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Rent Control and Housing Investment: Evidence from Deregulation in Cambridge, Massachusetts

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EXECUTIVE SUMMARY

Traditional economic analysis suggests that when price controls (rent regulation) are imposed on housing stock, housing quality declines over time because landlords are unable to recoup their investment and routine maintenance costs.

Conversely, rent *deregulation* should lead to significant new investment in housing that was previously rent stabilized. This question has important policy implications for New York City, where over half of the city's 2.1 million rental housing units are privately owned and rent stabilized.

This report documents the actual effect of rent deregulation on housing investment in Cambridge, Massachusetts. Cambridge maintained a very strict form of rent regulation from 1971 to 1994, when rent controls were removed by statewide initiative. Like New York, Cambridge is composed of both affluent and modest income neighborhoods, and has a very large older housing stock. The Cambridge experience should provide information highly relevant to the effects of rent deregulation in many parts of the New York market.

This study uses an econometric model that employs the most complete set of building-level data ever assembled for a project of this type and finds the following:

- In Cambridge, investment increased by approximately 20% over what would have been the case if rent control had been maintained.
- Investment increases occurred across a wide variety of settings; both affluent and modest income neighborhoods experienced an "investment boom".

These results suggest that complete deregulation of stabilized dwelling units would lead to important gains in housing quality in New York. These investment gains might also lead to neighborhood "spillover" effects as owners of property proximate to buildings experiencing new investment feel more comfortable making additional investments themselves.

Given the need for better maintenance and increased renovation of New York's aging housing stock, such an increase represents a considerable potential boon to the city's residents, and should draw serious consideration from New York City policymakers.

About the Author

Henry O. Pollakowski has been a housing economist at the MIT Center for Real Estate since 1996. He is the founding and current Editor of the *Journal of Housing Economics*, which is now beginning its second decade. In addition to spending 12 years as a senior researcher at the Harvard Joint Center for Housing Studies, he has taught at Boston College, Harvard University, the University of York (UK), and the University of Washington.

Dr. Pollakowski has done extensive work in housing economics, including influential contributions to the measurement of quality-adjusted housing price changes. He is widely recognized as a leading researcher on the economics of rent control, and during the past 15 years has conducted numerous studies of rent stabilization in New York City. He has specialized in the effects of land-use regulation on housing markets, and has done work on nonresidential property markets. He is the author of numerous scholarly and professional journal articles and *Urban Housing Markets and Residential Location*, a book focusing on the roles of location and house prices in housing decision-making.

While at Harvard, Dr. Pollakowski served as director of all phases of a national housing survey and contributed to the annual *State of the Nation's Housing*. He has studied house price appreciation for homeowners with modest incomes for the Ford Foundation, and has examined the effects of development delays on house prices for the Seattle Housing Partnership. He serves as a consultant to the low-income Bermuda Housing Corporation and the New Jersey Pinelands Commission. He has also conducted research for the National Multi-Housing Council, the Department of Housing and Urban Development, the World Bank, and numerous other private and public organizations.

As a faculty fellow of the Homer Hoyt Institute, Dr. Pollakowski has organized conferences on residential and commercial real estate analysis. He has also served as a Director of the American Real Estate and Urban Economics Association and as guest editor of the Association's journal. He received his BA in Economics from the University of Michigan and his Ph.D. in Economics from the University of California at Berkeley.

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Rent Control and Housing Investment: Evidence from Deregulation in Cambridge, Massachusetts

Introduction and Overview

The economics literature suggests that rent regulation holds down housing quality because landlords, afraid they will be unable to recoup their investments, defer maintenance and do not otherwise upgrade housing quality. If true, this has important consequences for New York City residents, as over half of the City's 2.1 million rental housing units are privately-owned but under rent stabilization.[1] These facts lead one to ask an important question: would repeal of rent stabilization lead to a significant increase in the City's housing quality?

This study seeks to answer that question by looking at the actual effect of deregulation on housing investment in Cambridge, Massachusetts. Between 1971 and 1994, when rent controls were repealed by statewide initiative, Cambridge maintained a very strict form of rent regulation.[2] A substantial portion of the rental market was controlled, and the controlled rents were held considerably below market rents. The repeal of rent control in fact came as a surprise to many, providing a relatively clean "natural experiment." Like New York, Cambridge has both affluent and modest-income neighborhoods, and has a great deal of older housing. Accordingly, Cambridge's experiences with rent decontrol are particularly instructive for New Yorkers.

This study documents the housing investment boom that followed rent decontrol in Cambridge. Examining investment in previously rent-controlled buildings, we find that investment increased by approximately 20 percent over what would have been the case in the absence of decontrol. Furthermore, we find significant investment increases were not confined to existing high-income neighborhoods; instead, investment increased in a large variety of settings—neighborhoods varying in income level, by structure type, and by concentration of formerly rent-controlled buildings. These substantive results suggest that complete deregulation of stabilized dwelling units would lead to important gains in housing quality in New York. These gains would occur in a variety of settings, especially where stabilized landlords faced below-market rents or feared that they would in the future. These investment gains could also lead to neighborhood "spillover" effects as owners of property proximate to buildings experiencing a new investment feel more comfortable making additional investments themselves.

