Wealth Accumulation and Homeownership:

Evidence for Low-Income Households

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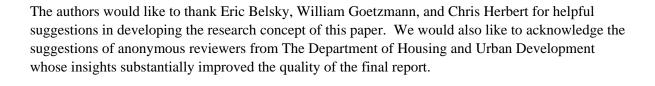Office of Policy Development and Research

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Executive Summary

For many years the federal government has promoted homeownership as an important goal for low-income families. A primary motivation of this policy goal is the concept that owner-occupied housing can be an important means of wealth accumulation, particularly for those lower-income and minority families that are able to purchase homes. However, very little has been done in the housing literature to determine the importance of housing and non-housing sources of wealth accumulation. This determination has been difficult to address for three reasons. First, detailed wealth information on families is seldom available on a consistent basis. Second, such information on wealth is even less likely to be available over time so that changes in wealth can be observed. Third, the process of housing wealth accumulation is dynamic. Housing wealth accumulation depends critically on how soon a family that is renting becomes a homeowner, whether or not the family graduates to more highly valued owned units over time, or becomes a renter again and never regains homeownership.

The issues above are addressed through an analysis based upon a unique panel data set, the Panel Study of Income Dynamics (PSID) collected by the Survey Research Center at the University of Michigan. The PSID is unique because the location of households in the sample can be identified at the Census tract level. Thus, household information can be merged with Census data for the purpose of the analysis. In addition, the PSID has detailed information for each household within the sample on housing tenure (own versus rent), housing expenditure levels, and household characters, including income and a detailed breakdown of the net wealth position of the family. Because of its panel nature, families can be followed over time and changes in these factors observed.

The dynamics of housing choice and housing expenditure are modeled to predict potential housing wealth accumulation for households across income and racial groups. Specifically, a probability model is developed from which the cumulative likelihood of homeownership is calculated over time for all households in the sample. It is important to note that explicitly accounted for in this approach is the likelihood that, having become owners, households may subsequently transition back to rental tenure and/or may move to other owned units over time. A housing expenditure equation is estimated to predict, at a given point in time, expected household expenditure. The higher the likelihood of choosing ownership and the greater the expenditure predicted, the larger the household's base of potential housing wealth. One additional element that is required to project the amount of housing wealth accumulation a given household might anticipate is the expected rate of appreciation in house value. To estimate the expected appreciation in house value, changes in the median value of owned homes in the Census tracts actually occupied by the PSID households are used (rather than regional averages). The predictions of housing wealth accumulation are compared to actual non-housing wealth accumulation during the sample period and implications drawn as to the relative importance of these two mechanisms for family wealth accumulation. The combination of the dynamic probability modeling in conjunction with the detailed geographic and wealth information represents a substantial extension of the existing literature in this area.

There are a number of interesting findings in the analysis. First, it is important to note that owners often transition back to renting and, particularly among low-income minority families, do not regain owner-occupied housing. Specifically, for those low-income minority residents who transition out of

owning only 37% return to owned status. For high-income white households this percentage is approximately 58%. This is a critical issue in that housing wealth accumulation is impacted by both whether or not a family returns to homeownership and how quickly this process occurs. Second, there are significant differences in the movement to a new house (typically of higher value) with associated impacts on housing wealth accumulation. For low-income minority households only 22% actually transition to a second home and of those about 14% move to a third owned home during the observation period. For high-income white families the percentages are higher, namely 33% and 28% respectively. Third, and not surprisingly, housing expenditures, the basis of housing wealth accumulation (through appreciation), also vary greatly across household types. For families differentiated by income, median house value is approximately $80,000 for high-income white households and $32,000 for low-income minorities. Finally, the impact of simple appreciation on housing wealth is relatively similar in this sample. Interestingly, appreciation between the 1990 Census and 2000 Census in owner-occupied units for tracts in which PSID families actually lived (rather than regional averages) suggests similar median appreciation rates, ranging from a high of 4.6% to a low of 4.3%.

The factors discussed above predict housing wealth accumulation estimates for families in the sample that are strikingly different across income and racial groups. For high-income white families average annual housing wealth accumulation due to appreciation (ignoring the equity down-payment and forced savings through amortization) is $4,460 dollars for high-income white households and $1,712 for low-income minority families. It is critical to recognize that the numbers for annual housing wealth accumulation compare very favorably to the actual accumulation of non-housing wealth by families over the same period. For high-income white households the average median level of non-housing wealth accumulation is $2,650, while for low-income minority household's it is, quite simply, $0.

In terms of lower income households, non-housing wealth accumulation is at best minor and, for minority families, often negative. Thus, over the nine year period of the study, owned housing is an important means of wealth accumulation. Indeed, the results may be broadly interpreted for lower income households as implying that housing wealth is total wealth.

These results tend to support public policies aimed at both increasing homeownership opportunities in general and those policies that focus on homeownership for lower income households. Even though homeownership is not a guarantee of successful wealth accumulation, in that a small percentage where all family types lose money on their homes is observed, in general household wealth appears to be positively impacted by homeownership. This conclusion is reinforced with comparisons to accumulation of non-housing wealth. Wealth accumulation for low-income and minority households, although low, experiences a major increase through home ownership. In this regard, current initiatives to increase low-income homeownership seem both desirable and valid. Moreover, this work suggests that policies designed to ensure that once households achieve homeownership, they remain homeowners (rather than reverting to rental tenure), and policies that enable families to transition to higher valued owned units over time will increase substantially their potential housing wealth accumulation. These conclusions about the value of owned housing are reinforced when the positive social impacts of homeownership on families, particularly children, are also considered.

I. Introduction

Historically the Federal government has promoted homeownership in a variety of ways.[1] Alphonso Jackson, Secretary of Housing and Urban Development (HUD), has reaffirmed that one of his top priorities is the expansion of homeownership opportunities to low-income families.[2] The rationale for the national emphasis on homeownership is the widely held belief that homeownership benefits individuals and society in a fundamental way.[3] The notion of the house as an asset, particularly for lower to middle income families that can afford to purchase a home, is central to this emphasis.

This report considers one channel through which it is hypothesized that these benefits are delivered. The impact of homeownership on the wealth position of households (over the period 1984-1992) is estimated, and compared to non-housing wealth. The analysis is based not only upon individual household data but also incorporates neighborhood characteristics. Our results are encouraging for policies designed to increase low-income homeownership. Lower income households appear to be served well by homeownership.

The Joint Center for Housing Studies [JCHS] (2000) notes that even during the "stock market boom," housing equity still represented the majority of wealth for most homeowners. More recently, JCHS (2003) presents compelling evidence that homeowners' ability to borrow against housing wealth has been a mainstay of the current economic recovery. Although HUD and other federal agencies have tried to make owner-occupied housing more affordable to lower- and middle-income families, these families must nonetheless make significant financial commitments to achieve homeownership. The financial commitment (average housing costs as a percentage of family income) associated with homeownership among lower income households is striking. As noted in the analysis by Orr and Peach (1999), the percentage commitment can run as high as 40 to 60 percent.[4] The work of Scanlon (1999) suggests that this kind of financial commitment is not surprising because homeownership for minority households is a critical determinant of "life satisfaction."

For lower-middle income families, homeownership is the single largest investment they will ever make. As such, it may be their most important source of wealth accumulation and ultimate financial security. Currently, there is a substantial debate about whether and under what economic circumstances housing is the best investment for low-income families.[5]

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[1] For an interesting overview of this issue and its application to low-income households, see Retsinas and Belsky (2002). Also see McCarthy, Van Zandt, and Rohe (2001).

[2] For more details see HUD News Release No. 04-0101.

[3] Various literature summaries of these impacts appear in the five papers contained in "Part 5. Socioeconomic Impacts of Homeownership" in Retsinas and Belsky (2002).

[4] As discussed in Mayer (1999), the implied financial risks to lower income households of this commitment are significant.

[5] For example, the following papers discuss this issue: Belsky and Duda (2002), Boehm and Schlottmann (2002), Case and Marynchenko (2002), Di, Yang, and Liu (2004), and Goetzmann and Spiegel (2002).

This report empirically models family wealth accumulation as a function of the household's level of housing expenditure, the appreciation of housing in the neighborhoods in which they live, and the movement of households through a series of housing choices during the period of study. The movement of families from renting and to homeownership and, subsequently, to other owned homes (often higher in value) or back to rental status over time will be referred to as a household's "hierarchy of housing choices". We utilize the dynamic approach to homeownership choice and transitions in Boehm and Schlottmann (2004) as the first step in predicting housing wealth accumulation for these families. In so doing, we are able to provide insights regarding the inter-temporal pattern of family housing choice on wealth accumulation. That is to say, how soon during a given period of observation a renter becomes a homeowner, and whether that family transitions quickly to other (potentially higher valued) owned units might be expected to affect the amount of housing wealth that the family accumulates.

This report fills a void in the literature on housing choice and wealth accumulation. If the fundamental nature of housing wealth accumulation is indeed dynamic, there has been little work empirically that utilizes a dynamic approach. Our approach can help explain the divergent findings in the literature on the importance of owner-occupied housing as an asset building strategy for low-income families.

