The Decision to Renovate

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Abstract:

Housing renovation is the main alternative means of housing supply besides construction of new housing. In the United States renovation and remodeling activities amount to around $300 billion per year. Renovation is also the main alternative to moving for households desiring a larger (or smaller) unit.

Using the American Housing Survey, we analyze the characteristics of those households that choose to renovate. We distinguish between those who renovate and do not move, vs. those who both renovate and move. Using a sample of about 27,000 housholds, econometric analysis of the data is used to identify factors affecting inclination to move and/or to renovate.

We find that there are important differences in the inclination to renovate among different sorts of households. Renovation inclination varies by geographic factors and by subregions within the metropolitan statistical areas. It *increases* with distance from place of work, somewhat surprisingly. It varies by income and education, and also sharply by race, while controlling for income and education, with non-whites considerably less likely to undertake renovation. It also varies by neighborhood amenities. People in larger units or in single homes are more likely to renovate than are others, other things equal. Those on the West Coast are more likely to renovate.

Separate analyses are conducted of the decision to undertake "major structural renovations" as opposed to other sorts, and also of the decision to conduct renovations that add to the living space of the housing unit. Household and geographic factors affecting this decision are analyzed econometrically.

The Decision to Renovate

I.   Introduction

At the level of the household, there are two main ways in which the consumption of housing may be changed. Either the household can move to a different residential housing unit, or it can renovate the unit in which it already lives. While the literature on household moving decisions is very large,[1] and in fact the entire literature on housing demand could be interpreted as referring to moving decisions, relatively little research has addressed the question of what determines when a household renovates *instead* of moving, or in some cases *in addition to* moving.

There are two methods by which the residential housing stock and housing supply change. First, housing units may be newly constructed or demolished, changing the total number in use. Second, existing housing units may be altered, enlarged or made smaller, renovated, remodelled, or otherwise changed. That renovation represents an alternative mode of altering housing supply has been understood going back at least to Mendelsohn (1977).   Housing renovation is a very large economic activity inn terms of the amount of resources involved. Bendimerad (2007) reports that Americans in 2005 spent $280 billion on home remodelling, and this number was projected by the author to increase at 3.7% in real terms until 2015. In the American Housing Survey data we will be using below, over half of home-owning households made some renovations during the previous two years.

In this paper we examine empirically the factors that affect the decisions of households to renovate the housing unit, instead of moving or in addition to moving. Our approach is to represent household decision making in the following sequential form:

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[1]   Some of this is surveyed by Hardman and Ioannides (1995).

Figure 1
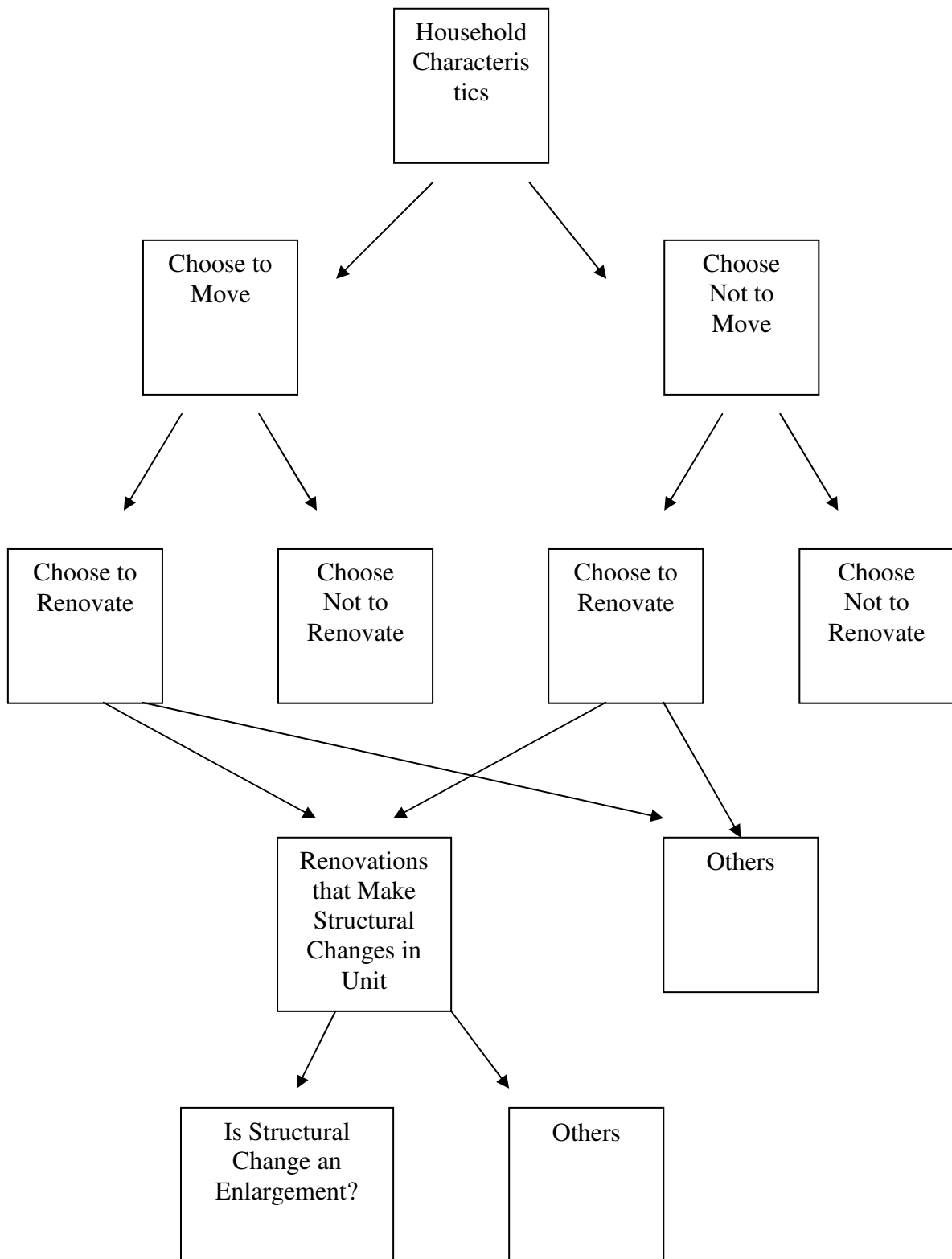
Households are considered here to make a series of consecutive decisions. The first is whether to move and the second is whether to renovate, although it is possible for the