The City of Cambridge and Rent Control

The city of Cambridge is the second largest in the Boston metropolitan area, with a population of just over 100,000. It is near the center of the metropolitan area, bordered by Boston to the east and south, Watertown and Belmont to the west, and Somerville and Arlington to the north. Cambridge is a diverse city, including university students and employees, professionals, and moderate-income wage earners. It includes large numbers of family households, non-family households (often young roommates or single people), and members of different racial and ethnic groups. Harvard University and the Massachusetts Institute of Technology are major employers, as are a multitude of high-tech companies.

Rent control was first legalized in 1970, when the Commonwealth of Massachusetts permitted cities and towns with populations over 50,000 to impose rent controls. Originally viewed as a temporary measure, rent control was adopted in Cambridge in 1971,[3] setting most rents at 1967 levels.[4] New construction and owner-occupied two-family dwellings were exempt. After the 1994 vote to end rent control, the state legislature provided one- or two-year extensions for lower-income tenants, with special thresholds for the elderly or disabled.[5]

At the time when rent control was abolished at the end of 1994, about two-thirds of the rental housing in apartment buildings with four or more units was under rent control. These dwelling units were located in 839 buildings ranging in size from 4 to over 200 units (Table A-1). During the first four years after deregulation, substantial upgrading of these buildings occurred, with average annual expenditure per dwelling unit increasing threefold.

Where was the post-decontrol investment made? There is no simple, tidy pattern relating affluence, type of structure, and rent control. There is a modest positive correlation across neighborhoods between growth in investment and the proportion of rent-controlled buildings in a given neighborhood.[6] However, the disparate nature of renovation projects (a few very large ones and an abundance of more ordinary ones) and the fact that we are working with "only" 10 neighborhoods lead us away from strong claims. Nonetheless, what is clear is that no neighborhood income distinction or structure type distinction makes a startling difference in terms of post-deregulation investment. Renovation and repair activity occurred in a wide variety of settings.

Of course, the period following deregulation coincided with a boom period for the greater Boston area housing market, with high levels of renovation and repair activity (Figure 1). Thus, previously unregulated rental housing in Cambridge also experienced substantial renovation and repair activity. Not surprisingly, differences of opinion exist about the extent to which the boom in previously controlled Cambridge rental housing was "simply" part of the larger Boston boom. Thus, we are able to measure rent decontrol's effect on housing investment only if we are also able to measure—and control for—investment that would have occurred anyway because of general market conditions.

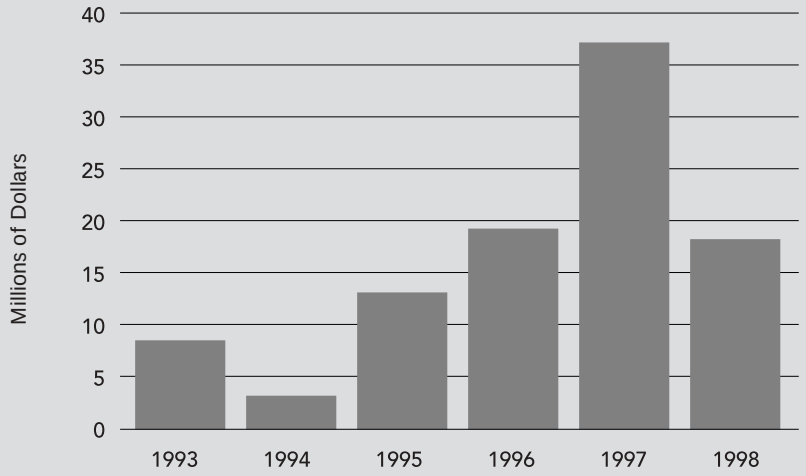
This study is able to answer that question through the use of an econometric model that employs the most complete set of building-level data ever assembled for a project of this sort. Put simply, we know by street address where all decontrolled rental units were, and what happened to the buildings containing them in terms of housing investment both before and after rent decontrol. The model applies regression analysis to equations designed to account for changes in the economic climate, changes in regulatory status, and location and characteristics of individual buildings. Only by accounting for these factors simultaneously can we isolate the effect of decontrol on housing investment.

The Data

The data set used in this study was constructed from three major sources. The first source is the set of all building permits issued in Cambridge for the years 1993 through 1998. The city's Inspectional Services Department requires that work on a building must begin within six months of the date the permit is issued, so we know that these data accurately reflect housing investment in Cambridge during the period studied. Each permit record includes date of the permit, address, category of the building and use, and a summarized cost estimate. For projects costing $50,000 or greater, the owner must submit an affidavit certifying that the cost of the permit is accurate as reported. A fee for the building permit is assessed at one percent of the total cost.[7] This study makes use of the building permits for rental properties.[8]

The second major data source is the record of rent-controlled buildings in the city. Prior to the end of rent control, the city's Rent Control board maintained detailed records of all regulated buildings in Cambridge, including the number of controlled units, exempt units, and commercial units in each building. This information was provided by the city of Cambridge under the Freedom of Information Act.

Figure 1:
Total Investment in Existing Cambridge Rental Buildings* with 4 or More Units



*Buildings with at least 1 rental unit.

Finally, the city's Residential Property Assessor has provided a current database of all properties within the city. This dataset includes address, size of lot, structure type, owner and occupation status, number of units, and 2002 assessed value for every property in Cambridge.