In this context, the literature on family wealth accumulation and housing choice has three shortcomings. First, little (if any) detailed family wealth information has been available, particularly over time for a given set of households. Thus, as described in detail in Belsky and Duda (2002), there has been little analysis of the timing of purchase and the dynamic of wealth accumulation.[6] Rather, the literature has focused on the *average* appreciation rates of homes either located in low-cost or low-income neighborhoods or at the bottom of the price distribution. As Goetzmann and Spiegel (2002) convincingly point out, this traditional measurement for housing as an asset is rather "dismal."[7] The complex nature of such measurements is discussed in detail for three large metropolitan areas (Boston, Chicago, and Los Angeles) by Case and Marynchenko (2002).[8]

Second, it is clear from the literature cited in Boehm (1993) on first time homeownership that wealth per se is an important factor affecting the likelihood and timing of home purchase. Few studies have attempted to model this dynamic. This joint dependency is more important given the later work of Gyourko, Linneman, and Wachter (1999) exploring differential rates of homeownership by race.

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[6] In general, demographic profiles and income profiles are tabulated at a given point in time. Classifications usually profile recent first-time purchasers versus current renters, differences by income or racial cohorts, etc. These studies provide valuable information, particularly if derived from data sources such as the American Housing Survey. However, the basic characteristics of the data do not allow a dynamic look at the issues considered here.

[7] Goetzman and Spiegel deal with a closely related theme to the literature cited here, the implicit risk associated with housing investment among low-income families. Their paper contains excellent references dealing with the risk of housing and the probability of mortgage default including those suggesting policy options such as creating insurance products to mitigate unwanted local housing risk.

[8] It is interesting to note that their analysis of these three cities (with different conditions in the regional economies) suggests that homeownership as a "good or bad" investment depends upon the time of purchase. The results presented in this analysis reinforce this conclusion.

They find no differences in ownership rates by households who have sufficient wealth to meet down payment and closing requirements. However, significant differences in ownership rates occur in "wealth constrained" households. In this regard, this report addresses how housing wealth accumulation relates to total wealth.

Third, if timing is an issue, there has been almost *no* analysis of the dynamics (timing) of home purchase and the family's subsequent movement through the "hierarchy" of housing choices. Without this type of analysis, it is not surprising that we know relatively little about the impact of the pattern of housing choice on wealth accumulation. See Boehm and Schlottmann (2002) for a summary of relevant literature on this topic.

The literature above has three primary implications for future research. First, detailed wealth information on families is seldom available on a consistent basis. Second, such information on wealth is even less likely to be available over time so that changes in wealth can be observed. Third, the process of housing wealth accumulation is dynamic. Housing wealth accumulation depends critically on how soon a family that is renting becomes a homeowner, whether or not the family graduates to more highly valued owned units over time, or becomes a renter again and never regains homeownership.

The three issues above are addressed in this study through a dynamic model of housing choice and housing expenditure to predict potential housing wealth accumulation for households across income and racial groups. Specifically, a probability model is developed from which the cumulative likelihood of homeownership is calculated over time for all households in the sample. It is important to note that explicitly accounted for in this approach is the likelihood that, having become owners, households may subsequently transition back to rental tenure and/or may move to other owned units over time. The likelihood of owning a first house and, subsequently, the likelihood of moving to other owned homes and/or returning to rental tenure during the observation period is predicted. Coupled with estimates of housing expenditure levels at different points in time for households in the sample, estimates of potential housing wealth accumulation (through appreciation) are calculated. These estimates are compared to actual non-housing wealth accumulation during the same time period for these families stratified by race (minority versus majority) and high versus low income. Thus, conclusions can be drawn about the potential importance of homeownership as a component of family wealth accumulation.

This report consists of six sections. Section II presents an overview of the data upon which the study is based and several data compilations, including the housing transitions among households over the period of study. The accumulation of non-household wealth is also presented and discussed. These results are shown along the dimensions of low income, high income, and minority household status. A discussion of the report's methodology is shown in Section III. Empirical results are summarized in Section IV. Wealth accumulation associated with homeownership is presented in Section V. These results are then compared to the earlier findings for non-housing wealth accumulation. Conclusions follow in the last section.

II.   Data and Primary Calculations: Housing Transitions, Housing Appreciation, and Non-Housing Wealth

Data

In this study, the Panel Study of Income Dynamics (PSID), as collected by the Survey Research Center at the University of Michigan, is used. Based on an initial survey of five thousand families in 1968, the PSID provides detailed annual family histories including housing choice.[9] The analysis utilizes the special supplements of the PSID containing information on household family wealth along with the primary data base.[10] These supplements have been subjected to a high quality imputation procedure, which ensures consistency across all three supplements available (1984, 1989, and 1994). These supplements provide detailed information on the net-wealth position of the family. Specifically, information is provided for each family on: (1) the value of their total debt; (2) the value of any family farm or business; (2) the amount of money in family checking and saving accounts; (3) the value of family owned real estate (other than their primary residence); (4) the value of family stocks, mutual funds, and IRA's; (5) the value of the family's automobile(s); (6) the value of any other assets of note owned by the family; and (7) the value of the family's equity in their primary residence.[11] More importantly, the PSID provides a sample for analysis that is more representative of the true wealth distribution in the U.S. than alternative data sets.[12]

In addition, the specific form of the PSID utilized in this study is the proprietary geo-coded version.[13] This database contains specific information on the locations of household residences in the sample at the Census tract level. The availability of this geographic information will allow the examination of housing value appreciation at the neighborhood level, i.e., average appreciation of owned homes in a given census tract, as well as the identification of the housing markets in which households reside. Prior research with the PSID has, in general, not been able to focus this specifically on housing location.

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[9]   During our sample period the PSID re-interviews were conducted annually. As of 1997 the PSID re-interviews have been done only every 2 years.

[10]   These special supplements were funded by the National Institute on Aging.

[11]   The best description of the PSID is available at their web site (psidonline.isr.umich.edu); see the section titled "overview" and the associated references.

[12]   This issue is discussed in Di, Yang, and Liu (2004). In particular, they suggest that the PSID is more representative of the "true" wealth distribution than either the Survey of Consumer Finances (over samples the wealthy) or the Survey of Income and Program Participation (over representation of poor).

[13]   Access to this sensitive data was provided through a formal agreement between the University of Michigan and the University of Tennessee. Unlike the earlier work of Boehm and Schlottmann (2004), the geo-coded PSID allows actual tracking of housing choices across census tracts.

We estimate our model of housing choice for the nine-year period 1984 to 1992.[14] Each household is followed throughout this period. In addition, for both the cumulative probabilities of homeownership and the estimation of average annual wealth accumulation, households are partitioned into four groups. These four groups reflect white and minority households classified by median income.[15] Specifically, our analysis focuses on households whose real income was above the median and below the median (in 1984).[16] We are particularly interested in any implications for **both** lower income households and for minority households.

Transitions in the Housing Hierarchy

Based upon the data from the PSID described above, Table 1 illustrates the dynamic nature of housing choice over the nine-year period (1984 – 1992). For each type of household classified by minority status and household income, there are four possible housing states shown in Table 1, namely renting, first home purchase, second home purchase, and third home purchase.[17] Not all households were retained in the sample. Individuals were retained in the sample if they could be tracked the entire time and if they maintained the status of household head or spouse during this period. Also shown in Table 1 is the average length (mean duration in years) a household is in a specific housing state. There are three points to note regarding these tables.

First, notice that movement of households from renting to homeownership is *not* a simple transition to first home purchase. This observation is true across the different types of households. A significant number of homeowners are observed to make a transition to a new (second) home. Any measurement of average wealth accumulation attributable to homeownership must recognize the implicit change in value between the first home and the second. For example, if a family initially resides in a house that is valued at $75,000 and house prices were appreciating at a rate of 5% per year the appreciation would be $3,750. Subsequently, if they were to move to another house valued at $100,000, and the appreciation rate stayed the same, the dollar amount of annual housing wealth accumulation achieved through appreciation would have increased to $5,000. In addition, in our sample, even when stratified by race and income approximately 25 percent of "renters" who are transitioning to homeownership are not moving to a first home, they have been owners previously during the period. For example, for

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[14] At the start of this analysis full information on our households was only available through 1992, even though the wealth information for 1994 was already available. Thus, although the 1994 wealth information could be used to infer wealth levels in 1992, the period of analysis itself was only through 1992.

[15] In the geo-coded PSID utilized in this analysis, during this time period the numbers of Hispanic households were too small to apply the modeling methodology outlined below (small cells). Thus, Hispanic households were not able to be treated as a cohort distinct from African-American households. Therefore, we employ a single minority cohort classification.

[16] Households were assigned to an individual MSA or, for rural residents, the appropriate county. Using median income information for the two census periods that bracket the time period (the 1980 Census and the 1990 Census with income information for 1979 and 1989 respectively), the annual average increase for those periods was applied and then used to stratify 1984 median income in the sample. This method was suggested to us by research staff at HUD. It is important to note that results presented in this study do not vary for alternative definitions of low-income such as 75%, 80% or 90% of the median income. The fundamental issue appears to be an individual household's position relative to the median.

[17] There are a small number of "fourth house" households, but the cells are too small for analysis.

high-income minority households (in Table 1) 29 moves are transitions from renting to a second home, 2 moves are transitions from renting to a third home and 110 moves are transitions from renting to a first home during the observation period. Thus, approximately 22.0% ([29+2]/141) of these moves out of rental units are not to the first home owned during the observation period. For the sample as a whole this ratio is 28.7%. This observation might help explain some of the diverse results in the literature concerning house values for "first time" buyers, which is often defined as all those who move from renting to owning without regard for prior tenure experience.