household to do both. If it has decided to renovate, will it undertake major structural change in the property unit, such as by enlarging the unit or re-dividing the internal space to create new rooms, or does it make other changes? And if structural changes are made, do they enlarge the total size of the built unit or merely rearrange internal space?   We wish to identify the characteristics that affect decision making at each level.

We will examine the characteristics of households making choices at each stage of the decision tree, and will use logistic regressions to characterize the likelihoods of making the relevant choices at each decision making level. The data set is based on a questionnaire in which households are asked about "major renovations only," defined as renovations involving an expenditure above ???   .

The structure of this paper is as follows: in the next section we review the existing literature on housing renovations. Following that we describe the AHS data set that will be used for the analysis.   We present summary statistics that describe different sets of households, based on whether they chose to move or renovate or both. This is followed by logistic regression analyses of these decisions.   Decisions involving major structural changes and renovations that increase the floor space of units are analyzed in separate logistic regressions. The paper ends with a section of conclusions.

II. *Literature Review:*

The scope of housing renovation has been an area of focus and tracking for the Joint Center for Housing Research at Harvard University. Among the surveys and other papers there that examine housing renovation are Baker and Kaul (2000), who examine how changes in household composition affect the decision to renovate, Bendimerad (2007), who forecasts trends in US housing renovation, Duda (2001), who surveys the role of federal funding programs in US housing renovation, and Guerrero (2003, 2004) and Reade (2001), who develop indicators

of renovation activity and financing, Reade and Di (2000) survey housing conversions in the United States, noting that they are distributed unevenly geographically and often accompany changes in household composition. Guerrero (2003) surveys the use of housing-related financial instruments in decisions to renovate housing.

There have been several interesting empirical papers on housing renovation decision making. Potepan (1989) finds that these decisions are sensitive to interest rates and household income. Bendimerad (2005) surveys differences in the inclination to undertake housing remodelling across American generations and racial groups, noting that "Generation X" members are considerably more prone to remodel than others. Kutty (1999) investigates housing modification decisions for elderly households. She finds that modifications are income elastic and often serve as a substitute for hiring in-home care.

In other empirical work, Reschovsky(1992) finds that the demand for housing "improvement" behaves very differently from the demand for housing upkeep. T.P. Boehm and K.R. Ihlanfeldt (1986) investigate factors that affect urban household expenditure on housing improvement, noting the importance of neighbourhood amenities and the cost of inputs. Helms (2003), in contrast, finds that amenities explain little in terms of the decision to renovate in "gentrifying" areas of Chicago. Bogdon (1996) examines empirically factors, including education and income, that affect the decision to hire an outside contractor to do housing renovations. Household "production" or repairs qre examined using a behavioural economic approach by Eastwood and Garnerl (1986). McMillen and Thorsnes (2006) discuss incorporating renovation expenditures into housing indices. Gyourko and Tracy (2006) investigate the importance of housing maintenance and repair expenditure on household inequality within the US. Some research on renovation decisions outside the United States has also been done, such as Carmon (1992) for Israel and Strassmann (1984) for Peru.

There has also been some theoretical work on housing innovation. Gyourko and Saiz (2004) develop a theoretical model of the decision to renovate, based on comparing the current value of a property to the equivalent of its construction materials and costs. Testing it with American Housing Survey data, they find that those with homes with market values below the value of construction materials are 50% less likely to renovate, controlling for income. Several theoretical papers, Arnott, *et al* (1983) and Kutty (1995), examine landlord decisions to invest in quality improvement through renovation.

III. The Data Set:

Information about household moving, renovations, and the factors affecting their likelihoods are derived from the 2005 American Housing Survey, the latest available at the time this paper is being written. The American Housing Survey is a national survey of housing conditions conducted by the US Census Bureau and the Department of Housing and Urban Development. Every other year it analyzes a national sample, and during in-between years it analyzes specific cities.[2]

The entire 2005 AHS national sample covers about 106,000 occupied housing units, of which about 70% are owned and about 30% rental units. Parts of the data are household-based, with one household per housing unit. Others are individual-based, such as salary and age. Detailed combined housing and personal data are available for only part of the total sample for a number of reasons. There is considerable missing data for some variables; for example, data on reasons for choice of location is available only for "recent movers," a fairly small subset of the total. In other cases there are missing data for things like housing value and size or housing physical features. In all, there is detailed usable housing information for

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[2] Sampling is described at length in http://www.census.gov/hhes/www/housing/ahs/ahs01/appendixb.pdf. The data are collected in a survey conducted by the US Census Bureau and the Department of Housing and Urban Development, and so the responses are interview answers, including regarding such things as the current value of the property and its quality rating.

about 42,000 households, of whom about 28,000 own their own home, although these also include some missing values, and so the actual numbers used in regressions below will be smaller.

