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## **Terminations of First-Time Homeownership**

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## **Abstract**

The cliché “once a homeowner, always a homeowner” is not true. We study the causes of terminations of spells of first-time homeownership. Using a national panel data set, we find that the likelihood of a household terminating a spell of homeownership is predictable at the time of purchase. Specifically, the lower the probability score that a household becomes an owner at the time of purchase, the greater the likelihood of termination of the subsequent ownership spell. This finding suggests that post-purchase counseling programs can be targeted toward those most at risk at the time of home purchase. We also find that post-purchase events affect the likelihood of termination. Important factors include changes in household earnings and wealth, house value, unemployment rates, family size, and marital status. There are substantial racial differences in termination rates. Some of these differences are explained by differences in household characteristics at the time of home purchase, and some by differences in post-purchase events or households’ reactions to them.

Keywords: homeownership, sustainability, terminations, housing demand, economic shocks.

JEL Classifications: D12, R21

## 1. Introduction

The number of homeowners and rate of homeownership has increased substantially since its trough in 1993. Specifically, the homeownership rate increased from 64 percent to 68.6 percent in the second quarter of 2005 and the number of homeowners increased by 13.2 million (U.S. HUD, Tables 25 and 27). This increase is the result of a number of causes including relatively low mortgage interest rates, innovations in the types of mortgages such as ones requiring very low down payments, increasing real household income, changes in the age distribution of households, and numerous public policies. Policies affecting a household's tenure choice include required pre-purchase counseling, anti-discrimination legislation, and constraints on the geographic distribution of mortgage lending.<sup>1</sup>

In this paper we ask the question: Once the first-homeownership is attained, is it, in fact, sustainable? The cliché “once a homeowner, always a homeowner” is not true. Among the youths in the National Longitudinal Sample of Youth (NLSY) 1979 cohort, our data source for this paper, 42 percent of the first ownership spells terminated within the observed period of 16 years. While some new homeowners are successful in the sense of sustaining that tenure status, some spells end.<sup>2</sup> Among those that end, some are purely voluntary such as a job relocation that results in an interruption of homeownership with a temporary spell of renting. Other spells end in mortgage default or selling a home to avoid default.

Observed data show striking differences in sustainability of first homeownership across races. Figure 1 presents the cumulative distribution of duration of first homeownership

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<sup>1</sup> A review of policies affecting homeownership and measures of their impact are reported in Herbert et al. (2005).

<sup>2</sup> A summary of the internal and external benefits of homeownership is in Dietz and Haurin (2003).

by race (white, black, and Hispanic) in the NLSY. Because of the weights used in calculating these distribution functions, they represent the national population. We observe that black homeownership is substantially less sustainable compared to that of the whites: 50 percent of the black homeownerships terminate by the 4-th year of owning while 50 percent of the white homeowners survive for more than 7 years.

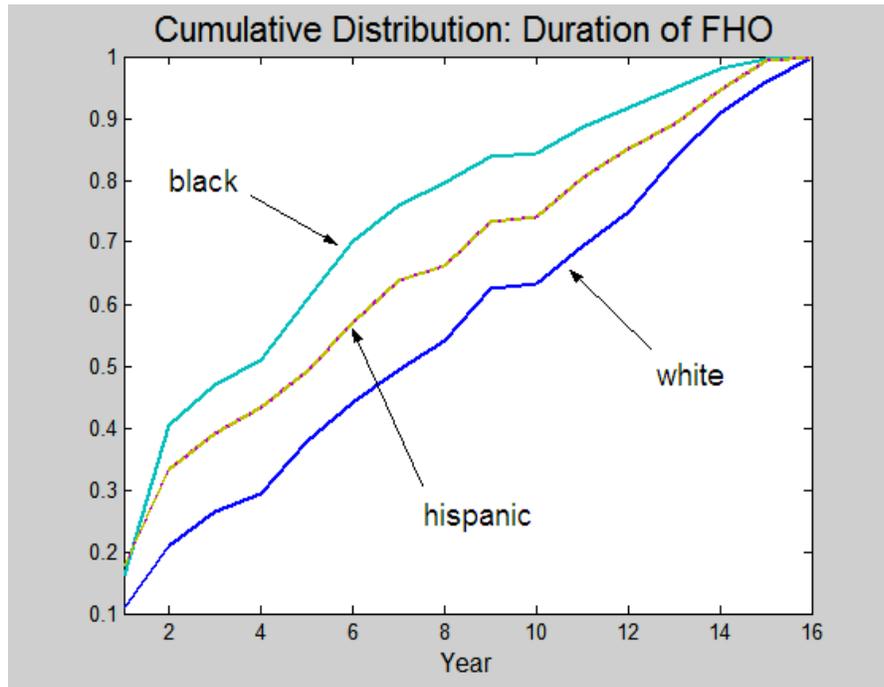


Figure 1: Cumulative Distribution of Duration of First Homeownership  
 Source: Authors' calculation based on weighted NLSY data.

This study identifies the factors that contribute to terminations of spells of first-time homeownership. We use a national longitudinal sample of young and middle aged households and a Relative Risk Cox model to test for which economic and demographic factors contribute to increasing the likelihood of terminating a spell of homeownership.