These three data sources have been matched at the building level. Where exact matches of addresses could not be made, properties were visited to make the correct match. As part of this process, the buildings have been sorted into the thirteen neighborhoods defined by the city. Although the neighborhoods are not exactly spatially aligned with the city's 30 census tracts, the US Census Bureau has specially prepared demographic, economic, and housing market data for the city by neighborhood. (Detailed information about the socio-demographic and housing stock characteristics of each neighborhood are provided in Appendix A). This allows us to examine variations in rental stock, intensity of rent control, and structure type distribution across neighborhoods. It also provides neighborhood information for the building-level simulation model presented below. Thus, for any address in Cambridge, we know building type, number of units, whether any units were rented, number of units under rent control at the time of deregulation, building permit history, and neighborhood.

The Models

Using these data we constructed a simulation model of renovation and repair expenditures at the building level.[9] This model allows us to determine what portion of post-deregulation investment in formerly rent-controlled buildings is due to deregulation, as opposed to the housing market boom.

The variables used in the equations are presented in Table A-2. The statistical results for the four regression models are presented in Table A-3. Specifically, regression equations calculate the determinants of renovation investment cost per unit, as measured by building permits. The individual observations consist of 1283 buildings (with four or more units) observed in each of the 6 years 1993-1998. The sample size of 7451 is thus approximately six times the number of buildings.[10] The distribution of these buildings by regulation status, number of units, and neighborhood is presented in Table A-1.

We present our findings after looking at four related, but distinct, simulation models. We do this because we found that no one model produced results that allowed us to be as statistically certain as we ideally would like to be that they were correct. The broad similarity of results across each of these four models, which differ slightly from one another in their assumptions, do give us confidence that Cambridge experienced a significant increase in housing investment in both affluent and less afluent neighborhoods as a result of rent decontrol.

The results of four variations of the model are presented in Table 1. For the city, we find that from 16

Table 1:
Percentage of Post-Deregulation (1995-1998) Investment in Formerly Rent Controlled Buildings Attributed to Deregulation

	Benchmark Model	Model Variation 1	Model Variation 2	Model Variation 3
More Affluent Neighborhoods*	15%	22%	22%	29%
Mid-Cambridge				
Agassiz				
Neighborhood 9				
Neighborhood 10				
Less Affluent Neighborhoods*	18%	8%	25%	15%
East Cambridge				
Wellington-Harrington				
Area IV				
Cambridgeport				
Riverside				
North Cambridge				
All Neighborhoods	16%	17%	23%	24%

Note:
** More Affluent Neighborhoods are those with median income above the citywide median. Less Affluent Neighborhoods are those with median incombe below the citywide median.*

to 24 percent of the post-deregulation investment in formerly rent-controlled buildings would not have occurred without deregulation. This is the deregulation share—the portion not stemming directly from the economic boom. We also find that the deregulation share for the more affluent neighborhoods is in the 15 to 29 percent range, while the share for the less affluent neighborhoods is in the 8 to 25 percent range. These are substantial effects. The four variations of the model that were used were those considered to be most reliable. As described below, they all operate on the same basic underlying economic principles.

The Benchmark Model

This model best reflects the basic economics underlying the analysis. Again, the variables listed are the determinants of investment cost per unit—for each building in each year. Economic conditions are represented by the employment rate. The coefficient is negative, accounting for part of the increase in housing investment as the unemployment rate fell. The next variables ideally would describe the building in terms of age, condition, and related factors. This information is not available. We do have information on whether the building consists of condominiums and how many units are in the building. Variables representing condominium building and structure size[11] are thus included.

The next variable denotes whether the building was rent-controlled (and hence decontrolled in 1995). With appropriate information on building age and condition, we would hypothesize that the coefficient would be negative—that is, that rent-controlled buildings would in general receive less investment. In our case, however, the rent control variable may also account for the unobserved poorer condition and greater age of buildings under rent control. In fact, the coefficient is positive. Thus the rent control variable probably captures not only the direct effect of being under rent control, but also the fact that these buildings are older, in worse condition, and more in need of very essential repairs.

The variable "Interaction of Rent Control and Time" is the key one in terms of being able to perform simulations. It takes a value of one for all (formerly) rent-controlled buildings for the post-deregulation years 1995 through 1998. It measures the extra investment that occurred, holding constant economic conditions and characteristics of the building. It has a positive coefficient, indicating that there indeed was extra investment. The final variable is median household income in the building's neighborhood. Its coefficient is positive, indicating that higher-income areas had more investment, as we would expect.[12]

Simulation of Renovation Investment Due to Rent Decontrol

Having estimated the benchmark model, we then simulate how much investment in formerly rent-controlled buildings would have occurred during the period 1995 through 1998 in the *absence* of decontrol. We use the benchmark model results in Table A-3 to accomplish this. Since the key variable "Interaction of Rent Control and Time" has been included in the equation to capture deregulation effects, its (positive) coefficient is now set equal to zero—this "takes away" the extra deregulation-induced investment. The benchmark model equation thus altered is then used to predict renovation investment per unit in the absence of deregulation. This simulated investment is then subtracted from the actual investment during 1995 through 1998 in the formerly rent-controlled buildings.[13] The answer is presented in percentage terms in column 2 of Table 1: 16 percent of the post-deregulation investment was due to deregulation.

It is also possible to display this result by neighborhood. In the more affluent neighborhoods of Mid-Cambridge, Agassiz, Neighborhood 9, and Neighborhood 10, 15 percent of the post-deregulation investment was due to deregulation. In the less affluent neighborhoods of East Cambridge, Wellington-Harrington, Area IV, Cambridgeport, Riverside, and North Cambridge, the corresponding percentage is 18 percent.