Some data editing to create the file actually used in the regressions below. First, only current home owners are included in the analysis below, while renters are excluded. Some households are excluded if variables seem unreasonable, such as if the head of the household is under age 18.[3] Renovations that were undertaken in response to natural disasters are identified in the survey and are excluded from the analysis below, because in a sense they are not "rational chosen," but rather are "forced" upon the household by *force majeure*. Because many households contain multiple employed people, we wished to avoid the "double counting" of houses from the AHS survey that would result from using individuals as the basis for the sample to be analyzed. Accordingly, for each household a single "breadwinner" or head of household is selected, identified as the member of the household with the highest salary. In cases of ties or zero salaries, the first person listed by the respondent on the survey questionnaire form was used to "represent" that household in this.

Household moving and renovations decisions can be analyzed using several sets of explanatory variables provided by the Survey. Household respondents are asked to report only "major renovations" of all sorts, where a major renovation is defined as ????? In cases of such renovations, the household is asked to report costs, whether or not an outside contractor was used, and what sorts of renovations were made, inside and outside the housing unit. It is possible to separate renovations that made structural changes from those that did not.

The relevant explanatory variables for the analysis here fall into three categories:

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[3] Data used here were further "cleaned" according to values of variables believed to be errors or extreme outliers, such as housing units with less than 10 square feet, non-positive incomes, housing units valued at less than 1000 dollars, rented for less than 10 dollars per month.

1. Personal and household variables. These include socio-demographic variables: gender, age, marital status, household size, education level, and race. There are also personal and household economic factors. These are salary (measured at the personal level for household "breadwinner"), household income from all sources, and indicators of household wealth, including number of cars, whether or not there is income from dividends.

2. Housing variables. These include first and foremost the form of housing tenure: ownership vs. renting. They include other housing-related variables: the value of unit (price or rent), type of building (apartment, house, mobile home), the level of property taxes (which is an indirect indicator of the level of local public services), and some physical features of the unit. The last group includes square footage of floor space, number of bedrooms, number of bathrooms, whether the unit has a garage or parking space included, whether it has a cellar, and the subjective quality rating of the unit.

3. Location and neighborhood variables. These include several location variables: region of the United States and position within the metropolitan statistical area - MSA (the central city of MSA, urban area in MSA outside central city, rural within MSA, urban and rural areas outside MSA). These also include indicators of whether there are nearby shopping services, green areas, apartment buildings, commercial services, whether the unit is in a gated neighborhood, etc.

IV.   *To move and/or to Renovate?*

The households in the American Housing Survey that renovate and/or relocate are described in Table 1. Households that moved in the two years preceding the Survey are separated from those that did not, and households that carried out major renovations are separated from those that did not. For categorical descriptive variables, chi-square significance tests are shown.

As can be seen these raw indicators, households that neither moved nor did renovations are less frequently headed by a male, less often contain a married couple, are considerably more likely to be non-white, and tend to be less well educated than the other groups. They also tend to earn lower income and salaries. Households that both moved and renovated have the highest incomes and salaries, are the youngest group, and have somewhat larger households than the others.

The four groups in Table 1 do not differ much when it comes to the size of the housing units, or the number of bedrooms and baths. The homes of recent movers are worth more than those of non-movers, whether they renovated or not. There are some differences in the physical units: those who renovate more frequently are in homes that contain a cellar. Those who neither move nor renovate are least likely to be in a single-family house. The four groups do not differ very much in terms of their distribution across the subregions within the metropolitan area, although non-movers tend to live in rural areas in relatively large numbers. Those on the West Coast are a bit more likely to be recent movers than households in other regions. There are some slight differences across the groups in terms of neighbourhood features and amenities.

Table 2 shows a logit regression of the decision of whether or not to move. The dependent variable is the logit of the likelihood of having moved during the previous two years (from the time the Survey was conducted), divided by the likelihood of not having moved. About 20% of households actually moved during the previous two years. Several household variables affect the moving decision. As seen in the table, household income has a negative coefficient, where a doubling of income lowers the logit by about 5%, other things equal. Age is also negatively correlated with the likelihood of moving. Non-white families (defined as those in which the head of household is not white) are considerably more likely to be among the recent movers.

The moving likelihood logit is correlated with a number of features of the housing unit and neighbourhood factors. Housing value is positively associated with the likelihood of being among recent movers, other things equal. Movers evidently tend to move to more expensive, but not necessarily physically larger, housing units. If their current housing unit is larger or has a larger number of bedrooms, then the household is *less* likely to be among the recent movers. A larger number of bathrooms is associated with higher likelihood of being among the recent movers. A higher property tax rate is positively associated with the likelihood of being in the recent movers group. Since this tax is presumably associated with neighborhood amenities, this would seem to indicate that movers tend to be those moving to neighbourhoods with superior levels of amenities.