Second, note that housing transitions are not symmetrical. Specifically, movement from renting to a first house and then to a second house and possibly a third owned home is not necessarily a "smooth" process. Households become renters throughout the time period, although they stay as renters for decreasing amounts of time as they progress up the "purchase" hierarchy. For example, in Table 1.a for high-income white households there are 220 instances in which first home buyers transition back to rental status. We also observe transitions from a second or third owned home to rental tenure 61 and 15 times respectively. However, for those that make the transition back to owning they do it more quickly the more experience they have as owners. Specifically, the average duration for those who begin the observation period as renters, but ultimately achieve homeownership, is 3.06 years. For renters who ultimately make the transition to a second or third home, average duration in rental tenure is 1.96 and 1.40 years respectively. Both the timing and number of moves a household makes are critical for the purposes of the analysis of housing wealth accumulation. Timing will affect the length of time a household has to accumulate housing wealth, and the number of owned homes ultimately will impact the house value on which appreciation is based.

Finally, note that analysis of the likelihood of being in a specific state of homeownership (i.e., 1st home, 2nd home, or 3rd home) conceptually is derived from four elements, namely households that enter homeownership from renting, households who remain in their current home, households who progress to another home, and households who leave homeownership to become renters. Thus, a simple *average* measurement of housing choice and family wealth accumulation may be misleading because each may take a very different time path in making their housing choices. For example, two groups of families (e.g., low-income whites versus low-income minorities) each could have a 30% likelihood of achieving homeownership by a particular point in the observation period. However, they might also have very different likelihoods of transitioning into other alternative states (i.e., back to rental or to another owned home). Consequently, these two households would have a very different likelihood of being in a first home at a particular point in time in the probability model estimated in this analysis than would be the case with a simpler model that only considered the average likelihood of transition to ownership. Once again, these dynamics, which are critical to getting an accurate picture of potential housing wealth accumulation, have not previously been incorporated into the literature in this area.

Table 1.a
Transition Matrix
High-Income White Households

Transitions From/To	Renting to First Home	First Home to Second Home	Second Home to Third Home
Number of Spells[b]	283	466	122
Mean Duration[c]	3.06	3.48	2.15

Transitions From/To	First Home to Renting	Second Home to Renting	Third Home to Renting
Number of Spells	220	61	15
Mean Duration	3.32	2.41	2.34

Transitions From/To	Renting to Second Home	Renting to Third Home	
Number of Spells	138	25	
Mean Duration	1.96	1.40	

[a] As described in the text, data are derived from the Panel Survey of Income Dynamics (1984-1992) and relevant PSID supplemental surveys.
[b] Spell refers to the time spent in a given tenure state (renting, first purchase, etc.). These entries represent the number of individual spells in the data for each state. The cells represent count data (length time varying) rather than a "fixed" interval [Markov] matrix.
[c] Average time in original state measured in years

Table 1.b
Transition Matrix
High-income Minority Households

Transitions From/To	Renting to First Home	First Home to Second Home	Second Home to Third Home
Number of Spells[b]	110	55	7
Mean Duration[c]	3.42	3.62	1.57

Transitions From/To	First Home to Renting	Second Home to Renting	Third Home to Renting
Number of Spells	66	13	1
Mean Duration	2.99	1.85	1.5

Transitions From/To	Renting to Second Home	Renting to Third Home	
Number of Spells	29	2	
Mean Duration	2.11	1.5	

[a] As described in the text, data are derived from the Panel Survey of Income Dynamics (1984-1992) and relevant PSID supplemental surveys.
[b] Spell refers to the time spent in a given tenure state (renting, first purchase, etc.). These entries represent the number of individual spells in the data for each state. The cells represent count data (length time varying) rather than a "fixed" interval [Markov] matrix.
[c] Average time in original state measured in years.

Table 1.c
Transition Matrix
Low-income White Households

Transitions From/To	Renting to First Home	First Home to Second Home	Second Home to Third Home
Number of Spells[b]	315	145	35
Mean Duration[c]	3.95	3.20	2.29
Transitions From/To	**First Home to Renting**	**Second Home to Renting**	**Third Home to Renting**
Number of Spells	200	53	6
Mean Duration	3.05	2.02	1.33
Transitions From/To	**Renting to Second Home**	**Renting to Third Home**	
Number of Spells	86	24	
Mean Duration	2.17	1.5	

[a] As described in the text, data are derived from the Panel Survey of Income Dynamics (1984-1992) and relevant PSID supplemental surveys.
[b] Spell refers to the time spent in a given tenure state (renting, first purchase, etc.). These entries represent the number of individual spells in the data for each state. The cells represent count data (length time varying) rather than a "fixed" interval [Markov] matrix.
[c] Average time in original state measured in years.

Table 1.d
Transition Matrix
Low-income Minority Households

Transitions From/To	Renting to First Home	First Home to Second Home	Second Home to Third Home
Number of Spells[b]	196	64	7
Mean Duration[c]	4.18	3.68	1.86
Transitions From/To	**First Home to Renting**	**Second Home to Renting**	**Third Home to Renting**
Number of Spells	132	31	2
Mean Duration	2.84	1.91	1.00
Transitions From/To	**Renting to Second Home**	**Renting to Third Home**	
Number of Spells	52	9	
Mean Duration	1.91	1.71	

[a] As described in the text, data are derived from the Panel Survey of Income Dynamics (1984-1992) and relevant PSID supplemental surveys.
[b] Spell refers to the time spent in a given tenure state (renting, first purchase, etc.). These entries represent the number of individual spells in the data for each state. The cells represent count data (length time varying) rather than a "fixed" interval [Markov] matrix.
[c] Average time in original state measured in years.

Housing Appreciation

Having matched our PSID households with the Census tracts in which they lived in each year of the analysis period, Table 2 presents information for all census tracts in our sample on the percentage of housing appreciation by income and minority status.[18] The percentages in Table 2 are derived from the average annual appreciation (between 1990 and 2000) in the median nominal house prices of owner-occupied housing in each tract in the sample in which our families resided over the nine-year period of analysis.[19] Rather than providing this information as simple averages, it is instructive to consider both the median appreciation and information on the distribution. For this reason, the four panels of Table 2 are shown for the two tails of the distribution (5%, 95%) as well as for the lower quartile and upper quartile. For example, for high income, white households the median annual percentage increase is 4.63%. However, 5% of the time households experienced returns over 12%, while on the opposite end of the spectrum, 5% of the time households experienced losses in house value greater than 0.53%.

Table 2
Percent Annual Appreciation in House Value 1990-2000
Census Tract Information for
Tracts in Which PSID Households Reside
By Income and Racial Group

	5%	Lower Quartile	Median	Upper Quartile	95%	Number of Observations
High Income, White	-0.530%	2.016%	4.630%	7.230%	12.025%	15,651
High Income, Minority	-0.456%	2.353%	4.786%	7.245%	11.930%	4,068
Low Income, White	-0.855%	1.551%	4.189%	6.916%	11.599%	11,448
Low Income, Minority	-0.536%	1.842%	4.305%	6.822%	11.353%	10,962
					Total	42,129

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[18] Recall that this report is based upon the geo-coded PSID. Thus, these figures are based upon the actual homeowner experience in the sample over time. Put another way, they are not simple averages taken at two points in time (such as beginning and end) that do not necessarily reflect actual experience. Specifically, the appreciation is the weighted average of the appreciation in all the neighborhoods the family lived in during the sample period with the weights being the number of periods that the family lived in a given location. The large number of observations (42,129) is due to taking housing values for every household in the PSID sample for every year. As noted above (see note 9), within the geo-coded PSID sample, the small cells for Hispanic households did not allow us to consider a separate cohort from African-American households.

[19] Although the period for the PSID data is 1984 – 92, tract level data were not available in a form for the 1980 Census that allowed it to be combined with PSID data. Consequently, Census information from the 1990 – 2000 period was used as the best estimate of tract level appreciation differences.

If a general observation is possible, it might be that homeownership (as measured by rate of appreciation) is a positive experience across all groups. Higher income homeowners have, of course, properties with higher value, but the rates of appreciation over the period are reasonably similar. There does not appear to be any particular oddity for the four cohorts, each of which displays a fundamental consistency of appreciation experience. All cohorts (at the lower tail of 5%) experience negative returns, the upper tail (95%) receives rates of appreciation more than double those of homeowners at the median, etc. Even for low-income minorities, the upper 5% of returns is 11.353% or higher, which is more than twice the median return of 4.305%.

The basic trends in (absolute) housing values from the PSID data for the nine-year period of observation are shown in Table 3. Not surprisingly, housing values increase with income and race in the expected manner. For example, considering all years high-income, white households have the highest median value, $80,000. From there values decrease to $50,000 for high-income minorities, $48,000 for low-income whites, and $32,000 for low-income, minority families. However, it is interesting to reflect upon the basic relationship between housing value, and income and minority cohorts over time. Specifically, most of the relationships appear reasonably stable over the period. For example, the ratio of house value (measured at the median) between lower income minority households and lower income white households from 1984 ($27,500/$40,000) to 1992 ($40,000/$58,500) is basically steady at approximately 68 percent. Similarly, if we assume the two extremes shown in Table 3 (i.e., low-income minority households and high-income white households), the basic ratio of value over the nine-year period remains in the range of 40 percent, ($27,500/$67,500 in 1984 and $40,000/$100,00 in 1992).