Three model variations are presented next. For all four models, the city-wide deregulation effect is in the 16 to 24 percent range.

Model Variation 1

Model variation 1 is the variant most similar to the benchmark model. The only difference is in how neighborhood effects are handled. Instead of using neighborhood median household income for this

purpose, a set of dummy variables representing the individual neighborhoods is used (Table A-3). This captures any systematic effect of neighborhood location on investment per unit that is not captured by the other variables. As can been seen in Table A-3 and Table 1, the results are very similar to those for the benchmark model for the city as a whole, but now the more affluent neighborhoods have a larger post-deregulation effect (22 percent) than do the less affluent neighborhoods (8 percent).

Model Variations 2 and 3

Model variations 2 and 3 handle the time dimension differently than the first two models. Instead of using the unemployment rate to represent economic conditions, a "Post-deregulation Time Period" variable is used (Table A-3). While the unemployment rate did decline throughout the sample period, the Boston metropolitan area housing market boom occurred largely after 1994. This variable thus takes a value of 1 for all observations beginning in 1995. In contrast, the "Interaction of Rent Control and Time" variable takes a value of 1 only for all previously-regulated buildings beginning in 1995. In model variation 2, this time variable is combined with the use of median household income as the neighborhood variable. In model variation 3, this time variable is combined with the neighborhood dummy variables (Table A-3). As shown in Table 1, the deregulation effect simulated by model variation 2 rises to 23 percent of post-deregulation renovation investment, with less affluent neighborhoods experiencing a slightly higher effect than more affluent neighborhoods. The deregulation effect simulated by model variation 3 is similar to model variation 2 for the city as a whole, but now the more affluent neighborhoods see a higher effect (29 percent) than the less affluent neighborhoods (15 percent).

The four models described present a range of values for renovation investment deregulation effects in formerly rent-controlled buildings with four or more units. Each model is based on economic reasoning, and no one model is considered to be the "best" on theoretical grounds. Given that this simulation modeling brings with it some imprecision, it is simply sound procedure to present a range of reasonable effects.

Conclusion

These findings about the success of rent decontrol in Cambridge provide important lessons that should inform the debate over the issue in New York. While smaller in size, Cambridge's housing situation parallels New York's in many ways. Like New York, it comprises both affluent and modest income neighborhoods. Also like New York, Cambridge has a large amount of older housing units. Given these similarities, Cambridge's experience bodes well for housing quality should full deregulation be implemented in New York as it was there.

As this study shows, that experience is one of a tremendous boom in housing investment, leading to major gains in housing quality. This research thus provides a concrete example of complete rent deregulation leading to housing investment that would otherwise not have occurred. Given the need for better maintenance and increased renovation of New York's aging housing stock, such an increase represents a considerable potential boon to the city's residents. Moreover, the results in Cambridge show that this expansion in housing investment was not confined to high-income neighborhoods, but rather spread across all socioeconomic boundaries. This suggests that the benefits of deregulation would reach New Yorkers in a variety of settings, especially where stabilized landlords faced below-market rents or feared that they would in the future.

It is impossible to predict the precise magnitude of housing investment increase that New York would experience in the aftermath of a complete deregulation of stabilized housing. However, the Cambridge experience suggests that if New York's policymakers wish to achieve significant improvements in housing quality in New York, they should give serious consideration to deregulation.

APPENDIX A

Cambridge Neighborhoods and Housing Stock

It is important to examine Cambridge neighborhoods and the housing stock to understand patterns of affluence, mid-size and large rental buildings, and rent control. Figure A-1 shows the physical boundaries of neighborhoods within Cambridge. While the city's population is diverse in terms of demographics and income levels, its thirteen neighborhoods can be broadly divided into two groups according to level of affluence.[14] The neighborhoods surrounding Harvard Square are generally wealthier, although they vary from having a significant number of single-family homes to being dominated by large apartment buildings. On the other hand, the neighborhoods to the east of Central Square plus an outlying neighborhood are more modest income with a mix of all property types except single-family and a larger percentage of rental housing. Table A-1 presents the distribution of rental structures by rent control status, number of dwelling units, and neighborhood. Figure A-2 presents 1990 median household income for each neighborhood.

The more affluent group is comprised of the northern neighborhoods of Agassiz, Neighborhood 9, and Neighborhood 10, as well as Mid-Cambridge, all with 1990 household income levels above the citywide median of $33,140. Agassiz is a small but dense neighborhood, largely populated by Harvard employees and students as well as professionals, with the highest levels of educational attainment in the city. Over 80 percent of the rental housing in this neighborhood was under rent control, one of the two highest percentages in the city. Neighborhood 9 is one of the city's largest neighborhoods, with all building types represented and an above-average incidence of rent control. Neighborhood 10 includes the well-known affluent Brattle Street area, which is characterized by substantial houses and sizable lots. Population density is relatively low compared to the other neighborhoods. This is the only neighborhood where owner-occupied units outnumber renter-occupied units. Housing over 13,000 residents, Mid-Cambridge is the one of the most populous and highly-educated neighborhoods in the city. Unlike the above neighborhoods, it consists of large apartment buildings, with more than 80 percent of the rental units formerly under rent control. As shown in Figure A-3, it had the largest number of rent-controlled buildings in the city.