Recent movers are least likely to be those currently living in urban and rural areas that are inside the metropolitan statistical area while also outside the central city, other things equal. All remaining metropolitan subregions are areas in which recent movers are more likely to be located. Those currently living in a single family home are less likely to be among recent movers. Residents of gated neighbourhoods are, not surprisingly, considerably more likely to be recent movers.

Interestingly, moving seems to be associated with somewhat longer commutes. Households in which the breadwinner commutes further are more likely to be those that household recently moved, other things equal. Owning two cars is also positively associated with the likelihood of being in the recent mover group. Explanatory variables that were ***not*** statistically significant factors include educational levels and some other neighbourhood amenities. The fact that these did not affect the decision to move may be noteworthy.

In Table 3, the decision of whether or not to renovate is analyzed, with separate logistic regressions for those who recently moved, those who did not move, and for all households together. The dependent variable in each case is the logit of the likelihood to renovate divided

by the likelihood of no renovations. Here all forms of major renovations are included, while below we will consider subcategories of renovations. About 57% of all households surveyed made some form of renovation in their property during the previous two years, which means that the base value of the ratio of the likelihoods for the entire sample is slightly greater than 1.

Of household characteristics, several indicators of socioeconomic status are positively associated with the likelihood to renovate. Household income is positively associated with the likelihood of having performed major renovations, other things equal. Doubling of income raises logit by 13%. Households with post-graduate education or that own at least three cars are considerably more likely to be among the renovators. Homeowner insurance premiums, indirectly a surrogate for the value of household chattel property within the home, is positively associated with the likelihood of renovation, probably a wealth effect. Finally, non-white households are considerably less likely to be renovators, other things equal. This is even more true of non-white recent movers.

The current value of the property increases the likelihood of conducting renovations, but only for non-movers. These are evidently households that tend to prefer to alter their existing property, instead of moving. For recent movers, housing value is unrelated to the likelihood to renovate. Those in single-family homes are much more likely to be among the renovators than those in other types of units. Those living in units with larger floor space were less likely to renovate, in all regressions. Those with a larger number of bedrooms or a larger number of bathrooms (in this latter case, among movers only) were more likely to be among the renovators. (Of course the renovations in question may have been what added those extra baths and bedroom in the first place.) Unsurprisingly, those in units built more recently were less likely to be renovators.

The effects of location within the metropolitan area are different for recent movers and non-movers. Among non-movers, those living in rural areas inside and outside the metropolitan statistical area (MSA) were the least likely to be renovators, other things equal. For movers, those living in urban areas outside the MSA were the least likely to be renovators, followed by those living in rural areas outside the MSA. Those living within the MSA but outside the central city were the most likely. Proximity to green areas was positively associated with the decision to renovate for all groups. Living close to shopping areas was negatively so associated.

V.   *Whether and How to Renovate*

In Table 4 we take a closer look at subcategories of renovations undertaken by households that decided to renovate. The table describes a number of characteristics of households, based on whether they enlarged their home, carried out other structural renovations in their home, carried out non-structural major renovations, and households that conducted no renovations at all. Movers and non-movers are here included together.[4]

From the table, it is seen that, in some things, these four groups are very similar, whereas in others they are quite different. Among the household characteristics, those undertaking structural changes are more likely than the other groups (non-structural changes or no renovations) to have a male head of household and to be a household composed around a married couple. They tend to be somewhat better educated than those not making structural changes, a bit younger, and with larger households. They also have higher incomes.

The type of renovation is also associated with some property and neighbourhood features. Those who make structural changes tend to live in larger homes. Those making enlargements live in homes worth more than those of the other groups, pay higher real estate

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[4]   If separated, the subsets would be too small to conduct statistical analysis.

taxes, and appear to have more non-housing property (as indicated by homeowners insurance rates). They are also more likely to be living in rural areas than the other groups.

The type of renovation pursued is the focus of Tables 5 and 6, which isolate major structural changes and changes that result in enlarged space in the unit, respectively.[5] . Each table shows two logistic regressions, one in which the alternative category consists of the set of all homeowners who did not pursue the renovation in question, and the second in which the alternative is the set of households who did other renovations. That is, those who carried out no renovations at all are excluded altogether in the second of the two regressions.

In Table 5, logistic regressions for all structural renovations are shown. The likelihood of making such renovations rises with household income and with the size of the household, but falls somewhat with age. It is negatively associated with ownership of more than three cars. Among property variables, the likelihood of structural renovation increases with the size of the housing unit, the number of baths, having a designated parking space, and is much more likely in single family houses. The likelihood rises with household income, but only when the "default group" includes non-renovators. When non-renovators are excluded, income is not a statistically significant explanatory variable. Some locational variables are statistically significant, and households living on the West coast are more likely to be structural renovators.

In Table 6, a similar set of regressions is shown for structural changes that enlarge the housing unit's floor space. Curiously, when the "default group" consists of those who undertake other non-enlargement renovations, the likelihood of enlargement renovation is negatively correlated with the salary of the household breadwinner. This contrasts with the positive coefficients found for income or salary in the other regressions discussed above. As in Table 5, the likelihood of enlargement renovations is positively related to household size,

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[5] There were so few cases of renovations that made the unit smaller, a mere 6 cases for the entire national sample, that these were not treated as a separate category.

and negatively associated with age, owning three or more cars, and with membership in non-white households. The likelihood of enlargement renovations rises with the value of the property, with the size of the unit in square feet, with the number of baths, and with being a single family house, but decreases when the home's construction was more recently built. Enlargement renovations are less likely in the urban subareas of the MSA, other things equal, compared with other subregions.