Non-Housing Wealth

Of critical importance to this report is the experience of homeownership on wealth accumulation of households. This requires a comparison of housing wealth accumulation to non-housing wealth accumulation. Recently supplements on household family wealth have been added to the primary PSID data base. Supplemental information on household wealth was collected in 1984, 1989, and 1994. There is an exceptionally good breakdown of the net-wealth position of the family. Specifically, information is provided for each family on: (1) the value of their total debt; (2) the value of any family farm or business; (2) the amount of money in family checking and saving accounts; (3) the value of family owned real estate (other than their primary residence); (4) the value of family stocks, mutual funds, and IRA's; (5) the value of the family's automobile(s); (6) the value of any other assets of note owned by the family; and (7) the value of the family's equity in their primary residence. Consequently, the non-housing wealth position of the family can be determined as well as changes in that wealth over 5 year intervals. Table 4 presents annual accumulation of non-housing wealth by income and racial cohort for the period of study in nominal dollars.

Table 4 shows non-housing wealth at the start of the sample period (1984) as well as the average annual change for the nine-year period. For each cohort, information is provided not only for the median value but, in addition, for the two tails (5%, 95%) and the lower quartile and upper quartile. There is a wide disparity in non-housing wealth and savings across racial and income groups. High-income white households have median net-wealth position of $20,700 in 1984 and have median savings of $2,650 over the period. In contrast, low-income Minority households have a median wealth of $150 at the start of the period with median savings of $0 during the same time period.

Table 3
Housing Value by Period

Year	95%		Upper Quartile		Median		Lower Quartile		5%	
All Years										
High Income, White	$	295,000	$	130,000	$	80,000	$	55,000	$	25,000
High Income, Minority	$	175,000	$	80,000	$	50,000	$	33,000	$	12,000
Low Income, White	$	150,000	$	75,000	$	48,000	$	30,000	$	8,000
Low Income, Minority	$	90,000	$	50,000	$	32,000	$	15,000	$	3,500
Individual Years										
1984										
High Income, White	$	175,000	$	95,000	$	67,544	$	49,250	$	25,000
High Income, Minority	$	110,000	$	69,000	$	45,000	$	30,000	$	10,000
Low Income, White	$	100,000	$	60,000	$	40,000	$	25,000	$	6,000
Low Income, Minority	$	75,000	$	40,000	$	27,500	$	12,000	$	3,000
1985										
High Income, White	$	200,000	$	100,000	$	70,000	$	50,000	$	25,000
High Income, Minority	$	125,000	$	68,000	$	44,750	$	30,000	$	9,000
Low Income, White	$	100,000	$	60,000	$	40,000	$	25,000	$	5,500
Low Income, Minority	$	80,000	$	45,000	$	30,000	$	13,500	$	3,000
1986										
High Income, White	$	225,000	$	110,000	$	75,000	$	50,000	$	25,000
High Income, Minority	$	131,250	$	70,000	$	45,000	$	30,000	$	9,000
Low Income, White	$	115,000	$	62,500	$	42,000	$	25,000	$	6,500
Low Income, Minority	$	80,000	$	45,000	$	30,000	$	14,000	$	4,000
1987										
High Income, White	$	275,000	$	125,000	$	80,000	$	55,000	$	25,000
High Income, Minority	$	150,000	$	76,000	$	48,000	$	30,000	$	10,000
Low Income, White	$	135,000	$	68,000	$	43,500	$	25,000	$	8,000
Low Income, Minority	$	80,000	$	49,000	$	30,000	$	15,000	$	3,000
1988										
High Income, White	$	300,000	$	140,000	$	85,000	$	55,000	$	25,000
High Income, Minority	$	160,000	$	80,000	$	50,000	$	32,000	$	10,000
Low Income, White	$	150,000	$	75,000	$	46,500	$	30,000	$	8,000
Low Income, Minority	$	80,000	$	46,389	$	32,000	$	17,000	$	4,000
1989										
High Income, White	$	325,000	$	150,000	$	90,000	$	56,000	$	28,000
High Income, Minority	$	190,000	$	85,000	$	57,000	$	36,000	$	15,000
Low Income, White	$	175,000	$	78,000	$	50,000	$	30,000	$	9,000
Low Income, Minority	$	93,000	$	50,000	$	35,000	$	19,000	$	4,000
1990										
High Income, White	$	350,000	$	160,000	$	92,000	$	60,000	$	30,000
High Income, Minority	$	220,000	$	89,500	$	60,000	$	39,000	$	15,000
Low Income, White	$	175,000	$	83,000	$	52,000	$	30,000	$	9,000
Low Income, Minority	$	95,000	$	50,000	$	35,000	$	15,000	$	3,400
1991										
High Income, White	$	330,000	$	156,500	$	95,000	$	60,000	$	29,000
High Income, Minority	$	200,000	$	90,000	$	60,000	$	40,000	$	14,000
Low Income, White	$	185,000	$	85,000	$	55,000	$	32,000	$	9,000
Low Income, Minority	$	110,000	$	55,000	$	35,000	$	20,000	$	4,000
1992										
High Income, White	$	350,000	$	160,000	$	100,000	$	65,000	$	30,000
High Income, Minority	$	225,000	$	92,000	$	60,000	$	40,000	$	15,000
Low Income, White	$	175,000	$	88,500	$	58,500	$	35,000	$	10,000
Low Income, Minority	$	120,000	$	60,000	$	40,000	$	20,000	$	5,000

Table 4
Annual Accumulation of Non-Housing Wealth
By Income and Racial Group
For All Sample Households
(1984-1992)

	5%	Lower Quartile	Median	Upper Quartile	95%	Number of Observations
High Income, White						
Ave. Change in Wealth	$ (15,003)	$ (560)	$ 2,650	$ 11,505	$ 63,728	1,739
Wealth in 1984	$ (165)	$ 7,210	$ 20,700	$ 70,200	$292,000	
High Income, Minority						
Ave. Change in Wealth	$ (7,331)	$ (871)	$ 300	$ 3,475	$ 20,080	452
Wealth in 1984	$ (1,522)	$ 2,001	$ 6,650	$ 17,900	$ 84,500	
Low Income, White						
Ave. Change in Wealth	$ (3,727)	$ (658)	$ 300	$ 2,978	$ 18,370	1,272
Wealth in 1984	$ (2,110)	$ 680	$ 5,000	$ 21,400	133,000	
Low Income, Minority						
Ave. Change in Wealth	$ (2,440)	$ (200)	$ 0	$ 530	$ 4,800	1,218
Wealth in 1984	$ (2,000)	$ 0	$ 150	$ 2,400	$ 16,000	
					Total	4,684

This comparison provides striking evidence not only of major differences between cohorts but the difficulty of low-income and minority households of building non-housing wealth over the time period. These results provide an interesting context in which discussions of the role of housing in wealth accumulation of (low-income) households can take place.

As shown in Table 4, low-income minority households basically were able to simply maintain their original non-housing wealth position over time. The average annual change in non-housing wealth is zero, with significant negative experience for many households. Low-income white households do better (an annual average change of $300), but the lower quartile experiences an annual loss of more than twice the median value (a negative $658). For the period covered by this study, it appears that the accumulation of non-housing wealth by low-income households was modest.

As expected, the non-housing wealth accumulation experience of high-income households is more favorable. White households experience, in a relative sense, positive gains with significant annual accumulations in the upper quartile ($11,505). High-income minority households in the upper quartile also have significant changes in non-housing wealth accumulation ($3,475) but start the period at much lower levels of total non-housing wealth. Thus, given the appreciation of owned housing in neighborhoods in which the families in the sample lived during the observation period (Table 3), and the relatively modest accumulation of non-housing wealth by families in the sample during the same time (Table 4), it appears that owned housing might be expected to play a pivotal role in the accumulation of wealth, particularly for low-income and/or minority families.

III. Model Specification[20]

Based upon the above discussion, modeling the relationship between family wealth accumulations and housing choice would be more meaningful if the following three elements of the dynamics of actual housing choice could be incorporated:

1. The likelihood of transition between specific housing states at a point in time. These transitions should reflect family characteristics including income and wealth.

2. Based upon the above, the cumulative probability that a family attains a specific housing state over the period of study. These cumulative probabilities need to reflect the non-symmetric nature of housing transitions.[21]

3. The dynamics of households moving between renting and owning as a more involved process than time to (first) homeownership. This requires an explicit recognition of timing issues (see Table 1 and accompanying discussion).

The three elements above are modeled in the dynamic approach to homeownership and the housing hierarchy in Boehm and Schlottmann (2004). In this study, the predicted probabilities of homeownership that can be derived from this model are combined with estimates of housing expenditure and house price appreciation to produce an estimate of wealth accumulation for households in the sample. This approach involves several steps. First, the likelihood of transitions within the hierarchy of housing choices must be estimated in order to provide probabilities of homeownership. Households enter the sample as either owners or renters; subsequently they could make any or all of the following seven transitions during our nine-year period of observation:[22]

1. Renting to owning their first home;

2. Owning their first home to renting;

3. Owning their first home to owning their second home;

4. Renting to owning their second home;

5. Owning their second home to renting;

6. Owning their second home to owning their third home; and

7. Renting to owning their third home.

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[20] Readers not interested in the model development should proceed to Section IV, which presents the empirical results.

[21] As was noted earlier in the discussion of Table 1, households do not always move directly from renting to a first house, then a second house, etc. sometimes they transition back to renting. In addition, the probability of being in a first house at any given point in time is a function of the likelihood of moving into that home from a rental unit and the likelihood of moving out to a rental unit, or to a second owned home.