The less affluent group of neighborhoods is comprised of East Cambridge, Wellington-Harrington, Area IV, Cambridgeport, Riverside, and North Cambridge. These neighborhoods are located in the south and east of the city, with the exception of North Cambridge. East Cambridge has traditionally been a blue-collar neighborhood with a sizable immigrant population since the mid-nineteenth century. Here and in nearby Wellington-Harrington multi-family structures are smaller than elsewhere, and the percentage formerly under rent control is below the city average. The median household income of $24,665 in Area IV is the lowest in Cambridge, about 75 percent of the citywide median. Mid-size buildings dominate, with the percentage formerly under rent control about average for the city. Cambridgeport is a diverse neighborhood that is larger than Area IV, with a somewhat higher median income. It contains a large number of duplexes in addition to a considerable number of midsize buildings. While its percentage of formerly rent-controlled duplexes and "triple-deckers" is somewhat larger than average, its percentage of formerly rent-controlled buildings with four or more units is slightly below average. Riverside is a diverse neighborhood, running from Harvard in the west to a more modest income area in the east, and bordering higher density, more affluent Mid-Cambridge to the north. Excluding Harvard dormitories, it is smaller than Cambridgeport. It has the highest percentage of rental housing (90 percent) in the city. Finally, North Cambridge is predominantly professional and middle-class. However, a substantial blue-collar population remains in this former industrial area. The percentage of formerly rent-controlled buildings is less than average.

Throughout the City, renter-occupied units as a percentage of total units remained fairly steady throughout the 1990's, at about 65 percent, but

decreased considerably from nearly 80 percent in the 1970's and 1980's. Across the city's neighborhoods, the percentage of units that are renter-occupied varies from 48 percent in Neighborhood 10 to over 90 percent in Riverside.

At the end of 1994, over 13,400 units in the city of Cambridge were under rent control. This represented slightly less than half of the city's rental housing stock. More than two-thirds of units in rental buildings with four or more units were under rent control. As with the composition of the housing stock, the intensity of rent control varied across neighborhoods, with the percent of rental dwellings under rent control somewhat higher in the more affluent neighborhoods.

Table A-1 presents the distribution of buildings throughout the city according to category of structure. The city Assessor's Department defines residential properties within the following main categories: single-family, two-family, three-family, four- to eight-unit apartment building, nine-unit or larger apartment building, and condominium unit. These categories differ slightly from the US Census, which groups 3- and 4- unit structures together and classifies 5 to 9 unit structures as a single group. Single-family homes make up 37 percent of residential buildings, but only 12 percent of the city's housing units. Duplexes and especially "triple-deckers" are more prevalent in the lower and eastern neighborhoods, such as Wellington-Harrington and East Cambridge. Larger residential buildings, those of 10 or more units, are most prevalent near the city's two largest universities, Harvard and MIT. In neighborhoods such as Mid-Cambridge, Riverside, and Agassiz, more than half of all dwelling units are located in apartment buildings.

Figure A-1:
Map of Cambridge Neighborhoods

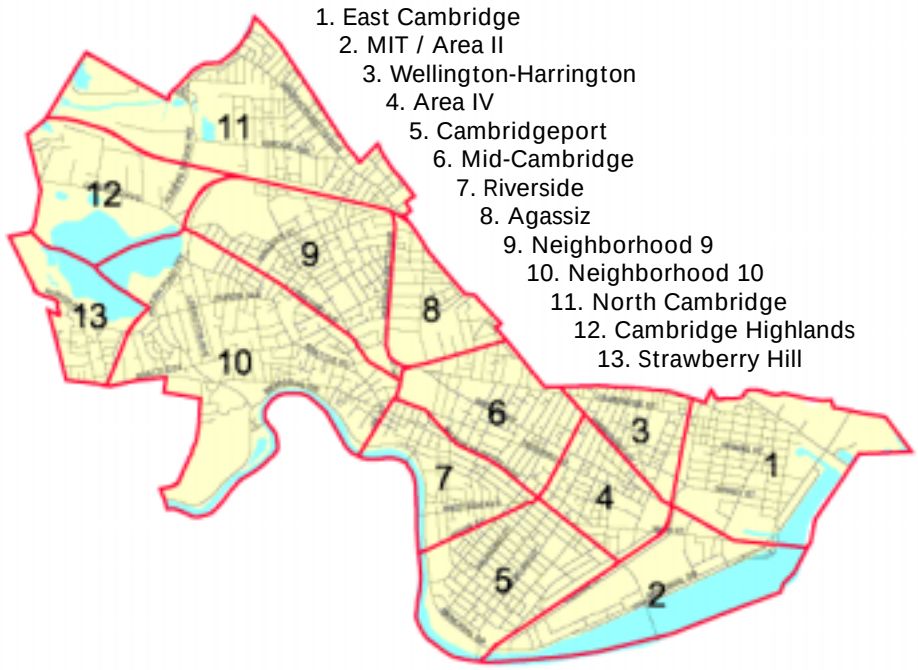


Table A-1:
Distribution of Rental Buildings by Structure Type

Percentage of Rental Buildings Under Rent Control

Neighborhood	1 unit	2 units	3 units	4-8 units	9-16 units	17-40 units	41+ units
East Cambridge	31%	25%	39%	49%	33%	0%	0%
Wellington-Harrington	23%	29%	39%	60%	45%	50%	0%
Area IV	24%	43%	55%	70%	50%	17%	0%
Cambridgeport	15%	34%	52%	67%	50%	50%	0%
Mid-Cambridge	42%	39%	52%	76%	76%	79%	92%
Riverside	59%	38%	61%	80%	62%	67%	27%
Agassiz	34%	46%	68%	79%	88%	70%	80%
Neighborhood 9	20%	23%	37%	78%	74%	72%	32%
Neighborhood 10	20%	22%	36%	59%	60%	86%	60%
North Cambridge	19%	23%	37%	56%	75%	38%	50%
Cambridge Highlands	17%	14%	50%	50%	0%	25%	50%
Strawberry Hill	30%	14%	31%	22%	0%	0%	0%
All Cambridge	26%	28%	46%	67%	64%	65%	46%