VI.   *Conclusions:*

Housing renovation is an important component of housing supply, yet one often ignored both in empirical analysis and in policy discussions about housing. In particular, the role of renovation as a substitute for moving is a matter that should be of greater interest. As such, it carries implications for such issues as geographic mobility and commuting behaviour. As urban areas spread and as demolition costs rise, renovation represents an important alternative to construction of new units in metropolitan areas. As such, urban planners, zoning commissions, and others need to take it into consideration. For all these reasons, a better understanding of household decision making regarding renovation

In this paper, we show that households choosing to renovate differ in some interesting ways from those who do not. In particular, socioeconomic status and race seem to affect the likelihood of making such decisions. Households that neither move nor do renovations appear to be on average those with lower socioeconomic status. They tend to earn lower income and salaries and they are less frequently headed by a male, less often contain a married couple, are considerably more likely to be non-white, and tend to be less well educated than the other groups. In contrast, households that both move and renovate have the highest incomes and salaries, are the youngest group, and have somewhat larger households

than the others. Those who move without renovating, or renovate without moving, on average tend to fall in between those two groups

   The chance that households *move* seems to be negatively associated with some indicators of higher socioeconomic status. In logistic regressions, household income has a negative effect on the chance of moving, as does age.   Being non-white raises significantly the likelihood to be among movers. In contrast, the decision to *renovat*e seems to be positively associated with indicators of socioeconomic status. Household income is positively associated with the likelihood of having performed major renovations, other things equal, as is having post-graduate education or owning at least three cars. Non-white households are considerably less likely to be renovators across the board. Non-white recent movers are even less likely to undertake renovations.

   Some wealth indicators seem to operate on renovation decisions. The current value of the property increases the likelihood of conducting renovations, but only for non-movers. Those in single-family homes are much more likely to be among the renovators than those in other types of units. On the other hand, those living in units with larger floor space are less likely to renovate, evidently because they are less in need of the extra space.

   In separate analyses of structural renovations compared with other types, it was seen that those undertaking structural changes have higher incomes, are somewhat better educated, and are more likely than the other groups (non-structural changes or no renovations) to have a male head of household and to be a household composed around a married couple. Structural change decisions that enlarge the housing unit's floor space seem to behave somewhat differently from those involving other renovation decisions. The likelihood of enlargement renovation is negatively correlated with the salary of the household breadwinner. This is the opposite of the impact of salary or income in the other regressions. The likelihood of enlargement renovations rises with property values, is positively related to household size,

and negatively associated with age, owning three or more cars, and with membership in non-white households.

Intra-household differences regarding housing remodelling and renovation may play an important role in housing inequality within and across metropolitan areas, and across demographic groups.

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Table 1: Characteristics of Households that Relocate and/or that Renovate, American Housing Survey 2005

	Households that did not Move Recently and Had No Renovations or Housing Repairs	Households that did Renovations or Repairs but Did Not Move Recently	Households that Moved Recently but did no Renovations or Repairs	Households that Both Moved Recently and did Renovations or Repairs	Chi Square Test that Division significantly Related to Variable (Significant at alpha =)
N	9,837	11,769	2,454	3,017	
Personal and Household Factors:					
Of households in column, percent with male breadwinner	59.67%	62.29%	64.18%	64.53	0.01%
Percent of Those in Columns whose Household Head Married with Spouse Present	56.65%	66.86%	57.05%	60.59%	0.01%
Percent of Non-White Household Heads in Column	40.65%	10. rabeta_1@totmail.com9%	17.07%	12.45%	0.01%
Percent of Breadwinners who are High School Graduates Only	37.88%	53.78%	51.75%	51.41%	0.01%
Percent who were Collage Graduates	12.75%	21.32%	26.65%	24.99%	0.01%
Percent with Postgraduate Education	8.00%	14.45%	12.18%	14.75%	0.01%
Mean and S.D. Household Annual Income	61,495 (68,328)	78,335 (76,909)	69,729 (60,911)	80,576 (76,094)	
Mean and S.D. Annual Salary of Breadwinner in Household	35,240 (51,308)	45,738 (57,589)	46,341 (46,273)	52,648 (58,435)	
Mean and S.D Number of Persons in Household	2.40 (1.36)	2.72 (1.40)	2.85 (1.53)	3.04 (1.58)	
Mean Commute Time for Breadwinner of Household – Minutes	34.07	34.11	30.53	33.56	
Mean Commute distance for Breadwinner of Household –	28.98	28.57	25.48	28.28	