We find that terminations are predictable at the time of home purchase. The metric we develop is a measure of a household's probability of becoming an owner at that point in time. This

probability is highly significant in predicting the likelihood of a spell terminating. That is, households that are the most marginal homeowners when they purchase a home are most likely to leave homeownership quickly. This probability score also explains large parts of the racial differences. This result, although intuitive, has not been previously recognized. If promoting homeownership is adopted as a public policy, policy makers can use this “probability score” to identify households most at risk of leaving first-time homeownership and more efficiently target homeownership counseling programs.

We also find that post-purchase events affect the likelihood of homeownership ending. Important factors increasing the probability of termination include falling household earnings, marital breakups, increasing unemployment rates, and changing mortgage interest rates. Factors tending to extend spells of homeownership include higher cognitive ability (Armed Forces Qualifications Test (AFQT) scores),<sup>3</sup> more schooling, increased non-housing wealth, and house price appreciation (except for Blacks).

## 2. Data

Analyzing these issues requires observing separate households over a substantial period of time. Further, the data set must contain a sample of young households so that we can observe them making the transition from renting to owning and have sufficient post-ownership observations to observe whether the ownership spell is successful. With these requirements in mind, we use the National Longitudinal Survey of Youth-79 (NLSY-79, Bureau of Labor Statistics 2005), a survey that began in 1979. We focus on the period from

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<sup>3</sup> The AFQT is a general measure of trainability on a scale of 1 to 99. Normed scores (adjusted for age differences) are reported in the survey. The test includes as components: arithmetic reasoning, word knowledge, paragraph comprehension, and numerical operations.

1985 to 2000 when respondents were ages 20-27.<sup>4</sup> We study first-time homeownership experiences that begin within the sample period. A household is followed until either the spell terminates, or is censored in 2000, or the respondent drops out of the sample.

An important distinction of our study is that housing tenure spells are measured as the total time spent in a particular type of tenure (owning or renting). Thus, spells are not necessarily the time spent in a particular dwelling unit. For example, a household that moves multiple times but always rents (or always owns) is defined as participating in a single spell.

Our study differs from the typical analysis of mortgage default, which is of course limited to a stay in a single dwelling.<sup>5</sup> While default results in the termination of a homeownership spell, not all involuntary terminations of homeownership result in mortgage default. A household may terminate a spell to avoid default and capture any equity left in the house. Another difference is that we use panel data and thus we can track household characteristics every year during a spell of homeownership, while typical default studies measure household characteristics only at the initiation of a mortgage.

Our study also differs from the typical studies of mobility as their focus is on the length of stay in a particular dwelling or location. We differ from the analysis of tenure transitions by Boehm and Schlottmann (2004), who focused on the length of time that a household remains in a particular dwelling as an owner or renter, not the length of time the household continues as a homeowner. While their study is very informative for answering questions about mobility and tenure choice, ours focuses on answering questions related to the sustainability of tenure as a homeowner.

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<sup>4</sup> Wealth data are not reported until 1985.

### 3. Model

If transaction costs were zero and there were no mortgage lending related constraints, transitions from homeownership to renting should occur whenever the utility gained from renting is greater than that gained from owning. Thus, the standard tenure choice model would be applicable. The most common model of housing tenure choice is the user cost framework where a household's tenure decision is guided by the cost of owning relative to that of renting. A general expression for the user cost of housing is: (Dougherty and Van Order 1982):

$$(1) \quad UC_t = \left[ (r_t + \tau_t)(1 - \theta_{it}) + d_t - \pi_t^e + \frac{\lambda}{\mu_c} + C_{it} \right] \frac{P_{ht}}{P_t}$$

where the subscript  $t$  represents the time period,  $\theta_{it}$  is the applicable “tenure choice tax rate” which is a function of household income,  $r_t$  is the interest rate,  $\tau_t$  is the property tax rate,  $d_t$  is the rate of depreciation and maintenance,  $\pi_t^e$  is expected house price appreciation,  $p_h$  is the constant-quality price of housing, and  $p$  is the average price level.<sup>6</sup> The last two terms in (1) represent credit constraints and transaction costs. The first is the ratio of  $\lambda$ , which is the shadow price of the credit rationing constraint, to  $\mu_c$ , which is the marginal utility of the non-housing consumption good. The second represents the annualized transaction cost associated with homeownership, this being a function of the planned length of stay. The model argues that households' decisions whether to own or rent are based on comparing the user cost of housing to the rental rate for a comparable quantity and quality property.

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<sup>5</sup> See Deng and Gabriel (2002) for a summary of the literature on mortgage default.

Although this model is often used to explain the transition to homeownership, it also can be used to explain transitions from homeownership. For example, a reduction in household earnings lowers the tax advantage of owning, making termination of a spell of ownership more likely. Household earnings could fall as a result of unemployment, wage reductions, or marital breakup.<sup>7</sup> In contrast, increased earnings should have a small but positive effect on the duration of homeownership unless it leads a household to trade-up to a larger house when, occasionally, relocation between one owned home and another is punctuated with a temporary spell of renting. An increase in the mortgage interest rate, if not locked in with a fixed rate loan, would also increase the likelihood of terminating a spell of homeownership due to the increase in the relative cost of owning.<sup>8</sup> Falling interest rates reduce the cost of owning but also increase the likelihood that a household will desire to move to a larger home and, similar to rising income, this move could lead to temporary spells of renting.