[22] While a few households in the sample owned more than three housing units during the observation period there were too few of them to include additional transitions to ownership in the analysis.

Once this model has been employed to estimate the likelihood of owning and the way this probability changes over time, it is then necessary to predict the level of housing expenditure by each household if they were to purchase a home in a given point in time. This requires estimation of a housing expenditure equation and subsequently the prediction of housing expenditure for all the families in the sample. Finally, the change in house value that could be expected over time for the homeowners in the sample in a specific location is necessary. Unlike previous studies that have utilized broad averages, we are able to track individual homeowners by census tract.[23] Consequently, we can measure the actual change in value for housing in the neighborhoods (Census tracts) in which these families are living at a particular time. To accomplish this average annual house price appreciation is calculated for each Census tract between the 1990 and 2000 Census.

Together, these predicted values will allow us to calculate the expected housing wealth accumulation for different subgroups of families in the sample. It is important to point out that this empirical approach captures the dynamics of household housing choice much more realistically than previous work in this area. Typically, renters are observed making the transition to homeownership. Having made this transition, remaining transitions have been ignored in previous work. Given the number and nature of subsequent housing choices that occur in our sample, analysis along traditional lines can be misleading. We might expect substantial distortion of the potential wealth accumulation of the household. For example, assume that two households become owners for the first time in the third year of the observation period. However, subsequently one of the families returns to rental housing while the other not only stays an owner, but also moves to its second and third owned unit. Clearly these two households have different wealth accumulation potential. Our probability model specification will capture this difference while traditional models have not.

One thing not explicitly considered in this analysis is transactions costs. Transactions costs are very hard to measure accurately as they have both a monetary component (the actual out of pocket cost of moving) and a non-monetary (physical and psychological) cost component that varies between households, particularly at different life-cycle stages. People that move more often, e.g., up the ownership hierarchy, certainly pay more in terms of out-of-pocket cost of moving, but may have lower psychological cost. In any event, the transactions costs associated with moving are not considered below. In addition, another limitation of this work concerns our ability to capture housing wealth accumulation through the process of amortization. Because we do not have information on when loans were originated and the terms of the loan, we are unable to consider the specifics of amortization for each household in the sample. In lieu of this, we do some basic calculations in Table 8 to illustrate the relative importance of amortization to each minority/income group that are the focus of the analysis.

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[23]   As noted above, the geo-coded PSID is able to accomplish this compared to the "standard" PSID.

Modeling of Housing Probabilities: A Continuous Time Model of Housing Choice and Housing Wealth Accumulation

The model developed in Boehm and Schlottmann (2004) is an adaptation of the pathbreaking approach to duration analysis (event histories) in Heckman and Walker (1986).[24] A major computational difference lies in the ability for observations (households) to transition backwards (lower levels in the housing hierarchy) rather than continuously advancing to higher states. Simply for illustrative purposes, we briefly summarize this approach.

Let T represent the time until ownership is achieved for an individual family measured from some reference point. In this analysis the reference point is the time at which the household head enters the sample (1984). In addition, let t represent calendar time measured from the same reference point. Thus, the likelihood that a family is still in its initial housing situation at calendar time t is P = Pr (T>t). This probably must be determined indirectly by first estimating the hazard function h, the likelihood that T > t given that the household achieves a new housing status in a very small time interval from t to t + Δt. This hazard rate can be made a function of a set of time-varying exogenous variables.[25]

This function can be specified more formally in a very simple form as:

$$h = \lim_{\Delta T \to 0} \frac{\Pr(T > t \mid t < T < t + \Delta t)}{\Delta t}$$

$$= \exp\ [\alpha + \beta X + \theta], \tag{1}$$

Where X is a vector of exogenous variables at time t + Δt and β is an associated vector of coefficients. The term θ represents a potentially complex form to capture duration dependence.[26]

Given this estimable hazard function, the cumulative probabilities of transitioning between housing states can be derived. Specifically, where m = the number of time periods, $\alpha_k = k/m$, and $\alpha_{k-1} = (k-1)/m$, the cumulative probability can be expressed as:

$$P = \sum_{k=1}^{m} \int_{\alpha_{k-1}}^{\alpha_k} h(t) \exp\left[-\int_0^t h(u)\,du \right] dt, \tag{2}$$

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[24] Developed over several years of research, the continuous time model approach of J. Heckman corrects for fundamental conceptual limitations of regression analysis, simple models of the hazard, etc.

[25] For details on the computational algorithm, contact the authors. The Weibull form of the hazard function employed in this analysis is a special case of the unrestricted hazard in which the hazard is a function of not only a set of time-varying independent variables but also of t, the length of time since the household entered the sample.

[26] For a detailed discussion of model specification and model selection, see Heckman and Walker (1986).

The cumulative probabilities in equation (2) follow over time the transitions shown in Table 1. For example, renters who have never owned a home at any point in time can either remain renters or transition only to first time homeownership. However, other households can exit into several possible alternative states such as renting or purchasing another home. At any point in time, any prior impact of homeownership on the wealth position of a household is taken into account.

Given the probabilities of housing transition and homeownership, in order to derive estimates of housing wealth accumulation for comparison to total family wealth and non-housing wealth, it is necessary to construct both a profile of housing expenditures and changes in house values. As noted, house appreciation is based upon census tract information specific to each household's location. For an estimate of housing expenditures, we follow a generally accepted format in the literature for this estimation (the estimated equation is presented in Section IV below). The housing expenditure equation was based upon all homeowners in the sample in 1984 and those families that purchased a home over the period 1984 to 1992 (yielding 4,780 observations on housing expenditures).

These relationships are linked to each other and the housing choice probabilities in the following manner. Using the continuous time model (CTM) of housing choice, parameters are estimated that represent the impact of various household and location characteristics on the likelihood of a household making a transition between housing tenure states (renting to own 1st home, 1st home to 2nd home, 1st home back to renting, etc.) over time. Taking the mean values for the four household types (white or minority / high or low income), which will change over time, the cumulative probability that a household of a given type becomes a homeowner by a given point in time is calculated.[27] Parameters from the housing expenditure equation can be used to estimate the expenditure a household would be expected to make if they purchased a home in a given year. Again, these estimates would change as the average characteristics of the individuals in the sample and their location change over time. For instance as income increases predicted expenditure would increase. Since appreciation is calculated, not estimated, we use Census tract level data between 1990- 2000 to determine the average annual appreciation in median house value for the neighborhoods (tracts) in which the different household types reside.[28] Ultimately housing wealth accumulation is based on these three factors. Specifically, for a given housing type, we predict the likelihood that an average member of a particular group would become a homeowner in year 1 and what the expenditure level they would be predicted to achieve. If they did purchase, they would experience appreciation of that house value for 9 years. In year two of the sample period, they would have a different likelihood of ownership and a different predicted expenditure level, and they would experience appreciation for 8 years, etc. Because these cumulative probabilities will differ over time for the racial/income groups under consideration (i.e., in year 2 high-income whites might have a 30% likelihood of being owners,

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[27] Note, these probability calculations can be quite complex because, at a given point in time, they involve the estimation of cumulative transition probabilities from preceding periods to the current time period. For the computational details regarding these probabilities, see Boehm and Schlottmann (2004) p. 125.

[28] While the 1990 to 2000 Census period does not correspond exactly with our observation period of 1984 to 1992, it is the period of time over which house price appreciation could be effectively observed using recent Census data, since 1980 tract information was not available in a form that could be effectively included in the analysis. However, it should provide a reasonable estimate of differential appreciation in the different neighborhoods (Census tracts) in which the different income/racial cohorts lived during the sample period.

whereas low-income Minorities might only have a 5% probability) housing wealth accumulation would be expected to be quite different due to the timing of transitions reflected initially in Table 1 and captured in the CTM model used to estimate the probabilities. The prediction of house wealth accumulation across the groups becomes the weighted average of these estimates over the sample period where the weights are the cumulative probabilities of ownership at particular points in time. Ultimately, it is the predicted value of housing wealth accumulation compared to non-housing wealth that is the primary focus of this study.

IV. Empirical Analysis

Table 5 lists the variables utilized in the analyses below. These variables reflect personal characteristics, educational attainment, and "regional" factors that have been suggested in the literature as relevant to explaining tenure choice and the housing expenditure level. Financial variables include family wealth and (estimated) permanent income.[29]

Housing Hierarchy Transitions: Cumulative Probabilities

Based upon our discussion of the housing transitions in Table 1, we estimate seven separate transitions within the housing hierarchy.[30] Individual estimated coefficients for each of these seven transitions are shown in the Appendix. Variables included in the equations comprised several factors. Personal characteristics such as age of the household head, marital status and gender, race and educational attainment were included. In addition, we included other life-cycle factors such as family size. Wealth and estimates of permanent income were incorporated as well.[31] Finally, we included information on city size.[32]

Although the model estimates are not the research thrust of this report, in general influences on attaining homeownership and having further transitions in the housing hierarchy behave as expected. For example, consider the transition from renting to first-time homeownership. This specific transition in our model corresponds to the literature on "first-time homeownership." Higher levels of education and permanent income increase the likelihood of purchasing a home. Conversely, the likelihood of homeownership declines with age and "single" status, particularly for female heads of households. For a discussion of the model itself, see Boehm and Schlottmann (2004).

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[29]   Permanent income is estimated from a set of independent variables that capture the individual's human capital, employment situation, and the region and size of community in which the family resides. Separate equations are estimated for minority households and white households in each year of the panel. For a similar approach, see Boehm and Schlottmann (2002). Our estimation techniques closely follow the procedure in Ihlanfeldt (1980) for estimating permanent income for housing analysis using the PSID.