Miles					
Mean and S.D. Age of Breadwinner	55.60 (16.53)	52.29 (15.10)	42.63 (14.43)	41.88 (13.45)	
Percent of Households in Column Owning No Car	11.45%	15.37%	15.44%	13.95%	0.01%
Percent Owning Two Cars	17.59%	28.48%	32.48%	33.74%	0.01%
Percent Owning Three or more Cars	5.67%	11.03%	8.76%	11.83%	0.01%
Housing Variables:					
Percent of column in Single Home	64.07%	96.34%	91.15%	94.75%	0.01%
Percent in Gated Neighborhood	3.65%	3.20%	7.28%	5.04%	0.01%
Mean and S.D Square Foot of Unit	2221.36 (1866.72)	2265.92 (1781.03)	2201.07 (1732.74)	2182.67 (1767.93)	
Mean and S.D. Number of Bathrooms	1.68 (0.75)	1.75 (0.74)	1.87 (0.77)	1.81 (0.76)	
Mean and S.D. Number of Bedrooms	3.04 (0.87)	3.20 (0.86)	3.11 (0.91)	3.21 (0.96)	
Mean and S.D. Value of Unit	242,308 (281,931)	266,540 (287,050)	271,576 (288,459)	275,980 (289,181)	
Mean and S.D. Annual Cost of Homeowners Insurance	746.00 (660.33)	795.54 (641.75)	758.14 (621.91)	795.31 (639.47)	
Mean and S.D. Annual Real Estate Taxes	2342.18 (2986.11)	2568.83 (2964.89)	2588.45 (3386.15)	2689.04 (3155.97)	
Percent with Parking Place as Part of Property	12.8%	15.5%	16.0%	17.0%	0.01%
Percent of Properties with a Cellar	30.2%	48.4%	37.0%	42.9%	0.01%
Percent having their Own Garage	53.0%	82.2%	81.3%	80.3%	0.01%
Neighborhood and Location Variables:					
Percent of those from column who are in Central City of MSA	23.75%	22.65%	25.22%	26.25%	0.01%
Percent who are in Secondary Urban Area within MSA	36.01%	37.34 %	30.44%	35.23%	0.01%

Percent who are in Rural Areas of the MSA	16.97%	17.09%	12.22%	14.45%	0.01%
Percent who are in Urban Areas outside MSA	7.42%	7.18%	18.09%	10.64%	0.01%
Percent who are in Rural Areas outside MSA	15.85	15.74	14.02	13.42	0.01%
Percent of Those Living on West Coast	19.31%	20.60%	22.13%	24.40%	0.01%
Percent Saying Shopping Nearby is Adequate	82.43%	82.67%	84.91%	83.69%	1.8%
Percent with Green Open Spaces Nearby	37.58%	41.41%	38.02%	41.06%	0.01%
Commercial Properties Nearby	16.7%	17.8%	17.5%	18.6%	5.2%
Percent Having Some Apartment Buildings Nearby	13.5%	12.2%	14.4%	14.3%	0.06%

(Numbers in Parentheses are standard deviations)

Table 2

Logit Analysis of the Decision to Move (Current Home Owners Only):

Intercept	-17.25
	(119.05)
Household Characteristcs:	
Log of Household Income	- 0.048
	(13.69)
Dummy if Head of Household Nonwhite	0.141
	(7.083)
Age of Breadwinner	-0.057
	(1664.9)
Dummy for ownership of exactly 2 cars	0.210
	(30.51)
Property Characteristics:	
Log of Value of Property	0.071
	(9.66)
Log of Annual Property Tax	0.047
	(4.416)
Log of Unit size in Square Feet	-0.145
	(12.82)
Year Current (new) Unit Built	0.0097
	(147.53)
Number of Bathrooms in Current (New) Unit	0.132
	(17.60)
Number of Bedrooms in Current (New) Unit	-0.079
	(9.433)
Dummy for Single Family Home	-0.287
	(11.54)
Neighborhood Characteristics:	
Log of Distance from Home to Job	0.060
	(24.00)
Dummy if Reside in Central Urban Area of MSA	--*
Dummy if Reside in Secondary Urban Area of MSA	-0.355
	(42.11)
Dummy if Reside in Rural Area within MSA	-0.267
	(38.99)
Dummy if Reside in Urban Area Outside MSA	0.687
	(125.42)
Dummy if Unit is in Gated Community	0.460
	(30.34)
Percent Concordant	73.6%
Somers' D	0.475
AIC (Intercept and Covariates)	20035.810
Significance of Chi Square of Likelihood Ratio	0.01%
N	22,833
Percent of Households in Regression who Moved	19.90%

(Numbers in Parentheses are Wald Chi Square)

Default Location is Rural Area outside MSA; * indicates other area not significantly different from that subregion

Table 3
Logit Analysis of the Decision to Renovate, separate regressions for Recent Movers and Non-Movers (Current Home Owners Only):

	Non-Movers Only	Movers Only	All Households
Intercept	7.21	34.80	-1.521
	(30.99)	(160.31)	(38.64)
Household Characteristcs:			
Log of Household Income	0.131	0.132	0.129
	(109.30)	(28.73)	(136.96)
Dummy for Postgraduate Education of Breadwinner	0.085	--	0.121
	(3.480)		(8.893)
Dummy for ownership of 3 or more Cars	0.103	0.244	0.170
	(3.905)	(5.67)	(13.61)
Age of Breadwinner	-0.012	--	-0.008
	(122.05)		(83.37)
Dummy if Head of Household Nonwhite	-0.268	-0.330	-0.300
	(29.67)	(13.61)	(49.43)
Log of Householder Insurance Premium	0.068	0.086	0.089
	(9.498)	(4.67)	(24.72)
Property Characteristics:			
Log of Value of Property	0.035	--	--
	(4.165)		
Log of Unit size in Square Feet	-0.051	-0.169	-0.081
	(2.531)	(5.26)	(7.468)
Log of Distance from Home to Job (Miles)	0.053	--	0.047
	(25.44)		(25.22)
Dummy for Single Family Home	0.492	0.383	0.502
	(37.97)	(7.617)	(53.48)
Year Current (new) Unit Built	-0.005	-0.018	--
	(48.80)	(174.80)	
Number of Bedrooms in Current (New) Unit	0.086	0.119	0.111
	(17.09)	(7.49)	(33.28)
Number of Bathrooms in Current (New) Unit	--	0.094	-0.092
		(2.78)	(17.03)
Neighborhood Characterists:			
Dummy if Reside in Central Urban Area of MSA	0.135	0.168	0.222
	(8.537)	(2.430)	(28.25)
Dummy if Reside in Secondary Urban Area of MSA	0.105	0.261	0.080
	(7.024)	(5.086)	(3.536)
Dummy if Reside in Rural Area within MSA	--*	0.256	0.190
		(6.14)	(26.28)
Dummy if Reside in Urban Area Outside MSA	0.127	-0.276	--*
	(4.021)	(5.4946)	
Dummy if Unit is Near	0.176	0.227	0.161