House price appreciation creates wealth, which may be drawn upon through mortgage refinancing or a home equity loan. These funds could be used to finance

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<sup>6</sup> The tenure choice tax rate is defined in Hendershott and Slemrod (1983) and it accounts for non-linearities in the tax code.

<sup>7</sup> Our measure of earnings is the total labor market earnings of the respondent and spouse, if one is present. Earnings include wages, salaries, commissions, tips, self-employment income, and farm and business income. An alternative measure is total family income. The problem with this measure is that the percentage of the sample with missing values is high and substantially greater than for earnings. The reason for this high rate of missing values is that if any component of income is missing (e.g. income from stocks and bonds), then total family income is missing. The earnings data are converted to constant dollars, using the year 2000 as the base.

<sup>8</sup> The NLSY-79 data set does not report the type of mortgage held by homeowners. Presumably, some of these young and relatively mobile households selected adjustable rate mortgages. Thus, when interest rates increase (we use the rate for 30 year fixed-rate mortgages) monthly mortgage payments for those households with ARMs would tend to increase, this change increasing the likelihood of a termination. Another case where rising mortgage rates cause a greater hazard rate occurs when a household changes jobs and locations, but the higher interest rate makes it difficult for the household to purchase another home in the new job location.

extraordinary expenses such as house maintenance, helping to extend spells of ownership.<sup>9</sup> Recent studies have found racial differences in the tendency to refinance mortgages, specifically Blacks refinance less often than Whites (Deng and Gabriel 2003). Thus, there could be racial differences in the tendency of households to draw on their post-purchase increases in home equity. Price depreciation not only reduces wealth, but also indicates that homeownership was a poor investment in a respondent's locality. From an investment perspective, to the extent that respondents believe house price changes are autocorrelated, terminations of spells of ownership should be more likely when house prices have fallen as the expected price appreciation term in (1) is lower than previously.

Once a home is purchased, changes in financial wealth may impact the probability of terminating a spell of ownership. Rising wealth after the time of purchase provides a cushion against lumpy and unexpected expenditures or temporary reductions in income. Reductions in financial wealth should have the opposite effect on the probability of termination.

We extend the termination of homeownership model by including a variable that measures the marginality of a household's hold on homeownership. Some households are more marginal owners than others in the sense that they had more difficulty overcoming mortgage lender constraints. Examples include renter households with low wealth and thus they had difficulty meeting the down payment constraint and paying closing costs, households with income that is low relative to the monthly house payment, and households with marginally acceptable credit scores. We hypothesize that these marginal households who have become homeowners have a relatively high risk of losing their home if there is an unexpected shock such as one that affects the cost of home maintenance or the household's

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<sup>9</sup> See Haurin and Rosenthal (2005) for a description of how house price appreciation affects household debt, equity, and consumption.

flow of income. We implement this argument by testing whether households with a low probability of owning at the time of home purchase have a greater risk of terminating their spell of ownership. This argument is similar to one found in mortgage finance where households with low credit scores at the time of purchase are hypothesized to be more likely to default during the period of the loan. We first estimate the probability that a household would become a homeowner in the year that it purchased its first home (Probown0). Low values of Probown0 indicate that a household's hold on homeownership is relatively marginal.

#### 4. Estimation Methods

We use a relative risk Cox model to analyze duration of time until the termination of first spell of homeownership. We include both time invariant and time varying covariates. The estimation method accounts for right censoring, which occurs due to respondent attrition from the sample or reaching year 2000.

Let  $X_i(t) = \{x_i(u); 0 \leq u < t\}$  be the covariate history of the individual  $i$  up to time  $t$ .

The hazard process is given by,

$$(2) \quad \lambda[t; X(t)]dt = P\{T \in [t, t + dt) \mid X(t), T \geq t\} = \lambda_0(t) \exp[X(t)' \beta]dt,$$

where,  $\lambda_0(t)$  is an arbitrary, unspecified baseline hazard,  $\beta$  is the vector of coefficients of interest.

The sample consists of  $k$  failure times  $t_1 < t_2 < \dots < t_k$ , so that the remaining  $n - k$  observations are right censored. Let  $R(t)$  denote the set of items at risk of failure at time just before  $t$ . Then, the  $j$ th term in the partial likelihood is,

$$(3) \quad L_j(\beta) = \frac{\lambda[t_j; X_j(t_j)]}{\sum_{l \in R(t_j)} \lambda[t_j; X_l(t_j)]}.$$

This gives rise to the partial likelihood,<sup>10</sup>

$$(4) \quad L(\beta) = \prod_{j=1}^k \frac{\exp[X_j(t_j)' \beta]}{\sum_{l \in R(t_j)} \exp[X_l(t_j)' \beta]}.$$

The estimated coefficients,  $\beta$ , measure how the logarithm of relative hazard  $\lambda(t, \cdot)/\lambda_0(t)$  is affected by a unit change in the covariate. We report the hazard ratio,  $\exp(\beta)$ , this equal to the relative hazard  $\lambda(t, \cdot)/\lambda_0(t)$ . When  $\beta = 0$ , the hazard ratio is 1 and when  $\beta > 0$  ( $< 0$ ) the hazard ratio is greater (less) than 1. The standard errors are estimated by bootstrapping because of the inclusion of the estimated value, `Probn0`, in the set of explanatory variables.<sup>11</sup>

To facilitate the interpretation of variables' impacts on the duration of first-time homeownership, we report the differences in the proportion surviving for various durations of the spell. Consider the cumulative hazard,

$$(7) \quad H(t) = \int_0^t \lambda_0(t) \exp[X(t)' \beta] dt.$$

Using estimates of  $\hat{\lambda}_0(t)$  and  $\hat{\beta}$  we can calculate  $\hat{H}(t)$ . Once this predicted distribution function has been obtained we identify  $\tilde{t}$  such that,  $\hat{H}(\tilde{t}) = 0.5$ .