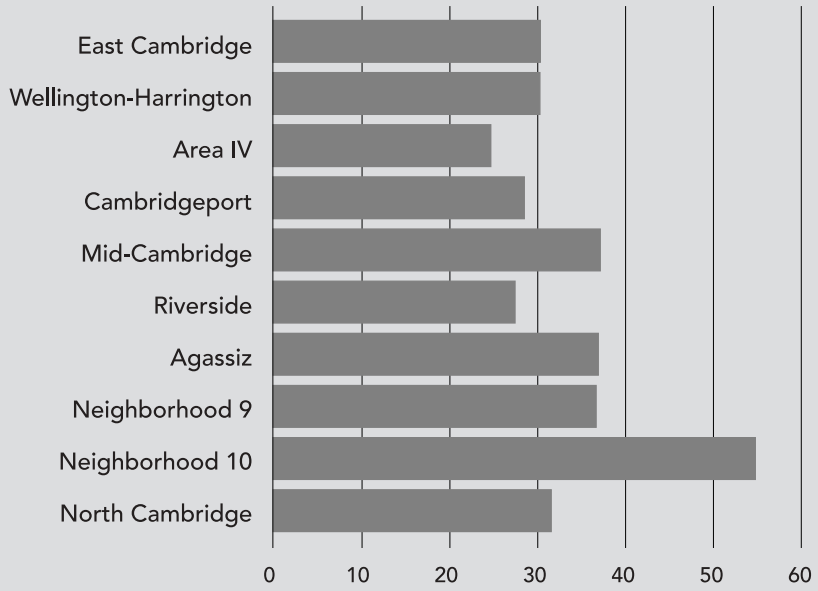
Number of Controlled Buildings

Neighborhood	1 unit	2 units	3 units	4-8 units	9-16 units	17-40 units	41+ units
East Cambridge	13	36	49	47	4	0	0
Wellington-Harrington	9	28	87	72	5	2	0
Area IV	5	40	64	73	6	1	0
Cambridgeport	14	76	131	89	9	2	0
Mid-Cambridge	19	62	119	102	31	38	12
Riverside	27	34	90	78	8	10	3
Agassiz	13	46	50	44	14	7	4
Neighborhood 9	18	39	57	50	14	18	8
Neighborhood 10	25	68	44	17	9	6	6
North Cambridge	15	94	85	33	6	5	1
Cambridge Highlands	1	4	2	1	0	1	1
Strawberry Hill	7	11	11	2	0	0	0
All Cambridge	166	538	789	608	106	90	35

Total Number of Rental Buildings

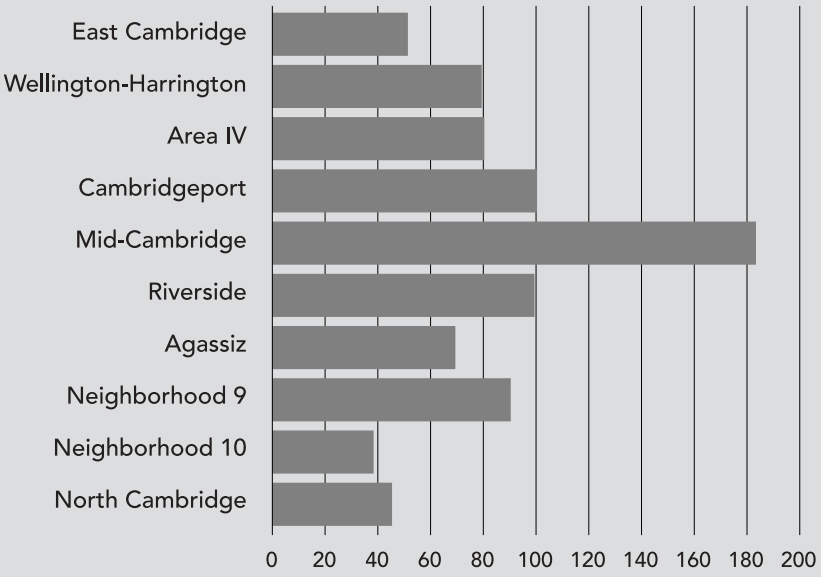
Neighborhood	1 unit	2 units	3 units	4-8 units	9-16 units	17-40 units	41+ units
East Cambridge	42	146	126	96	12	3	4
Wellington-Harrington	40	95	222	120	11	4	1
Area IV	21	93	117	104	12	6	0
Cambridgeport	92	226	253	132	18	4	1
Mid-Cambridge	45	159	229	134	41	48	13
Riverside	46	89	148	97	13	15	11
Agassiz	38	99	73	56	16	10	5
Neighborhood 9	88	170	156	64	19	25	25
Neighborhood 10	123	304	123	29	15	7	10
North Cambridge	78	405	231	59	8	13	2
Cambridge Highlands	6	28	4	2	1	4	2
Strawberry Hill	23	76	36	9	0	0	2
All Cambridge	642	1890	1718	902	166	139	76

Figure A-2:
Median Household Income by Neighborhood (1990)



Source: 1990 US Census. Includes all neighborhoods used in empirical analysis, those with significant rental housing.

