	(0.043)	(0.039)	(0.046)
Constant	0.505***	0.577***	0.497***	0.568***	0.397***	0.451***
	(0.008)	(0.018)	(0.018)	(0.020)	(0.015)	(0.019)
N	23536	5060	4889	5147	4628	3812

Note: The Dependent variable is monthly rent discount as a fraction of contraction rent (i.e., rent discounts divided by contract rents). Monthly rent discount is estimated using the model in row 6 of Table 1. Shown above are OLS regression results on African American, Hispanic, APPI (Asian American and Pacific Islanders) dummies. AAPI also includes small numbers of Native Americans and people who reported two or more races. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS. Housing units with zero and top-coded rents are dropped. The top-coded monthly contract rents are \$3500 in 2002, \$3500 in 2005, \$5700 in 2008, \$4800 in 2011; \$5500 in 2014; and \$5995 in 2017.

Table E27: Robustness of Racial Inequality in Estimated Rent Discounts over Time: Drop Units with Significantly Negative Discounts

	Dependent Variable: Monthly Rent Discounts (in thousand 2017$)					
	All	2002	2005	2008	2011	2017
African American	-0.192***	-0.267***	-0.191***	-0.310***	-0.077***	-0.073**
	(0.010)	(0.021)	(0.021)	(0.023)	(0.021)	(0.029)
Hispanic	-0.181***	-0.223***	-0.160***	-0.291***	-0.094***	-0.103***
	(0.010)	(0.020)	(0.019)	(0.023)	(0.019)	(0.026)
AAPI	-0.069***	-0.012	-0.068**	-0.212***	-0.016	-0.013
	(0.016)	(0.040)	(0.034)	(0.037)	(0.031)	(0.041)
Constant	0.609***	0.653***	0.559***	0.689***	0.513***	0.620***
	(0.007)	(0.015)	(0.015)	(0.018)	(0.014)	(0.019)
N	21868	4877	4533	4709	4231	3518

Note: *Note*: Shown above are OLS regression results of monthly rent discounts on African American, Hispanic, APPI (Asian American and Pacific Islanders) dummies. AAPI also includes small numbers of Native Americans and people who reported two or more races. The Dependent variable, monthly rent discounts, is in thousand 2017 US dollars and is estimated using the model in row 6 of Table 1. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002, 2005, 2008, 2011, and 2017 NYCHVS. Housing units with zero and top-coded rents are dropped. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017. Units with statistically negative rent discounts are dropped.

Table E28: Robustness of Racial Inequality in Estimated Rent Discounts over Time: Repeated Rents Approach

	Dependent Variable: Monthly Rent Discounts (in thousand 2017$)		
	2002-2005	2005-2008	All
African American	-0.089	-0.263**	-0.194**
	(0.117)	(0.118)	(0.084)
Hispanic	-0.319***	-0.327***	-0.318***
	(0.088)	(0.114)	(0.079)
AAPI	-0.075	-0.277***	-0.198**
	(0.133)	(0.100)	(0.079)
Constant	0.384***	0.560***	0.490***
	(0.059)	(0.057)	(0.042)
N	246	389	635

Note: Shown above are OLS regression results of monthly rent discounts on African American, Hispanic, APPI (Asian American and Pacific Islanders) dummies. AAPI also includes small numbers of Native Americans and people who reported two or more races.

Dependent variable, monthly rent discounts, is calculated as changes in monthly contract rents (in thousand 2017$) of de-regulated units (see Section 4 for details). Deregulated units are occupied rental units that were rent-stabilized in a previous survey but became market units in the next survey.

Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002 and 2005 NYCHVS. Sample includes 635 recently deregulated rental units. Trimming of outliers are done by dropping units with top and bottom 1% of rent discounts, zero monthly contract rent, or top-coded rents. The top-coded monthly contract rents are $3500 in 2002, $3500 in 2005, $5700 in 2008, $4800 in 2011; $5500 in 2014; and $5995 in 2017.

Appendix E.1 Details on Rent Discount and Policy Awareness

Table E29: Legal Status versus Self-Reported Regulation Status

Self-Reported Status	Legal Status		
	Private	Rent Stabilized	Total
Rent-controlled	70	474	544
	1.79%	8.60%	5.77%
Rent Stabilized	136	1409	1545
	3.48%	25.55%	16.40%
Private	2317	1338	3655
	59.29%	24.27%	38.79%
Don't Know	621	1198	1819
	15.89%	21.73%	19.31%
Not Reported	764	1095	1859
	19.55%	19.86%	19.73%
Total	3908	5514	9422
	100.00%	100.00%	100.00%

Notes: Data comes from pooled 2002 and 2005 waves of the New York City Housing and Vacancy Survey (NYCHVS). The difference between legal status and self-reported regulation status is first studied in Jiang et al. (2022).

Table E30: Summary Statistics of Household Characteristics by Awareness

	Correctly Aware		Incorrectly Aware		Difference
	mean	sd	mean	sd	
Female	0.571	0.495	0.554	0.497	0.018
Age	48.035	16.423	42.758	14.667	5.277***
White	0.490	0.500	0.276	0.447	0.214***
African American	0.182	0.386	0.227	0.419	-0.045***
Hispanic	0.265	0.441	0.393	0.489	-0.128***
APPI	0.063	0.244	0.103	0.304	-0.040***
Monthly Contract Rent	1.120	0.525	1.185	0.670	-0.065***
Monthly Rent Discount	0.602	0.668	0.273	0.553	0.330***
Total Household Income	70.327	98.217	61.479	75.008	8.849***
Housing tenure	13.297	11.506	8.196	8.331	5.102***
Observations	3869		2326		

Note: Gender and race variables in row 1 and rows 3-6 are dummy variables. AAPI stands for Asian Americans and Pacific Islanders and also includes Native Americans and people of two or more races. Monthly contract rent, rent discount, and total household income are in thousand of 2017 U.S. dollars. Rent discounts are estimated using hedonic model shown in row 6 of Table 1. Housing tenure is defined as the number of years that renters have lived in the same housing unit. Column 6 reports differences in the means between rent-stabilized and private market rental units. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: 2002 and 2005 NYCHVS.