As comparative static exercises, we compare  $\tilde{t}$  between two groups. For example, to compare Black and White households who are otherwise the same, we first calculate each

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<sup>10</sup> The partial likelihood arises as the product of conditional probability statements but it is not directly interpretable as a likelihood in the ordinary sense of the term. See Kalbfleisch and Prentice (2002) for a detail explanations and a formal treatment.

groups' predicted hazard as if everyone in the sample belonged to that group, and then compare the  $\tilde{t}$ 's between groups. For a continuous variable, we compare the  $\tilde{t}$  for two values of the variable, the mean and the mean plus one standard deviation.

Our explanatory variables include both time invariant measures and measures of the change in a variable from the date of home purchase ( $x_t - x_0$ , where  $t$  is the current survey year and the spell of ownership started in period 0). Apart from Probown0, our time invariant variables include Black, Hispanic, Asian, sex, AFQT score (a measure of mental ability or trainability), education level at the time of purchase, immigration status, and parents education levels. The three measures of race are included to test whether there are racial differences in the termination process that are not otherwise explained by post-purchase changes in economic and demographic control variables or by the initial marginality of the household as an owner. Marginality is measured by Probown0, the estimated hazard rate of the household becoming an owner in that year.<sup>12</sup> This value is estimated using the same sample, but from the survey years prior to homeownership when the households were renters. A Cox hazard model was used for the estimation. The predicted hazard rate in the year of transition to being a first-time homeowner was calculated and used as the value of Probown0.<sup>13</sup> The smaller the value of Probown0, the more marginal is a household's hold on homeownership at the time of purchase.<sup>14</sup>

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<sup>11</sup> The program used for the estimation is Stata 9SE. The nonparametric bootstrap uses 200 replications. In general, we found that the results are similar to the robust standard errors produced with the method of Lin and Wei (1989).

<sup>12</sup> The "hazard rate" is the probability of a termination occurring at a point in time given that a termination has not occurred up to that point.

<sup>13</sup> A full description of the model of time to first homeownership and estimation results are described in Haurin and Munasib (2005). The sample period begins in 1979. The estimation is a Cox relative risk model and explanatory variables include: Black, Hispanic, Asian, male, first and second generation in the U.S., parental education, respondent's education, marital status, number of children, an achievement test score,

We also include a set of time varying variables that are suggested by the user cost model, augmented by demographic control variables. Economic variables include post-purchase changes in household earnings, non-housing financial wealth, house value, mortgage rates, and the state unemployment rate.<sup>15</sup> Demographic variables include changes in education level since purchase, family size, getting married, getting divorced-widowed-separated, and reporting a new health problem that limits the amount or type of work.<sup>16</sup> We test for asymmetric responses to increases and decreases in the economic covariates by including separate measures for rising and falling values of  $x$ . Increases in  $x$  are measured by  $(\text{Up} - x)$  and decreases in  $x$  are measured by  $(\text{Down} - x)$ . Specifically,

$$(8) \quad \begin{aligned} \text{Up} - x &= x_t - x_0, & \text{if } (x_t - x_0) > 0, & & \text{Up} - x &= 0, & \text{otherwise.} \\ \text{Down} - x &= |x_t - x_0|, & \text{if } (x_t - x_0) < 0, & & \text{Down} - x &= 0, & \text{otherwise.} \end{aligned}$$

We use the absolute value to  $(\text{Down} - x)$  to simplify the interpretation in the estimation. For example, we expect the hazard ratio of Up-wealth to be less than 1 (it lowers the hazard of termination). The hazard ratio for Down-wealth is expected to be greater than one because

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health, earnings, other income, inheritances, net wealth, region, city or suburban location, regional house prices, regional unemployment rate, regional expected house price appreciation rate, and the mortgage rate.

<sup>14</sup> The time-invariant variables that were used in calculating the probability score (Probown0) are also included in this regression. The rationale for using a time-invariant variable in the termination regression which was already used in calculating Probown0 (first stage) is that the characteristic may continue to affect the duration of first homeownership (second stage), but through a different channel. So, for blacks, in the first stage the issue was that they may have been discriminated against or do not have enough knowledge about home-buying. And, in the second stage, blacks may have less knowledge to do the refinancing, etc. The set of time-invariant variables, {male, first generation, second generation, parents higher grade completed}, may have an effect through differences in network access (social or otherwise) that the household can tap in times of crisis such as a potential foreclosure. These networks may also matter in obtaining information about refinancing etc. The set of time-invariant variables, {AFQT score, HGC at the time of purchase}, may matter in processing information about housing finances in particular and financial information in general.