Figure A-3:
Number of Controlled Apartment Buildings by Neighborhood



**Buildings having 4 or more rental units. Includes all neighborhoods used in empirical analysis, those with significant rental housing.*

Table A-2:
Description of Variables Used in Regressions

Dependent Variable: Investment Cost per u=Unit

Variable Name	Description
Unemployment Rate	Annual Boston Metropolitan Area unemployment rate
Rent Controlled Building	1 if building was previously rent controlled
Post-deregulation Time Period	1 for post-deregulation years (1995 - 1998)
rc_afterrc	Interaction of rent controlled building and post-deregulation time period
Condo	1 if building contains condominium units
9-16 Units is Building	1 if building contains 9 to 16 units
17 or more Units in Building	1 if building contains 17 or more units
Household Income	Neighborhood household median income
Neighborhood 1	1 if building is in East Cambridge
Neighborhood 3	1 if building is in Wellington-Harrington
Neighborhood 4	1 if building is in Area IV
Neighborhood 5	1 if building is in Cambridgeport
Neighborhood 6	1 if building is in Mid-Cambridge
Neighborhood 7	1 if building is in Riverside
Neighborhood 8	1 if building is in Agassiz
Neighborhood 9	1 if building is in Neighborhood 9
Neighborhood 10	1 if building is in Neighborhood 10
Neighborhood 11	1 if building is in North Cambridge

Table A-3:
Four Regression Models

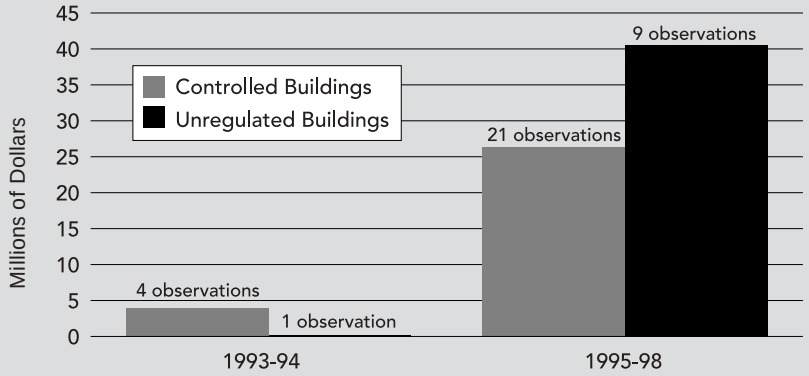
Variable	Benchmark Model	Variation 1	Variation 2	Variation 3
Constant Term	260.12 (125.83)	286.53 (123.93)	133.27 (92.24)	160.67 (82.70)
Unemployment Rate	-24.98 (24.47)	-24.85 (24.47)		
Rent Controlled Building	21.96 (51.89)	33.82 (50.23)	9.69 (61.59)	21.22 (59.52)
Post-deregulation Time Period			30.05 (64.81)	29.29 (64.79)
rc_afterrc	6.31 (62.33)	6.61 (62.33)	24.79 (76.13)	25.60 (76.12)
Condo	-106.50 (34.37)	-95.34 (34.41)	-106.69 (34.39)	-95.53 (34.41)
9-16 Units is Building	86.56 (58.62)	95.82 (60.00)	86.57 (58.64)	95.83 (60.02)
17 or more Units in Building	56.84 (42.48)	79.17 (43.92)	56.69 (42.53)	79.03 (43.94)
Household Income	0.001 (0.002)		0.001 (0.002)	
Neighborhood 3		62.43 (104.34)		62.39 (104.35)
Neighborhood 4		-63.96 (75.21)		-63.88 (75.22)
Neighborhood 5		15.15 (87.30)		15.13 (87.29)
Neighborhood 6		-67.19 (70.37)		-67.24 (70.37)
Neighborhood 7		6.00 (78.73)		6.03 (78.71)
Neighborhood 8		-8.86 (82.09)		-8.86 (82.12)
Neighborhood 9		-62.06 (73.90)		-62.16 (73.90)
Neighborhood 10		74.86 (87.36)		74.88 (87.38)
Neighborhood 11		18.76 (107.83)		18.75 (107.76)
Prob > F	0.01	0.01	0.01	0.02
Adj R^2	0.002	0.003	0.002	0.003
Observations	7451	7451	7451	7451

APPENDIX B

Very Large Renovation/Reconstruction Projects

As discussed in the presentation of the building-level renovation and repair simulation results, a small number of projects were not included in the simulation model. The typical cost of one of these projects was several orders of magnitude greater than most of the renovations considered in the simulation model. They are typically qualitatively different, in that they may involve complete gutting and reconstruction of a building. Also, from a statistical point of view, the type of simulation model used here cannot encompass such disparate cases. In some cases it would be the equivalent to comparing construction of a new multifamily building with remodeling a kitchen. It is important to have a rule to follow in segmenting a sample in this way. The rule used here is for each neighborhood to remove the largest five percent of the projects that occurred (note that this is not five percent of the total sample, since many building/year observations showed zero investment). Thus the four model variations were estimated using all observations of zero investment and all observations of positive investment that met the criterion of having cost per unit less than the 95th percentile for the relevant neighborhood. The 35 very large investments not included in the four model variations are depicted in Figure B-1 by regulation status and time period. It is important to emphasize that ideally such sample segmentation should be done in terms of characteristics other than the value of the model's dependent variable (such as gutted property). Unfortunately such characteristics were not available.

