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The Growth Earnings of Low-Income Households and the Sensitivity of Their Homeownership Choices to Economic and Socio-Demographic Shocks

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Executive Summary

Purpose and Motivation

This report discusses two aspects of the post-purchase experiences of low-income homeowners. First, intertemporal changes in the post-home purchase earnings of low-income first-time homeowners are described. Knowing the path of their earnings over time is important because the degree to which low-income first-time homeowners are able to remain in owner-occupied housing depends, in part, on the growth of their earnings. However, very little is known about these time paths.

The second part of the study investigates the impact of household and macroeconomic variables on the duration of time spent as a low-income first-time homeowner. This study builds upon the first analysis and determines the extent that ownership spells terminate due to earnings shocks and family disruptions. While most low-income households' first ownership spell is successful, some return to renting relatively quickly. This is the group that is the particular focus of the second part of the study.

Methodology and Data

The data set for this study is a national longitudinal sample of young and middle age low-income individuals. The first part of the analysis identifies the year of first home purchase and the household's earnings in that year. It then follows these homeowners over time and records their earnings and compares the real earnings (deflated) to the amount earned at the time of home purchase. The empirical methodology adopted is ordinary least squares regression, which is used to estimate the annual growth in earnings of low-income first-time homeowners. Because the data are from a panel data set, a second set of estimates is conducted that accounts for unobserved person specific attributes. The second part of the study uses the same data set to investigate the causes of low-income homeowners ending their first spell of ownership. The appropriate model for investigating this question is the so-called failure-time model where the probability of termination is estimated for each year following home purchase, this probability known as the hazard rate. The impact of a number of variables thought to contribute to the termination of a spell of ownership is measured.

Findings

The key finding from the first part of the analysis is that household earnings among new homeowners typically rise at a relatively rapid rate. The causality likely flows in both directions: families that expect their incomes to increase are more likely to select into homeownership, and homeownership also may cause households to increase their work effort and income. Nevertheless, even allowing for the possibility of bi-directional effects, it is clear that for the typical low-income owner-occupier in our sample, homeownership is sustainable. Focusing only on earnings growth, first-time low-income homeowners' earnings grow at a 13 percent rate, this being at least twice the growth rate for low-income renters or any moderate-income or high-income group. Some of this growth in earnings results from changes in the household's characteristics such as aging (a proxy for greater job

experience), attending and completing college, and getting married. Some of the growth in earnings is associated more closely with being a homeowner, either because of a direct causal effect of homeownership on work effort and earnings, or because households that anticipate higher future earnings become homeowners.

The second part of the study investigates the impact of household and macroeconomic variables on the duration of homeownership spells, where spell length is measured from the date of first home purchase. Falling earnings and house values accelerate the termination of homeownership and thus a move back to rental housing or living with parents. In contrast, terminations are less likely the greater the level of household earnings at the time of home purchase, the lower the mortgage interest rate, and the lower the state unemployment rate. Among the demographic variables, being (and remaining) married, greater education and cognitive ability, a smaller family size, and greater age of the respondent all reduce the likelihood of terminating a spell of ownership. Race, particularly being Black, substantially increases the probability of terminating a spell of homeownership.

The baseline rate of terminations varies over the duration of a homeownership spell, peaking around the third year of ownership. At the peak, the rate of failures of low-income households who survived as an owner to that time is about 7 percent. The rate of terminations falls off after the third year, down to 5 percent in year five and 2 percent in the tenth year of a spell of homeownership. Thus, there is a significant risk of ending ownership spells through the seventh year.

Policy Implications

The results from the first part of the study suggest that, on average, the mortgage payment-to-income ratio for low-income first-time owners falls over time. This increase in earnings helps these households sustain ownership. A tentative conclusion is that policies that have promoted homeownership for young low-income households generally will tend to succeed because of future earnings growth. However, these findings do not imply that all low-income homeowners enjoy greater earnings over time.

Some changes in a family's status or the local economic environment may make termination of a homeownership spell attractive to a given household, but other occurrences of terminations are likely not welcomed by individual families. The results show that Black households have a much greater hazard rate of terminating a spell of homeownership, even after controlling for a large number of economic and demographic variables. Although this analysis does not identify the cause of this result, this is certainly something that bears additional research and policy attention. It is possible, for example, that discrimination may reduce the ability of Black families to sustain homeownership even after clearing the initial hurdle of purchasing a home. One possible mechanism by which this could occur is if discrimination results in reduced job security. Alternatively, it is possible that public policies designed to facilitate homeownership among minority and low-income families have drawn a disproportionate number of marginal minority homebuyers into owner-occupied housing. Such families would be more sensitive to the influence of adverse shocks. If this is the cause of the race-related result, then pre- and post-ownership counseling programs may be appropriate, especially ones targeted at how to manage negative shocks to household finances, including reduced income, unexpected home maintenance, and rising mortgage interest rates. Such a policy initiative would also

be consistent with the finding that education and knowledge extend spells of homeownership for all owner-occupiers.