<sup>15</sup> Changes in the state unemployment rate reflect changes in local macroeconomic conditions. Changes in unemployment rates may affect a household's behavior through effects on household expectations about the growth of future earnings and future house price appreciation.

<sup>16</sup> These variables take the value of 1 only in the year the event occurs, otherwise they are 0.

larger absolute values of falling wealth should increase the hazard of terminating a spell of homeownership.

## 5. Results

There are 2,086 respondents who purchased a house for the first time during the sample period.<sup>17</sup> Variable means and standard deviations are presented in Table 1. Basic estimation results that highlight racial difference in termination rates are presented in Table 2; those with a set of interaction variables are in Table 3. Table 4 presents the comparative static exercises.

The estimated hazard rate is shown in Figure 2. This is the underlying probability of termination that shifts proportionally as the time invariant covariates change values. It is greatest in the early years of a spell, peaking at about three years near six percent and then falling monotonically. Thus, survival as a first-time homeowner during the first three years of first-time ownership leads to subsequent periods of time when the probability of a termination is much lower, this finding important for public policy.

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<sup>17</sup> Households that purchased a home prior to 1985 are excluded from our analysis.

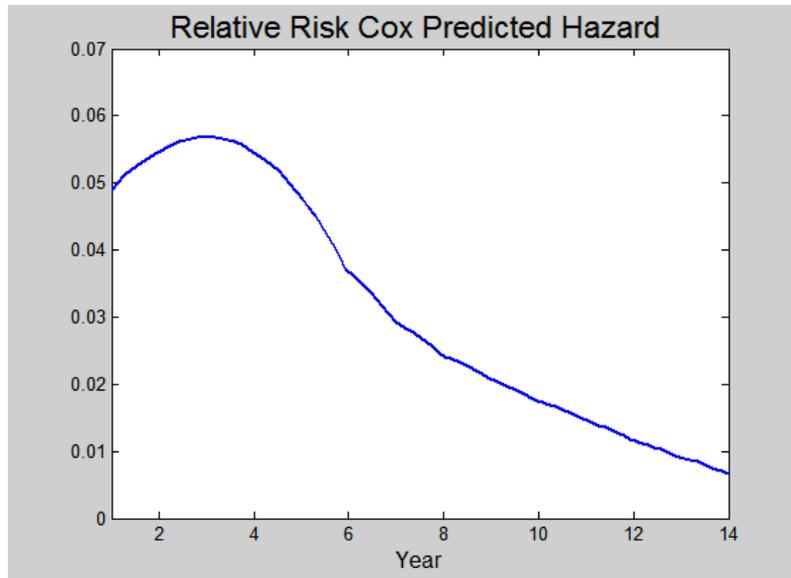


Figure 2: Predicted Hazard of Cox Proportional Hazard Estimates

The first set of results in Table 2 (regression [1]) shows that the hazard rate of terminations of homeownership by Blacks is 56 percent greater than the reference group (Whites). The rate for Hispanics is 49 percent greater while that for Asians is not significantly different.<sup>18</sup> The differences in survival are correspondingly large. At five years of duration, 68 percent of Whites survive, while only 55 percent of Blacks and 56 percent of Hispanics are still in their first spell of homeownership.

There has been little study of racial differences in rates of termination of first-time homeownership and thus our finding that these differences are large leads to the question of why they occur. We next control for the marginality of a household's hold on tenure at the time of home purchase by including the Prodown0 score (regression [2]). There are substantial racial differences in the average score. The mean values for Whites, Blacks,

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<sup>18</sup> Given that we present hazard ratios rather than coefficients, we also present the significance level rather than standard errors.

Hispanics, and Asians are: 20.2, 11.8, 14.2, and 13.8. The hazard ratio reported in Table 2 implies that those households with high values of  $Probown_0$ , that is, non-marginal owners, have a lower probability of terminating a spell of homeownership. A one percentage point increase in the probability of owning at the time of home purchase lowers the hazard of termination by 2.5 percent. Inclusion of  $Probown_0$  reduces the size of the hazard ratios of Black and Hispanic and the racial differences in fifth year survival probabilities falls to seven percentage points, holding constant the value of  $Probown_0$ .

Some of the racial differences in termination rates could be explained by the groups experiencing different post-purchase events or responding to these events differently. Regression [3] reports the results when a set of additional economic and demographic variables are included in the estimation.

Most post-purchase variables have the expected effects. Falling earnings increase the hazard of termination by 4.8 percent per \$10,000, although increase annual earnings do not have a significant effect. Increased financial wealth apparently provides a cushion to address lumpy or unforeseen costs as each additional \$10,000 reduces the hazard rate of a termination by 2 percent. However, reduced wealth does not increase the hazard rate. Increased house value also provides a potential source of wealth through the use of second mortgages or home equity loans. The estimates suggest that each \$10,000 of capital gain reduces the hazard rate by 3.2 percent. The direction of impact of falling house values is as expected, but it is not statistically significant.

Rising mortgage interest rates increase the hazard of termination, but although the effect is relatively large, it is not significant. In general, we expected falling mortgage interest rates would extend the period of homeownership, but we find the opposite. A

possible explanation is that households took advantage of the lower rates to increase their quantity of housing, requiring a move, but this required a temporary spell of renting.<sup>19</sup> Another explanation is that the result is spurious because interest rates only vary temporally and, while our period of observation is not short, rates declined over most of the period making accurate estimation difficult.