[30]   The "same cell" households are, of course, not estimated (i.e. those renters that remain renters, etc.).

[31]   Note that in a few of the transitions shown in the appendix that "family income" is utilized rather than "permanent income" and/or "wealth." This was due to convergence problems in estimating the model. Not surprisingly, family income is highly correlated with both of the other variables.

[32]   One group of variables not included in the specification described above is a set of control variables capturing the families' housing experience prior to the sample period. That is to say, we might expect housing history prior to 1984 to affect the families' choices during our observation period. A number of variables were experimented with to control for their tenure, expenditure, and mobility history. None of these variables proved to be statistically significant predictors and, therefore, were not retained in the final specification of the model.

Table 5
Variable Names and Definitions

Variable Name	Definitions
Personal Characteristics	
Married	1 = Married; 0 = Otherwise
Single Female	1 = Single female; 0 = Otherwise
Single Male	1 = Single male; 0 = Otherwise
Race of Head	1 = Household head is white; 0 = Otherwise
Veteran	1 = Household head is a veteran; 0 = Otherwise
Disability	1= Household head is disabled; 0 = Otherwise
Family Size	Total Number of household members
Number of Moves	Total number of moves made during the observation period
House Value	House value in dollars
Period	Year of observation (1 through 9)
Education	
Less than High School	1 = Less than high school graduate; 0 = Otherwise
High School Graduate	1 = High school graduate; 0 = Otherwise
Some Post – Secondary Education	1 = Training after high school, but not college graduate; 0 = Otherwise
College Education or More	1 = College graduate or more; 0 = Otherwise
Income and Wealth	
Wealth	Total wealth in thousands of dollars
Permanent Income	Permanent income in thousands of dollars
Transitory Income	Transitory income in thousands of dollars
Family Income	Total family income in hundred of dollars
Regions	
New England	1 = New England (ME VT NH MA CT RI); 0 = Otherwise
Middle Atlantic	1 = Middle Atlantic (NY NJ PA); 0 = Otherwise
South Atlantic	1 = South Atlantic (DE MD VA NC SC GA FL DC); 0 = Otherwise
East North Central	1 = East North Central (MI WI IL IN OH); 0 = Otherwise
East South Central	1 = East South Central (WV KY TN MS AL); 0 = Otherwise
West North Central	1 = West North Central (ND SD NE KS MN IA MO); 0 = Otherwise
West South Central	1 = West South Central (TX OK AR LA); 0 = Otherwise
Mountain	1 = Mountain (MT ID WY NV UT CO AZ NM); 0 = Otherwise
Pacific	1 = Pacific (CA WA OR AK HA); 0 = Otherwise
Residence	
Large Metropolitan	1 = Largest city in MSA's population 500,000 or more; 0 = Otherwise
Other Metro	1 = Largest city in MSA's population 50,000 to 499,999; 0 = Otherwise
Small City	1 = Largest city in county's population 10,000 to 49,999; 0 = Otherwise
Rural	1 = Largest city in county's population less than 10,000 or no city in county; 0 = Otherwise
Price/Cost Variables for Expenditure Eq.	
Effective Interest Rate	Expressed as a Percent. Data Source: Federal Housing Finance Board. If not in an MSA, the annual state average was used
Index of Housing Prices	Specific to the market in which the household resides at a given time. Appreciation rate between 1990 Census and 2000 Census was used to adjust values (housing, annualized).
Annual Appreciation	Annual appreciation for the market in which the housing choice was made. If not in MSA, county was used. Data source: 1990 Census – 2000 Census.

The four panels of Table 6 present the cumulative probabilities of homeownership by income status and minority status.[33] The cumulative probabilities represent the likelihood of having a given tenure status and depend upon the relevant transition probabilities. For example, consider second home purchase for high-income white households. In period 1 this probability is 2.072%. This means that by the end of period one the likelihood that the average high-income white household will move into a new home from a home they owned at the beginning of the observation period is just slightly more than 2%. In period two, there is a total likelihood of moving to a second house by the end of the period of 4.848%. This probability reflects the fact that between the first and the second period it would have been possible for families that were in their first owned home to transition to the second and families who might have achieved homeownership in the first period could transition back to rental status or move to a third owned housing choice. Similar arguments can be made for other cumulative probabilities, and the overall likelihood of ownership in some form (the last column) is the sum of the preceding three cumulative probability columns. Consistent with other literature, note that low-income minority households have the lowest likelihood of attaining homeownership at the end of the nine-year period (0.39 in Table 6.c, or 39%). However, also note that one reason for this is the significant likelihood that low-income minority households may no longer be in their first home, that is they may have transitioned back to renting (as shown in first column of Table 6.c, 0.21 or 21%). Traditional probability models cannot capture this dynamic (i.e., the transition out of a tenure state previously attained).

In general, low-income households have more difficulty purchasing a second home as shown in Table 6. At the end of the observation period the cumulative probability of being in a second home is just 17.3% for low-income white families and only 7.1% for low-income minority households. In other words, first home purchase tends to be the dominant homeownership activity. In addition, it is interesting to note the significant likelihood that a high-income minority household might transition back to renting, 10.3% by the end of the period (see first column of Table 6.b). This fact also interferes with overall homeownership. This may reflect, at least in part, the significant losses shown in Table 4 above for non-housing wealth among the lower quartile of high-income minority households.

Housing Expenditures

The housing expenditure equation was based upon all homeowners in the sample in 1984 and those families that purchased a home over the period 1984 to 1992 (yielding 4,780 observations on housing expenditures). The housing expenditure equation is shown in Table 7.[34] Since the estimated relationship for housing expenditures follows a generally accepted format in the literature for these estimations, and our estimates are "in line" with the literature, we only briefly comment on these estimates. One variable that warrants further discussion is our total wealth measure included in the PSID data. This variable combines both housing and non-housing wealth. As such it includes housing wealth accumulated from previous ownership experience by households in the sample. In this way previous ownership and the subsequent housing wealth accumulation can impact current expenditure decisions of the families in our sample.

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[33] Note that the individual probabilities do not simply sum to an exact total due to the nonlinear computations.

[34] Based upon our estimating equation for permanent income (see note 18 above) an estimate of "transitory income" was included as a regressor in the housing expenditure equation.

In addition to the demographic variables, the measures of wealth and income, and the broad regional identifiers, the geographically specific identifiers allowed us to include measures of housing prices, housing price appreciation, and interest cost not normally available when the PSID is used to estimate a housing expenditure equation. For each market (MSA's or counties) the census tract data are divided into those tracts with median incomes above the area median income (high-income tracts) and those with income below the area median income (low-income tracts). Median house prices and house price appreciation are computed for both the low-income and high-income sub-samples. For the market in which they made a housing expenditure, each household was assigned as high or low-income based on the median income in that market in that year as compared to their family income.[35] In general these two variables are significant and have the positive signs as one might have expected. In markets where housing prices are generally higher, households spend more on housing. Ceteris paribus, higher rates of appreciation should produce increased investment demand for housing. The coefficient for this variable was also positive and statistically significant, implying that higher levels of housing expenditure are associated with higher levels of appreciation. In addition, data from the Federal Housing Finance Board on the effective interest rate in different areas (states or MSA's) over time was added to the primary data set. As expected, higher interest rates lead to lower levels of housing expenditure. In summary, for this type of data (i.e., household level) the model explains housing expenditure levels quite well, with an adjusted R^2 of 0.486. Given these estimations, the housing component of family wealth accumulation can be calculated.

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[35] Note that this criterion is slightly different than that used to define the low-income subgroup in the estimate of the housing choice hierarchy described earlier. In that case, due to the inter-temporal nature of the analysis and subsequent probability calculations, an income subgroup had to be established at a particular point in time and maintained throughout the analysis. In this case, because we looked at purchases at a particular point in time in a pooled time-series cross-section analysis, we were able to designate households as high or low-income in a given market at a particular point in time when they made a housing expenditure decision.