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a Green Area	(28.59)	(12.13)	(31.23)
Dummy if Commercial Property Nearby	0.138 (10.39)	--	0.167 (19.99)
Dummy if Shopping Nearby Described as Adequate	- 0.075 (3.155)	-0.162 (3.413)	-0.099 (6.908)
Percent Concordant	60.8%	65.7%	59.8%
Somers' D	0.222	0.317	0.204
AIC (Intercept and Covariates)	24704.978	6186.178	31169.454
Significance of Chi Square of Likelihood Ratio	0.01%	0.01%	0.01%
N	18,514	4,775	23,275
Percent of Households in Regression who Renovated	56.7%	57.1%	56.7%

(Numbers in Parentheses are Wald Chi Square)

*Default Location is Rural Area outside MSA; * indicates other area not significantly different from that subregion

Table 4: Characteristics of Households by the Type of Housing Renovation they Made

	Major Structural Renovation that Added New Space to Unit	Internal Restructuring of Space that did NOT add New Space to Unit	Other Renovations	No Renovations	Chi Square Test that Division significantly Related to Variable (Significant at alpha =)
N	343	11113	13,337	12,127	
Personal and Household Factors:					
Of households in column, percent with male breadwinner	67.35	68.37	62.20	60.66	0.01%
Percent of Those in Columns whose Household Head Married with Spouse Present	74.64	72.24	64.88	56.88	0.01%
Percent of Non-White Household Heads in Column	6.71	11.32	11.40	14.22	0.01%
Percent of Breadwinners who are High School Graduates Only	50.44	50.22	53.78	54.72	1.20%
Percent who were Collage Graduates	21.87	25.52	21.80	20.28	0.01%
Percent with Postgraduate Education	17.78	15.81	14.31	11.82	0.01%
Mean and S.D. Household Annual Income	93,035 (88,249)	94,703 (95,240)	77,071 (74,291)	63,392 (66,969)	
Mean and S.D. Annual Salary of Breadwinner in Household	55,267 (68,572)	59,794 (73,019)	45,920 (55,788)	37,671 (50,622)	
Mean and S.D Number of Persons in Household	3.19 (1.58)	3.27 (1.51)	2.74 (1.42)	2.49 (1.41)	
Mean and S.D. Commute Time for Breadwinner of Household – Minutes	32.70 (140.33)	31.48 (134.92)	34.32 (141.50)	33.31 (141.34)	
Mean and S.D. Commute distance for Breadwinner of Household – Miles	27.94 (140.63)	25.93 (135.02)	28.81 (141.68)	28.23 (141.51)	
Mean and S.D.	48.96	44.39	50.79	53.36	

Age of Breadwinner	(13.44)	(12.71)	(15.41)	(16.67)	
Percent of Households in Column Owning No Car	17.49	16.26	14.92	16.47	0.01%
Percent Owning Exactly Two Cars	32.36	32.08	29.28	27.03	0.01%
Percent Owning Three or more Cars	11.08	11.77	11.10	8.37	0.01%
Housing Variables:					
Percent of column in Single Home	99.13	97.39	95.82	92.87	0.01%
Mean and S.D Square Foot of Unit	2687.45 (2138.48)	2468.84 (2028.09)	2218.47 (1742.92)	2213.58 (1833.19)	
Mean and S.D Square Foot of Space added to Unit	309.78 (2491.46)	--	--	--	
Mean and S.D. Number of Bathrooms	1.98 (0.80)	1.85 (0.87)	1.75 (0.73)	1.72 (0.76)	
Mean and S.D. Number of Bedrooms	3.36 (0.90)	3.35 (1.02)	3.18 (0.87)	3.05 (0.88)	
Mean and S.D. Current Value of Unit	357,587 (383,509)	287,861 (307,654)	263,902 (281,297)	248,590 (283,846)	
Mean and S.D. Annual Cost of Homeowners Insurance	947.93 (809.29)	821.54 (693.01)	789.03 (631.31)	748.32 (651.37)	
Mean and S.D. Annual Real Estate Taxes (Owners Only)	3141.14 (3705.97)	2837.68 (3391.20)	2554.92 (2943.90)	2391.72 (3074.38)	
Percent with Parking Place as Part of Property	11.95	20.49	15.61	18.05	0.01%
Percent having their Own Garage	86.59	76.91	82.00	78.13	0.01%
Neighborhood and Location Variables:					
Percent of those from column who are in Central City of MSA	16.03	24.53	23.46	23.28	0.01%
Percent who are in Secondary Urban Area within MSA	34.11	35.31	37.08	34.42	0.01%
Percent who are in Rural Areas of	20.12	16.53	16.50	16.12	0.01%