Termination rates are sensitive to changes in the economic environment of the respondent's home state. An increase of the unemployment rate by one-percentage point raises the hazard rate by 18 percent, while a reduction in the unemployment rate by a point reduces it by 6 percent (but not significant). A theoretical explanation for this finding is that a higher state unemployment rate signals lower job security. Less job security increases the risk of owning a home and likely reduces expected house price inflation. These factors lower the demand for homeownership and thus could increase the likelihood of termination of a spell of ownership.<sup>20</sup>

Among the demographic variables, AFQT score and the highest grade completed at the time of purchase have significant effects and they both reduce the likelihood of termination. . Each additional point scored in the AFQT lowers the hazard by 1 percent and one additional year of schooling lowers the hazard by 6 percent. We find little effect on homeownership spells of singles getting married or of the respondent reporting an illness that

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<sup>19</sup> For example, the current home could be sold but a newly constructed home not yet be ready for occupancy, resulting in the household temporarily renting. Another example is if reduced interest rates result in a household relocating across states or MSAs and temporarily renting in the new, unfamiliar, market.

<sup>20</sup> A very different, data oriented, explanation is that our measure of annual earnings is for the prior calendar year and the survey is administered typically in March to May. The unemployment rate is measured for the survey year and thus could be a more up-to-date measure of the household's economic situation when the survey is administered.

affects the type or amount of work. In contrast, we find a very large positive effect of marital breakups on the hazard rate.

Inclusion of the demographic variables and the post-purchase variables reduce the black and white difference to 13 percent in regression [3] from a 56 percent difference in regression [1], and a 27 percent difference in regression [2]. We also see that Hispanic is no longer significant after inclusion of the full set of covariates.

Next we focus on some of the specifics of the nature the black-white differences. In table 3, first we interact black with Probown0 (regression [4]). The interaction with Black is significant and the hazard ratio is less than one. Thus, while all marginal homeowners are more likely to terminate a spell of homeownership, marginal Black homeowners have an even greater likelihood of ending their ownership spell.

In regression [5] we added a test of the hypothesis that Blacks react differently to changes in home equity than Whites, perhaps due to their known different tendencies to refinance mortgages. We interacted the Black indicator variable with the two variables measuring the change in the respondent's house value. The interaction of Black with rising house values is significant with a hazard ratio above one. The interpretation is that increasing house values provide a cushion that Whites apparently tap, but not Blacks. That is, the hazard ratios of 'Up house value' and the interaction 'Black \* (Up house value)' almost offset each other. This result is consistent with the literature's finding that Blacks do not refinance to the extent Whites do.

In Table 4, we present expected lengths of the first homeownership spells using regression [3] (the procedure, which uses equation (7), was explained in section 4). A 1 standard deviation increase in Probown0 increases the spell length by 57 percent. Also, the

black spells are 23 percent smaller than the white spells even after accounting for the marginality score, observed time-invariant characteristics, and post-purchase changes.

## **6. Conclusions and Policy Implications**

We find that many first-time homeowners return to renting or living with relatives. The hazard rate of termination varies over the duration of the first homeownership spell, peaking near the third year of ownership. At the peak, the annual rate of failures of low-income households who survived as an owner to that time is about six percent. The rate of terminations falls off after the third year down to two percent in the ninth year of a spell of homeownership. This finding suggests that policies with the goal of sustaining homeownership should focus on the first five years of residence by first-time homeowners.

One of the major findings of this study is that the rate of terminations of first-time homeownership is substantially greater for Blacks and Hispanics than Whites or Asians. This difference in rates persists after controlling for both differences in household endowments and characteristics at the time of home purchase and differences in their post-purchase experiences. We offer several possible explanations for this result, all of which rely on the possible influence of unobserved effects not captured by the control variables.

Herbert et al. (2005) note that significant racial indicator variables in tenure choice equations often are interpreted as evidence of discrimination in the housing market. However, in our case, all respondents have already become homeowners and thus the argument for discrimination is either weaker or more subtle. For example, a mortgage may have been obtained by a minority household but discrimination may have increased the cost

of securing the mortgage because the characteristics of the loan contract were relatively unattractive. Thus, discrimination could leave Black and Hispanic homeowners more exposed to the influence of negative shocks.

An alternative explanation is that policies designed to encourage homeownership among disadvantaged households could draw highly marginal households into the pool of homeowners. These households could have unobserved characteristics that result in a greater termination rate. Under this scenario, the differences in applicant pools would not be fully captured by our measure of marginality at the time of purchase. The result could be higher termination rates among minorities, reflected in the significant coefficients for the Blacks in Table 2.

A third possibility is that responses to negative shocks differ among racial and ethnic groups. White households may have more resources to call on, one example being parental wealth. Alternatively, White households may have more knowledge of how to cope with negative shocks and not terminate a spell of ownership due to greater knowledge about housing, mortgage, and real estate markets. This knowledge may have been passed on from parental or close relatives' ownership experiences.