Table 6.a
High Income White Households: Transition Probabilities and Cumulative Probability of Homeownership

Period	First-time Homeownership to Renting (Transition)	First-time Homeownership to Second Home Purchase (Transition)	Renting to First Time Homeownership (Transition)	First Time Homeownership	Second Home Purchase	Third Home Purchase	Overall Homeownership
1	0.005412	0.02724	0.06568	0.75142	0.02072	0.00000	0.77214
2	0.014572	0.05983	0.13357	0.73593	0.04848	0.00278	0.78718
3	0.021289	0.09949	0.20435	0.71761	0.08273	0.00707	0.80741
4	0.027032	0.14139	0.27408	0.69807	0.12032	0.01266	0.83105
5	0.030697	0.18286	0.34172	0.67994	0.15883	0.01946	0.85823
6	0.032949	0.22028	0.40573	0.66510	0.19494	0.02674	0.88678
7	0.036728	0.24930	0.46485	0.65432	0.22498	0.03339	0.91269
8	0.039515	0.27181	0.51870	0.64798	0.24965	0.03946	0.93708
9	0.041056	0.28837	0.56797	0.64600	0.26904	0.04488	0.95992

Table 6.b
High Income Minority Households: Transition Probabilities and Cumulative Probability of Homeownership

Period	First-time Homeownership to Renting (Transition)	First-time Homeownership to Second Home Purchase (Transition)	Renting to First Time Homeownership (Transition)	First Time Homeownership	Second Home Purchase	Third Home Purchase	Overall Homeownership
1	0.00979	0.01642	0.02724	0.57566	0.00951	0.00000	0.58517
2	0.02476	0.03562	0.05920	0.56929	0.02204	0.00048	0.59182
3	0.04046	0.05892	0.09334	0.56106	0.03766	0.00123	0.59994
4	0.05652	0.08368	0.12827	0.55210	0.05511	0.00222	0.60944
5	0.07006	0.10918	0.16397	0.54450	0.07393	0.00349	0.62192
6	0.08311	0.13104	0.19898	0.53900	0.09125	0.00479	0.63504
7	0.09287	0.15028	0.23342	0.53669	0.10740	0.00616	0.65024
8	0.10056	0.16515	0.26664	0.53759	0.12100	0.00738	0.66596
9	0.10305	0.17886	0.29950	0.54202	0.13391	0.00882	0.68475

Table 6.c

Low Income White Households: Transition Probabilities and Cumulative Probability of Homeownership

Period	First-time Homeownership to Renting (Transition)	First-time Homeownership to Second Home Purchase (Transition)	Renting to First Time Homeownership (Transition)	First Time Homeownership	Second Home Purchase	Third Home Purchase	Overall Homeownership
1	0.01419	0.02227	0.03129	0.49593	0.01110	0.00000	0.50703
2	0.03321	0.04893	0.06994	0.49255	0.02711	0.00136	0.52102
3	0.05218	0.08018	0.11185	0.48854	0.04683	0.00365	0.53901
4	0.07063	0.11290	0.15519	0.48478	0.06914	0.00665	0.56057
5	0.08641	0.14539	0.19904	0.48270	0.09309	0.01047	0.58627
6	0.10046	0.17379	0.24217	0.48318	0.11615	0.01460	0.61393
7	0.11058	0.19856	0.28424	0.48690	0.13802	0.01894	0.64386
8	0.11870	0.21740	0.32448	0.49364	0.15688	0.02303	0.67355
9	0.12406	0.23148	0.36279	0.50318	0.17293	0.02689	0.70300

Table 6.d

Low Income Minority Households: Transition Probabilities and Cumulative Probability of Homeownership

Period	First-time Homeownership to Renting (Transition)	First-time Homeownership to Second Home Purchase (Transition)	Renting to First Time Homeownership (Transition)	First Time Homeownership	Second Home Purchase	Third Home Purchase	Overall Homeownership
1	0.02330	0.01560	0.01525	0.27882	0.00435	0.00000	0.28317
2	0.05234	0.03417	0.03512	0.27989	0.01069	0.00022	0.29079
3	0.08281	0.05560	0.05702	0.28123	0.01851	0.00061	0.30034
4	0.11367	0.07765	0.07996	0.28303	0.02741	0.00113	0.31157
5	0.14203	0.09913	0.10346	0.28609	0.03703	0.00180	0.32492
6	0.16748	0.11790	0.12710	0.29082	0.04651	0.00256	0.33990
7	0.18775	0.13418	0.15062	0.29760	0.05572	0.00342	0.35673
8	0.20319	0.14713	0.17378	0.30639	0.06413	0.00434	0.37486
9	0.21458	0.15655	0.19652	0.31700	0.07145	0.00522	0.39368

Table 7
Housing Expenditure Regression

Variable Name	Mean	Regression Coefficients	t-statistics
Intercept	1	71648.00	8.74
Single female	0.08389	-8578.34	-3.08
Single male	0.16004	-5161.94	-2.19
Age	42.99958	428.04	6.97
High school	0.19100	5563.97	2.45
Some post-secondary	0.33661	10975.00	5.17
College education or more	0.23117	35065.00	13.29
White	0.75900	13109.00	6.71
Family size	3.11946	1647.93	2.81
Veteran	0.30021	-1774.44	-1.07
Disability	0.16151	-39.67	-0.02
Metropolitan, not large	0.35335	-7652.91	-3.49
Small city	0.27929	-13071.00	-5.53
Rural	0.19916	-18718.00	-6.8
Total Wealth	119.09684	2.05	2.76
Permanent Income	29.63840	799.75	14.26
Transitory Income	111.87864	90.57	35.99
Index of Housing Prices	135280	0.05	6.19
Annual Appreciation	0.05095	26418.00	1.94
Effective Interest Rate	11.17808	-4882.38	-9.66
Middle Atlantic	0.10042	-13711.00	-3.25
South Atlantic	0.21967	-18818.00	-4.69
East North Central	0.16757	-28178.00	-6.92
East South Central	0.10167	-26941.00	-6.22
West North Central	0.09038	-29720.00	-6.87
West South Central	0.10753	-28481.00	-6.91
Mountain	0.04833	-22423.00	-4.63
Pacific	0.12050	8190.38	1.96
No. of Obs.	= 4,780		
Adj R Square	= 0.486		

V. Wealth Accumulation: Appreciation and Amortization

The primary purpose of estimating the tenure choice and housing expenditure models outlined above was to explore the role of housing in wealth accumulation. The dynamics of housing choice available from this approach allow a more accurate assessment of the "timing" of housing choice and its impact on family wealth. Based upon the estimated equations above, in this section we provide estimates of wealth accumulation by income and race (and the full sample) over the nine-year period.[36]

Wealth estimates were constructed for families in the sample in the following way. First, using the coefficients from the housing choice hierarchy, the cumulative probability of home ownership for every household (whether or not they are actually renting at a given point in time) was estimated. Generally one would expect these probabilities to increase over time (and they do), but it is important to note that they reflect the likelihoods of transitions out of homeownership into rental status, as well as movement up the ownership hierarchy to a second and third home. Next, in each period for every household (whether they bought a home or not) their predicted level of expenditure was computed using the coefficients from the housing expenditure equation that was estimated. Finally, appreciation in house prices must be calculated. Because, as noted earlier, actual appreciation cannot be observed, information from the Census tracts (neighborhoods) in which families have made housing choices is used to approximate it. Specifically, the annual average appreciation in median owner-occupied house value in the tracts lived in between the 1990 and 2000 Census is used to approximate actual appreciation.[37] The estimated average annual dollar value of appreciation is a weighted average that depends upon when it was assumed that a purchase took place. That is, if the household made a purchase in year 1 that expenditure level would experience appreciation for 8 years. If they purchased in year two, that expenditure level would experience appreciation for 7 years, etc. These results are provided in Table 8.[38]

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[36] The basic heuristic of these estimates are as follows. Based upon the housing expenditures equation, an estimate of house value is calculated in each period from 1984 - 1992. Then, for *each* household in *each* period, house value is adjusted by the probability of ownership. The *weighted* average house values are then calculated for each subgroup (where weights are the ownership probabilities). Estimated house values for each year, and other mean values, are used to generate annualized changes in house value. A weighted average is constructed with the weights being the "cumulative probabilities of homeownership" for each year.

[37] Note that 1980 Census data could have been looked at in addition to the 1990 and 2000 information. However, it was not available in a form that would have made it viable to extract information for the right tracts and add them to the data set.

[38] The housing values in Table 8 differ from those in Table 3 since values in the later table are based upon sample households rather than census tracts.

Table 8
Housing Wealth Accumulation

	Average Annual Housing Wealth Appreciation			Average House Value		
	Lower Quartile	Median	Upper Quartile	Lower Quartile	Median	Upper Quartile
High Income, White	$ 1,465	$ 4,460	$ 8,771	$ 74,929	$ 97,030	$ 122,891
High Income, Minority	$ 1,175	$ 3,359	$ 6,687	$ 53,829	$ 70,094	$ 93,439
Low Income, White	$ 833	$ 2,729	$ 6,148	$ 49,859	$ 64,291	$ 88,891
Low Income, Minority	$ 426	$ 1,712	$ 4,299	$ 29,096	$ 42,454	$ 63,012

Amortization Illustration*

	Year 1			Year 9		
	Lower Quartile	Median	Upper Quartile	Lower Quartile	Median	Upper Quartile
High Income, White**	$ 304	$ 393	$ 498	$ 4,405	$ 5,704	$ 7,224
High Income, Minority **	$ 218	$ 284	$ 379	$ 3,164	$ 4,120	$ 5,463
Low Income, White***	$ 213	$ 275	$ 380	$ 3,094	$ 3,989	$ 5,516
Low Income, Minority***	$ 124	$ 182	$ 269	$ 1,805	$ 2,634	$ 3,910

* Uses Average House Value, a 30 year mortgage, an 11% annual interest rate, and monthly compounding
** Assumes a 10% downpayment
*** Assumes a 5% downpayment

The top panel of Table 8 is based purely on appreciation in house value for households in our sample. Comparing these results (for median values) with non-housing wealth accumulation presented in Table 4 suggests four observations:

1. For high-income white households, housing is an important "asset" and a larger part of wealth accumulation than non-housing wealth. The role of housing wealth is much more important for high-income minority households compared to non-housing wealth, given their low annual increases in non-housing wealth. Specifically, median average annual housing wealth appreciation is $4,460 for high-income white households, where as non-housing wealth accumulation over the same period is only $2,650 (Table 4). For, low-income minority families these figures are $1,712 and $0 respectively.

2. For lower income households, non-housing wealth is very small, with significant dissavings for many lower income minority households. For low-income white households median annual average accumulation is only $300. For low-income

minorities it is approximately $0. In each case, the bottom quartile of households experiences an average annual change in non-housing wealth that is negative (see Table 4). Thus, to a significant extent, housing wealth and total wealth are synonymous for lower income families. This observation is particularly true for minority households.