the MSA					
Percent who are in Urban Areas outside MSA	8.45	8.89	7.80	9.58	0.01%
Percent who are in Rural Areas outside MSA	21.28	14.73	15.15	16.60	0.01%
Percent of Those Living on West Coast	22.74	16.98	21.66	18.45	0.01%
Percent Saying Shopping Nearby is Adequate	18.71	17.40	17.10	17.09	87%
Percent with Green Open Spaces Nearby	48.08	45.32	40.88	37.62	0.01%
Commercial Properties Nearby	16.81	21.10	17.78	16.80	0.22%
Average (SD) of Costs for Structural Changes	60,756 (130,438)	19,567 (53,683)	--	--	

(Numbers in Parentheses are standard deviations)

Table 5
Logit Analysis of the Decision to Make Major Structural Renovations:

	Logit of Decision to Make Any Major Structural Renovation vs. All other Choices*	Among those who Renovated Only, Logit of Decision to Make Any Major Structural Renovation
Intercept	8.43	3.68
	(12.65)	(2.14)
Household Characteristics:		
Log of Household Income	0.136	0.057
	(19.53)	(3.98)
Age of Breadwinner	- 0.022	- 0.020
	(94.87)	(72.00)
Dummy if Head of Household Nonwhite	- 0.363	-0.238
	(13.65)	(5.56)
Number of Persons in Household	0.152	0.136
	(57.58)	(41.15)
Dummy for ownership of 3 or more Cars	- 0.188	-0.230
	(4.28)	(6.15)
Property Characteristics:		
Log of Current Value of Property	0.050	--
	(2.24)	
Log of Unit size in Square Feet	0.159	0.197
	(7.44)	(10.71)
Dummy for Single Family Home	0.683	0.418
	(12.63)	(4.56)
Year Current (new) Unit Built	-0.0076	-0.0042
	(40.94)	(10.99)
Number of Bathrooms in Current Unit	0.160	0.180
	(13.68)	(16.49)
Dummy if Unit has Its Own Parking Space	0.215	0.257
	(7.91)	(10.71)
Neighborhood Characteristics:		
Dummy if Unit is Near a Green Area	0.214	0.144
	(13.75)	(5.92)
Dummy if Commercial Property Nearby	0.208	0.165
	(7.91)	(4.80)
Dummy if Shopping Nearby Described as Adequate	- 0.146	--
	(3.78)	
Dummy if Reside in Secondary Urban Area of MSA	--**	-0.127
		(4.25)
Dummy for West Coast	0.176	0.212
	(5.29)	(7.92)
Percent Concordant	66.3%	63.6%
Somers' D	0.343	0.284
AIC (Intercept and Covariates)	10125.9	8668.0
Significance of Chi Square of Likelihood Ratio	0.01%	0.01%
N	24,851	13,960
Percent of Households in Regression who Did Major	5.56%	9.81%

Structural Renovation
(Numbers in Parentheses are Wald Chi Square)
* Including No renovation at all
**Default Location is Rural Area outside MSA; subregions not listed in table were non-significantly different from default subregion

Table 6
Logit Analysis of the Decision to Make Major Structural Renovations that Add to the Size of the Housing Unit:

	Logit of Decision to Make Major Structural Renovation that Added New Space to Unit vs. All other Choices*	Among those who Renovated Only, Logit of Decision to Make Major Structural Renovation that Added New Space to Unit
Intercept	8.78	11.31
	(3.78)	(5.06)
Household Characteristics:		
Log of Household Income	0.122	--
	(4.33)	
Log Of Breadwinner Salary	--	-0.105
		(2.75)
Number of Persons in Household	0.187	0.145
	(26.36)	(12.50)
Dummy if Head of Household Nonwhite	-0.528	-0.466
	(5.53)	(3.51)
Dummy for ownership of 3 or more Cars	-0.305	- 0.379
	(2.78)	(3.94)
Property Characteristics:		
Log of Current Value of Property	0.211	0.343
	(8.29)	(16.25)
Log of Unit size in Square Feet	0.232	0.246
	(4.31)	(4.02)
Dummy for Single Family Home	1.266	--
	(4.67)	
Year Current (new) Unit Built	-0.011	- 0.010
	(21.33)	(16.78)
Number of Bathrooms in Current (New) Unit	0.172	0.228
	(4.58)	(6.75)
Neighborhood Characteristics:		
Dummy if Reside in Central Urban Area of MSA	- 0.529	- 0.610
	(10.57)	(11.54)
Dummy if Reside in Secondary Urban Area of MSA**	-0.413	- 0.445
	(9.96)	(9.57)
Percent Concordant	63.4%	63.4%
Somers' D	0.339	0.311
AIC (Intercept and Covariates)	3409.60	2522.91
Significance of Chi Square of Likelihood Ratio	0.01%	0.01%
N	25,520	11,274

| Percent of Households in Regression who Did Major Structural Renovation that Added Space to Unit | 1.29% | 2.45% |

(Numbers in Parentheses are Wald Chi Square)

* Including No renovation at all

**Default Location is Rural Area outside MSA; ** indicates other area not significantly different from that subregion