A fourth possible explanation for the higher estimated minority termination rate is racial segregation in the housing market. Minority families are disproportionately located in inner city urban neighborhoods in which much of the housing stock is old. Housing in these neighborhoods is likely subject to unexpectedly high maintenance costs, reducing the ability of families to sustain homeownership. However, we have no control for the age of the dwelling in our data set.

Our second major finding is that the risk of termination of a spell of homeownership is highly predictable at the time of home purchase. We developed a “marginality score” that equals the hazard rate of the household transitioning into homeownership at the time of purchase. We argue that the lower the value, the more marginal the household’s hold on ownership. Our test of this hypothesis strongly confirms the importance of this variable. Each percentage point greater is this score (less marginal), the hazard rate of a termination falls by 2.1 percent. Households that achieve homeownership, but barely, are at substantial risk of reversion back to renting or living with others. This is especially true for Black households. This finding is important for policy makers because it allows them to focus resources on those households most likely to leave ownership. While most counseling programs educate households about how to become homeowners, few focus on providing information about how to sustain ownership.<sup>21</sup>

Intertemporal changes in economic variables also matter, particularly economic variables that improved following a purchase. We find that termination rates fall as a household’s house value rises (only for non-Blacks), and there is some evidence that increases in household wealth has a similar effect. Falling earnings increase the hazard of termination. Among the demographic factors, marital breakup greatly increases the probability of a termination while higher AFQT score and more schooling lower it.

Just as not all households would benefit economically from becoming homeowners, not all households that begin a spell of homeownership benefit from remaining homeowners. Reductions in wealth may change the optimal portfolio composition away from real estate. Reductions in family earnings reduce a household’s tax bracket and raise its user cost of

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<sup>21</sup> A summary of post-purchase counseling programs is in Collins and Gorey (2005). They describe existing programs in North Carolina, Minnesota, Chicago, Atlanta, Indiana, and Pennsylvania.

homeownership, favoring renting. House price depreciation in a locality may signal that housing is a poor investment in the area. Increased expected mobility following a divorce may make renting desirable.

While some changes in a family's status or the local economic environment may make termination of a homeownership spell attractive to a given household, other occurrences of terminations likely are not welcomed by families. A first-time homeowner may not know how to cope with unexpected maintenance costs. Temporary spells of unemployment or reduced income may trigger a home sale among the most marginal, uninformed, and inexperienced homeowners. Most current public policies are ones that encourage homeownership and they assist households making a purchase. They do not sustain homeownership once it is achieved. Post-ownership counseling programs assisting the most marginal new homeowners would be appropriate.

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## Tables

Table 1: Descriptive Statistics

<b>Variables</b>	<b>N</b>	<b>Mean</b>	<b>Std</b>	<b>Min</b>	<b>Max</b>
Probability score of owning (prodown0)	10862	18.20	9.69	1.32	95.13
Black	10862	0.14	0.34	0.00	1.00
Hispanic	10862	0.13	0.34	0.00	1.00
Asian	10862	0.01	0.10	0.00	1.00
Male	10862	0.49	0.50	0.00	1.00
First generation	10862	0.04	0.19	0.00	1.00
Second generation	10862	0.03	0.16	0.00	1.00
Parents highest grade completed (HGC)	10862	12.49	3.24	0.00	20.00
AFQT score	10862	52.48	27.73	1.00	99.00
HGC at time of purchase	10862	13.65	2.24	6.00	20.00
Change in HGC	10862	0.13	0.51	0.00	6.00
Family size	10862	3.16	1.33	1.00	13.00
Get married	10862	0.02	0.14	0.00	1.00
Get divorced/widowed/separated (DWS)	10862	0.01	0.11	0.00	1.00
Get sick	10862	0.01	0.11	0.00	1.00
Up earnings (\$0000)	10862	1.28	2.55	0.00	47.92
Down earnings (\$0000)	10862	0.38	1.33	0.00	30.01
Up wealth (\$0000)	10862	3.50	10.48	0.00	101.27
Down wealth (\$0000)	10862	1.27	6.11	0.00	107.84
Up national mortgage rate	10862	0.08	0.25	0.00	1.53
Down national mortgage rate	10862	1.05	1.20	0.00	4.53
Up state unemployment rate	10862	0.40	0.89	0.00	7.20
Down state unemployment rate	10862	0.80	1.11	0.00	8.10
Up house value (\$0000)	10862	2.27	6.58	0.00	69.61
Down house value (\$0000)	10862	1.04	3.88	0.00	51.83