3. The implied average annual appreciation (in nominal dollars) in house value for lower income minority households is the lowest in our sample (see Table 8). However, it is the only significant source of wealth accumulation for these households (compared to Table 4).

4. Comparing the lower quartiles in Table 4 to those in Table 8, those households in the lower quartile of housing wealth accumulation clearly do better with home ownership as a manner of wealth accumulation compared to households in the lower quartile of non-housing wealth.

Given the low (or nonexistent) non-housing wealth accumulation for lower income households, the lower panel of Table 8 is particularly important as it demonstrates another element of wealth accumulation associated with homeownership. These calculations illustrate the type of forced savings associated with amortization per se. It is impossible to determine where families that entered our sample as owners are in the amortization schedule. Therefore, average annual amortization is considered at the beginning and middle years of a 30-year loan for the average annual housing values associated with a particular family type.[39] The importance of these calculations for lower income families is obvious. This is particularly true for minority households. Specifically, for low-income minority households, $2,634 is the median total estimated amortization over the observation period. On an annual basis this averages out to approximately $293 dollars. For households whose median annual non-housing wealth accumulation is $0, this represents a substantial amount of "forced savings" resulting from mortgage repayment.

Taken together, in our view Table 8 and the other reported results present a strong argument that:

1. Owned housing is an important means of wealth accumulation;

2. Housing as wealth is particularly important for minority and lower- income households; and

3. The implicit movement of households up the housing hierarchy only adds to the (positive) magnitude of these effects.[40]

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[39] Other assumptions are shown in the table.

[40] Specifically, as household's transition from one owned home to the next, the value typically increases, thus increasing the base on which on which appreciation is calculated. One factor contributing to that increase in expenditure is total wealth, which includes housing wealth. Housing wealth is a function of past housing price appreciation and amortization during the periods when the family owned previously.

VI. Conclusions

This paper has examined the role of housing choice within the housing hierarchy on family wealth accumulation. In the housing policy literature, this is the first time a dynamic model of housing choice has been used to estimate potential wealth accumulation from owned housing. In addition, to our knowledge, it is the first time the geographically detailed version of the Panel Study of Income Dynamics has been used to locate families within Census tracts in order to identify the relative differences in house price appreciation that might be expected to occur in different high-income and low-income neighborhoods in different locations across the country.

Our results illustrate the complex nature of housing choice for families, particularly those with lower incomes. Rather than simply focusing on time to homeownership, we find a high likelihood that lower income families will "slip" back to renting after attaining homeownership. For minority households this probability is quite high. In addition, the progression beyond first time homeownership is quite limited for lower income households. Indeed, for minority households, first-time homeownership is effectively the only step observed in the housing hierarchy (that is, they don't trade up as much as non-minorities).

In terms of lower income households, non-housing wealth accumulation is at best minor and, for minority families, often negative. Thus, over the nine year period of our study, owned housing is an important means of wealth accumulation. Indeed, our results may be broadly interpreted for lower income households as implying that housing wealth is total wealth.

These results tend to support public policies aimed at both increasing homeownership opportunities in general and those policies that focus on homeownership for lower income households. Even though homeownership is not a guarantee of successful wealth accumulation,[41] household wealth appears to be positively impacted by homeownership. This conclusion is reinforced with comparisons to accumulation of non-housing wealth. Wealth accumulation for low-income and minority households, although low, experiences a major increase through home ownership. In this regard, current initiatives to increase low-income homeownership seem both desirable and valid. Moreover, our work suggests that policies designed to ensure that once households achieve homeownership, they remain homeowners (rather than reverting to rental tenure), and policies that enable families to transition to higher valued owned units over time, will increase substantially the potential for housing wealth accumulation. These conclusions about the value of owned housing are reinforced when the positive social impacts of homeownership on families, particularly the children, are also considered.

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[41] In fact we observe a small percentage of instances where all of our family types lose money on their homes (see Table 2).

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Appendix

Estimated Coefficients:
Transitions in the Housing Hierarchy

The following tables (Table A-1a and Table A-1b) present the estimated coefficients for each of the seven transitions from the model described in Section III and Section IV.

Table A-1a
Housing Hierarchy Transition Coefficients
Renting to Various Ownership Tenures

Variable Names	Renting to First Time Homeownership (1)		Renting to Second Time Homeownership (2)		Renting to Third Time Homeownership (3)	
	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
Intercept	0.1292	0.570	-4.0710	-8.531	-6.1544	-4.253
Personal Characteristics						
Single Female	-0.6617	-5.374	0.3682	1.923	0.1622	0.338
Single Male	-0.4202	-3.940	-0.6797	-2.950	-0.8944	-1.482
Age	-0.0289	-8.174	0.0165	2.704	0.0203	1.159
White	0.3741	4.451	0.7752	4.355	1.0759	2.203
Veteran	-0.1156	-1.292	0.1091	0.678	0.0550	0.142
Disability	0.0446	0.411	-0.1997	-1.113	-0.7642	-1.238
Family Size	-0.1422	-4.931	0.1053	1.940	0.0260	0.179
Income and Wealth						
Permanent Income	0.0239	7.348	0.0045	0.642	na	na
Total Wealth	0.0006	1.265	0.0011	2.687	na	na
Family Income [a]	na	na	na	na	0.0109	2.280
Residence						
Other Metro	0.2395	2.567	0.1844	0.960	0.6832	1.173
Small City	0.2796	2.622	0.3028	1.427	0.8123	1.389
Rural	0.4710	3.989	0.7502	3.533	1.0148	1.647
Education						
High School Graduate	0.1362	1.223	-0.1034	-0.473	0.0222	0.040
Some Post-Secondary Education	0.2930	2.699	0.1560	0.766	-0.1704	-0.328
College Education or More	0.2523	1.857	0.1988	0.758	-0.1306	-0.224
Time in State						
Gamma 1	0.2548	5.258	-0.3010	-2.897	-0.4226	-1.231
Gamma 2 [b]	na	na	na	na	na	na
f [c]	na	na	na	na	-0.2432	-0.309

[a] As might be expected, Permanent Income, and Total Wealth are highly correlated. For certain transitions this collinearity prevented the model from converging. In these instances, Family Income (which is highly correlated with both) was substituted for these two variables in the estimation.
[b] "na" for Gamma 2 indicates that the duration term was specified as weibull rather than quadratic for the particular transition in question.
[c] "na" for f indicates that it was not possible to estimate the non-parametric heterogeneity parameter for the particular transition in question.

Variable Names	First Time Homeownership to Renting (1)		Second Time Homeownership to Renting (2)		First Time Homeownership to Second Time Homeownership (3)		Second Time Homeownership to Third Time Homeownership (4)	
	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
Intercept	1.6585	1.555	1.2376	2.039	-0.1421	-0.438	-0.5654	-0.710
Personal Characteristics								
Single Female	0.9790	4.782	0.8109	3.042	0.3308	2.171	0.4956	1.869
Single Male	0.5400	3.070	0.7464	2.329	-0.1612	-1.113	-0.1968	-0.527
Age	-0.0368	-6.229	-0.0254	-3.150	-0.0405	-10.629	-0.0149	-1.766
White	0.2468	1.910	-0.1282	-0.561	0.4545	3.984	0.7054	2.390
Veteran	0.2431	1.836	0.3636	1.641	-0.0052	-0.057	-0.2252	-1.212
Disability	0.0487	0.359	-0.0222	-0.089	0.0854	0.693	-0.0545	-0.212
Family Size	0.1081	2.590	-0.0291	-0.398	-0.0515	-1.555	-0.1637	-2.141
Income and Wealth								
Permanent Income	-0.0313	-5.553	-0.0244	-2.767	na	na	0.0018	0.242
Total Wealth	-0.0037	-11.766	-0.0020	-3.955	na	na	-0.0001	-0.374
Family Income [a]	na	na	na	na	0.0010	1.235	na	na
Residence								
Other Metro	-0.0912	-0.607	-0.0095	-0.035	-0.0799	-0.710	-0.3751	-1.683
Small City	-0.1516	-0.929	-0.2768	-0.902	-0.0668	-0.567	-0.2056	-0.881
Rural	-0.5092	-2.835	0.1193	0.397	-0.1363	-1.039	-0.2280	-0.839
Education								
High School Graduate	-0.4422	-2.547	-0.4714	-1.437	-0.3260	-2.382	0.1520	0.455
Some Post-Secondary Education	-0.1271	-0.778	-0.3357	-1.265	-0.0435	-0.362	0.3673	1.200
College Education or More	0.2155	1.024	-0.0327	-0.100	0.1953	1.542	0.5532	1.578
Time in State								
Gamma 1	2.8761	3.200	0.1726	1.144	3.3793	5.564	0.0590	0.472
Gamma 2	-5.5328	-3.890	na	na	-6.6932	-5.722	na	na
f	-1.9975	-3.780	na	na	na	na	0.1306	0.283

[a] As might be expected, Permanent Income, and Total Wealth are highly correlated. For certain transitions this collinearity prevented the model from converging. In these instances, Family Income (which is highly correlated with both) was substituted for these two variables in the estimation.

[b] "na" for Gamma 2 indicates that the duration term was specified as weibull rather than quadratic for the particular transition in question.

[c] "na" for *f* indicates that it was not possible to estimate the non-parametric heterogeneity parameter for the particular transition in question.