Table E31: Summary of Rent Discounts as Fraction of Contract Rents by Awareness

	Correctly Aware			Incorrectly Aware		
	Avg. Discount	N	Pct.	Avg. Discount	N	Pct.
White	0.701	1876	49.34	0.324	615	27.25
African American	0.647	686	18.04	0.406	517	22.91
Hispanic	0.733	999	26.28	0.418	890	39.43
AAPI	0.847	241	6.34	0.384	235	10.41
Total	0.709	3802	100	0.386	2257	100

Note: Relative measure of rent discounts shown above is computed by dividing monthly rent discounts by monthly contract rents. Monthly rent discounts are estimated using the hedonic model shown in row 6 of Table 1. AAPI stands for Asian Americans and Pacific Islanders and also includes Native Americans and people of two or more races.

Source: 2002 and 2005 NYCHVS.

Table E32: Who lives in Rent Stabilized Units: Relationship between Rent Regulation Status and Household Characteristics (All Housing Units)

	Dependent Variable: Rent Stabilization Dummy					
	All	2002	2005	2008	2011	2017
Female	-0.016***	-0.002	-0.019**	-0.016**	-0.021***	-0.020**
	(0.003)	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)
Age	-0.004***	-0.005***	-0.004***	-0.003***	-0.004***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
African American	-0.002	-0.031***	-0.013	0.012	0.009	0.021*
	(0.004)	(0.010)	(0.010)	(0.009)	(0.010)	(0.011)
Hispanic	0.118***	0.126***	0.123***	0.128***	0.104***	0.109***
	(0.005)	(0.011)	(0.011)	(0.010)	(0.010)	(0.011)
Asian and others	-0.011**	-0.011	-0.000	-0.010	-0.010	-0.018
	(0.005)	(0.013)	(0.013)	(0.011)	(0.011)	(0.012)
College & above	0.024***	0.048***	0.045***	0.023***	0.010	0.004
	(0.004)	(0.009)	(0.009)	(0.008)	(0.008)	(0.009)
Married	-0.043***	-0.057***	-0.042***	-0.031***	-0.046***	-0.042***
	(0.004)	(0.009)	(0.009)	(0.008)	(0.009)	(0.010)
Number of children	0.006	0.003	0.008	-0.006	0.008	0.018*
	(0.004)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)
Household size	-0.026***	-0.030***	-0.025***	-0.025***	-0.024***	-0.024***
	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Household income	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.623***	0.704***	0.665***	0.548***	0.635***	0.565***
	(0.008)	(0.018)	(0.018)	(0.016)	(0.017)	(0.020)
R-square	0.062	0.078	0.070	0.053	0.067	0.052
N	77886	15662	15363	17757	16115	12989

Note: The data come from the 2002, 2005, 2008, 2011, and 2017 waves of NYCHVS. Dependent variable of the linear probability model shown in panels above is rent stabilization dummy. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table E33: Who lives in Rent Stabilized Units: Relationship between Rent Regulation Status and Household Characteristics (Only Rental Units)

	Dependent Variable: Rent Stabilization Dummy					
	All	2002	2005	2008	2011	2017
Female	-0.008*	0.006	-0.001	-0.009	-0.015	-0.019*
	(0.005)	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)
Age	-0.001***	-0.002***	-0.001***	-0.000	-0.001***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
African American	-0.054***	-0.086***	-0.070***	-0.039***	-0.039***	-0.022
	(0.006)	(0.013)	(0.014)	(0.013)	(0.013)	(0.015)
Hispanic	0.045***	0.051***	0.045***	0.065***	0.038***	0.037**
	(0.006)	(0.013)	(0.014)	(0.013)	(0.013)	(0.015)
Asian and others	-0.029***	-0.039**	-0.021	-0.022	-0.015	-0.032*
	(0.008)	(0.019)	(0.018)	(0.017)	(0.017)	(0.018)
College & above	0.041***	0.066***	0.065***	0.043***	0.028**	0.021
	(0.005)	(0.013)	(0.012)	(0.011)	(0.012)	(0.013)
Married	0.021***	-0.000	0.020	0.038***	0.014	0.026**
	(0.006)	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)
Number of children	-0.002	0.003	0.012	-0.019*	-0.008	0.008
	(0.005)	(0.011)	(0.012)	(0.011)	(0.011)	(0.013)
Household size	-0.024***	-0.028***	-0.027***	-0.020***	-0.022***	-0.022***
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Household income	-0.000***	-0.000	-0.000**	-0.000***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.564***	0.643***	0.592***	0.484***	0.580***	0.476***
	(0.010)	(0.023)	(0.023)	(0.022)	(0.023)	(0.026)
R-square	0.013	0.025	0.017	0.012	0.014	0.013
N	52855	10624	10341	11932	11056	8902

Note: The data come from the 2002, 2005, 2008, 2011, and 2017 waves of NYCHVS. Dependent variable of the linear probability model shown in panels above is rent stabilization dummy. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.