Table 2: Relative Risk Cox Hazard Estimates

Regressions	[1]		[2]		[3]	
	<i>hazard ratio</i>	<i>p-value</i>	<i>hazard ratio</i>	<i>p-value</i>	<i>hazard ratio</i>	<i>p-value</i>
Black	<b>1.5598</b>	0.0000	<b>1.2724</b>	0.0060	<b>1.1387</b>	0.1570
Hispanic	<b>1.4854</b>	0.0000	<b>1.3039</b>	0.0020	1.1187	0.2830
Asian	1.0780	0.8200	0.9327	0.8430	0.8588	0.6410
Probown0			<b>0.9754</b>	0.0000	<b>0.9795</b>	0.0000
Male					0.9725	0.6590
First generation					1.0809	0.6100
Second generation					0.9575	0.8280
Parents HGC					1.0134	0.2650
AFQT score					<b>0.9945</b>	0.0000
HGC at time of purchase					<b>0.9394</b>	0.0010
Change in HGC					1.0741	0.3530
Family size					1.0365	0.1600
Get married					1.1644	0.5080
Get DWS					<b>2.7441</b>	0.0000
Get sick					0.8088	0.5760
Up earnings (\$0000)					0.9709	0.2340
Down earnings (\$0000)					<b>1.0481</b>	0.0080
Up wealth (\$0000)					<b>0.9848</b>	0.0770
Down wealth (\$0000)					1.0066	0.3370
Up mortgage rate					1.2301	0.1220
Down mortgage rate					<b>1.1626</b>	0.0020
Up unemployment rate					<b>1.1834</b>	0.0000
Down unemployment rate					0.9384	0.2410
Up house value (\$0000)					<b>0.9677</b>	0.0440
Down house value (\$0000)					1.0120	0.2390
No. of subjects	2086		2086		2086	
No. of failures	872		872		872	
Log likelihood	-6390.33		-6371.57		-6304.23	
Wald chi2(25)	45.79		75.07		238.66	
Prob > $\chi^2$	0.0000		0.0000		0.0000	

Note: Hazard ratios that are significant at 1%, 5%, or 10% level are in boldface.

Table 3: Relative Risk Cox Hazard Estimates with Race Interactions

Regressions	[4]		[5]	
	<i>hazard ratio</i>	<i>p-value</i>	<i>hazard ratio</i>	<i>p-value</i>
Black	<b>1.5597</b>	0.0100	<b>1.4475</b>	0.0350
Hispanic	1.1378	0.2120	1.1334	0.2930
Asian	0.8785	0.7130	0.8813	0.7140
Probown0	<b>0.9824</b>	0.0000	<b>0.9824</b>	0.0000
Male	0.9707	0.6390	0.9668	0.5880
First generation	1.0770	0.6490	1.0794	0.6390
Second generation	0.9512	0.8160	0.9471	0.8170
Parents HGC	1.0130	0.2590	1.0123	0.2860
AFQT score	<b>0.9946</b>	0.0000	<b>0.9945</b>	0.0010
HGC at time of purchase	<b>0.9391</b>	0.0020	<b>0.9404</b>	0.0030
Change in HGC	1.0729	0.3430	1.0772	0.3940
Family size	1.0380	0.1370	1.0386	0.1630
Get married	1.1589	0.5650	1.1520	0.5450
Get DWS	<b>2.7359</b>	0.0000	<b>2.7287</b>	0.0000
Get sick	0.8041	0.6200	0.7853	0.5470
Up earnings (\$0000)	0.9705	0.2330	0.9671	0.1860
Down earnings (\$0000)	<b>1.0473</b>	0.0220	<b>1.0481</b>	0.0140
Up wealth (\$0000)	<b>0.9849</b>	0.1040	<b>0.9856</b>	0.1030
Down wealth (\$0000)	1.0064	0.2970	1.0069	0.2470
Up mortgage rate	1.2305	0.1750	1.2045	0.1990
Down mortgage rate	<b>1.1629</b>	0.0020	<b>1.1593</b>	0.0010
Up unemployment rate	<b>1.1851</b>	0.0000	<b>1.1868</b>	0.0000
Down unemployment rate	0.9398	0.2690	0.9344	0.2150
Up house value (\$0000)	<b>0.9676</b>	0.0360	<b>0.9556</b>	0.0340
Down house value (\$0000)	1.0116	0.2680	1.0055	0.6280
Black*Probown0	<b>0.9711</b>	0.0350	<b>0.9710</b>	0.0440
Black*(Up house value)			<b>1.0748</b>	0.0390
Black*(Down house value)			1.0543	0.1950
No. of subjects	2086		2086	
No. of failures	872		872	
Log likelihood	-6302.06		-6297.46	
Wald chi2(25)	267.26		318.14	
Prob > $\chi^2$	0.0000		0.0000	

Note: Hazard ratios that are significant at 1%, 5%, or 10% level are in boldface.

Table 4: Comparative Dynamics (year when cumulative hazard function,  $H(\tilde{t}) = 0.5$ )

Shock	$\tilde{t}$ , where $H(\tilde{t}) = 0.5$
Regression [3] with no shock	7.21
Whites	7.91
Blacks	6.43
Hispanics	6.60
Asians	11.50
Males	7.38
Third or older generation immigrant	7.24
First generation immigrant	6.42
Second generation immigrant	7.79
No get married shock	7.26
Get married shock	5.79
No get W/D/S shock	8.23
Get W/D/S shock	2.45
No get sick shock	7.18
Get sick shock	11.62
1 sd shock in parent HGC	6.74
1sd shock in AFQT score	9.89
1 sd shock HGC at the time of purchase	9.52
1 sd shock of change in HGC	6.81
1 sd shock in family size	6.69
1 sd shock in up earnings	8.23
1 sd shock in down earnings	6.55
1 sd shock in up wealth	9.50
1 sd shock in down wealth	6.77
1 sd shock in up house value	11.82
1 sd shock in down house value	6.71
1 sd shock in up mortgage rate	6.66
1 sd shock in down mortgage rate	5.54
1 sd shock in up unemployment rate	5.78
1 sd shock in down unemployment rate	8.15
1 sd shock in probown0	11.34