Figure B-1:
Total Costs by Regulation Status, Very Large Observations



ENDNOTES

1. According to initial findings from the 2002 New York City Housing and Vacancy Survey, there are 3,209,000 housing units in New York City, of which 2,085,000 are rented. 1,065,000 are under rent stabilization, and 60,000 are rent controlled. 686,000 private units are unregulated, and the remaining 274,000 rental units include Public Housing, Mitchell-Lama, *In Rem*, HUD-regulated, Article 4, Loft Board units. Source: NYC Department of Housing Preservation and Development.

2. Rent control began in Cambridge in 1971, shortly after the 1970 Rent Control Enabling Act. The initial acts controlled the rents of most units built prior to January 1, 1969, the major exceptions being cooperatives and owner-occupied two or three-family homes. In addition to limiting rent increases, the law also limited the circumstances under which a landlord could remove a tenant from a unit and required a certificate of eviction in such a case. In 1981, citing the removal of 10 percent of controlled rental units in the city between 1970 and 1980 and a vacancy rate below 1 percent, the city passed additional regulation limiting the removal of units from the market.

3. Boston, Lynn, Somerville, and Brookline also adopted rent control. In 1976, the planned expiration date, the state legislature allowed some jurisdictions to extend rent control under a home-rule petition. Nonetheless, Lynn deregulated in 1974, as did Somerville in 1979. Boston adopted vacancy decontrol in 1974, and Brookline decontrolled many of its units by 1991. Cambridge alone kept the strictest form of rent control.

4. Maximum rents were set, in general, at 1967 levels. Future adjustments to the maximum rent level were allowed in order to provide owners a "fair net operation income." Such rent changes could be positive or negative. Increases were allowed for capital improvements to the units (upgrades, as distinguished from standard maintenance) and changes in operating expenses, including taxes. If landlords failed to perform ordinary maintenance and repairs, or if the units became deteriorated, maximum allowable rents could be adjusted downward. Provisions were also made for general adjustments to rent levels for any particular class of rental units. These rules provided the city with substantial power to limit rents, resulting in 1994 rents that were substantially below market.

5. Only 7 percent of rent control households applied and qualified for these transitional extensions. This small response reflected in large part the increased occupational status and incomes of residents benefiting from rent control in Cambridge (Pollakowski, 1997).

6. The correlation coefficient calculated is between growth in investment (1995-98 investment divided by 1993-94 investment) and percent of rental housing previously under rent control. For the 10 primary rental neighborhood used for most of the calculations, the correlation coefficient is .15. For all 13 neighborhoods, it is .30. The remainder of this study focuses on 10 of 13 neighborhoods, those which had a significant amount of available rental housing.

7. When more than one permit was issued for a specific address in a given year, this activity is represented as one "permit" in the data set used for this research. These multiple permits often occur because costs are initially underestimated. In these cases, the costs for the individual permits are summed to obtain the total cost for each building in each year. Since building permit cost is at the core of this work, it is important to create a cost variable that represented total cost per building per year.

8. Permit data used covers all buildings having four or more units and at least one rental unit. Excluded are public housing and tax-exempt properties, such as dormitories.

9. These building-level results exploit our data set to the fullest since they are based on address-matching of the assessor's file, the rent control file, and the building permit file, along with neighborhood-level data. This analysis covers most renovation and repair investment requiring a building permit in buildings with four or more units. A small number of exceedingly large jobs were not included in this analysis. These jobs were largely reconstruction projects that dwarfed typical renovations in terms of cost by several orders of magnitude. The selection of these projects for separate consideration is described in Appendix B.

10. The sample size is not exactly six times the number of buildings because of a small number of missing observations and because a small number of very large projects were treated separately (Appendix B).

11. The city Assesor's Department defines residential properties within the following main categories: single-family, two-family, three-family, four- to eight-unit apartment building, nine-unit or larger apartment building, and condominium. The regression variables divide the largest buildings into two further categories: 9- to 16-unit apartment building and 17-unit apartment building.

12. The estimated Model 2 is statistically significant (F-test) at the .01 level. The adjusted R2 of .002 looks low, but the nature of what is being explained must be remembered. For a majority of building / year observations, cost per unit is zero. There are also many observations that are low but varying. Finally, having a substantially higher explanatory power would entail being able to explain, for example, why an investment took place in 1998 instead of 1997. Some, but not all, of these issues could be partially addressed with more building-specific data. The estimated standard errors in parentheses in Table A-3 are somewhat higher than we would like. It is for this reason that four different models are estimated and compared.

13. Ideally, out-of-sample prediction would be used. That is, half of the sample would be used to estimate the model, and the other half used for simulation purposes. Issues of sample size and precision made this option impractical.

14. 10 of the 13 neighborhoods had a significant amount of available rental housing, and this study focuses on them. Table A-1 provides summary data for all 13 neighborhoods.

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Henry Olsen

Advisory Board
Stephen Goldsmith, Chairman
Mayor Jerry Brown
Mayor John O. Norquist
Mayor Martin O'Malley
Mayor Rick Baker

Fellows
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