The finding that the initial mortgage interest rate and changes in that rate are an important determinant of terminations suggests that low-income (often inner city) borrowers need access to prime lenders. The presence of subprime lenders may facilitate low-income households securing a first home loan, but the results suggest that a one percentage point higher initial interest rate increases the baseline probability of termination of the spell by 16 percent annually thereafter.

There also are risks associated with ARMs. While a falling mortgage interest rate decreases the probability of a termination, a rising rate increases the probability by twice the amount. That is, the impact of changing interest rates is not symmetric. Offsetting this effect is that often the initial interest rate on an ARM is lower than a FRM, reducing the probability of termination of a spell of ownership. It is reasonable to extrapolate our results to conclude that low-income households holding an adjustable rate mortgage are exposed to substantial risk of an interest rate hike and the resulting higher probability of terminating their spell of ownership.

I. Introduction

This report is composed of two sections. Following the introduction, the first research topic investigates the growth rate of earnings of low-income households following their first purchase of a house. This study then analyzes the correlates of this income growth and thus identifies which low-income households are most likely to succeed in homeownership. This is the first study of the post-purchase earnings paths of first-time homeowners, which highlights the importance of this analysis. The second section of the study focuses on unsuccessful spells of first-time homeownership by low-income households. It investigates the causes of terminations. An important question is which households terminate spells of homeownership, this question relevant for the larger policy question of whether some households that are encouraged through public policies to become homeowners have unsuccessful experiences. The report concludes with a summary of the research findings and policy implications.

Whether households with low income at the time of home purchase can sustain homeownership depends, in part, on the growth of their earnings. However, essentially nothing is known about the time paths of earnings for low-income households once they become homeowners. If earnings increase, then the monthly mortgage payment-to-income ratio declines if the household has chosen a level mortgage payment option. This decline should increase the ability of households to remain a homeowner in the face of minor shocks. Examples of these shocks include unexpected home maintenance costs or family health costs.

The central goal of this study is to measure the earnings growth paths of young and middle-aged low-income households that transition to homeownership. The rate of earnings growth of low-income homeowners is compared to that of higher income households of similar age, and also to that of low-income renters. These comparisons are made with and without controls for respondents' socio-demographic characteristics and broader macroeconomic variables that affect earnings growth. We also control for unobserved person-specific attributes using the fixed effects econometric method, this feasible only for panel data sets.

A cautionary note throughout the study is that of causality. We do not identify whether households with a particular earnings growth path (e.g. rising) select into homeownership, or whether homeownership causes individuals to work harder resulting in higher rates of earnings growth. For example, there is evidence that households increase their labor supply prior to becoming a homeowner (Haurin, Hendershott, and Wachter 1996). These first-time purchasers may continue their high rate of labor supply post-purchase in order to meet the increased financial commitments that are associated with owning one's own home. In this way, homeownership may cause a household's earnings to grow more rapidly than if the household remained a renter. However, there also is reverse causality. That is, low-income households that expect their earnings to grow rapidly are more likely to select into homeownership. Separation of these effects would require simultaneous treatment of both causal factors and is beyond the scope of this study. Instead, we document the equilibrium outcomes observed in the housing market. As will become apparent, this yields considerable information that is pertinent to the formation of housing policy.

The second part of the study is our analysis of the sensitivity of low-income households' duration of time spent as an owner to financial and social shocks, including changes in earnings and other economic variables, as well as changes in social factors such as a marriage or divorce. Anecdotally, a common belief is that relatively few middle and upper income households respond to these crises by switching from owning to renting. What happens to low-income households is not known, but generally it is assumed that their tenure choice is relatively sensitive to these negative events. We test for the extent of this sensitivity. This analysis is related to the recent HUD funded study of the sustainability of homeownership and the return to renting by Haurin and Rosenthal (2004). That study considered all income groups rather than focus on the impact on low-income households. Also, it included multiple spells of owning and renting rather than focus on first-time ownership, and it was less concerned about the impact of post-purchase earnings.

Analyzing these issues requires that one observe individual households over a substantial period of time. This requirement implies that a longitudinal data set must be used for these analyses. 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 track their changes in earnings. With these requirements in mind, we use the National Longitudinal Survey of Youth-1979 (NLSY), a survey with over 12,686 respondents in 1979. The respondents were young at the initiation of the survey, ages 14 to 22. The survey continued though 2000 when respondents are ages 35 to 43. Typically, these are the ages during which first homeownership occurs and thus the survey is ideal for investigating our research question. The average period of homeownership that we observe is about 6.4 years, but it ranges from 4.7 years for low-income households to 8.2 years for high-income households. These statistics are somewhat misleading because they include censored observations. Censoring occurs in either the year 2000 (our last year of observations) or if a household fails to participate in the survey.¹ Forty-eight percent of the spells started during the 1980s, with the rest starting later in the sample period.

Summary of Findings

Our first finding is that the real income of new low-income homeowners grows at a substantial rate post-purchase. Homeowners with total family earnings in the bottom quartile experience an annual growth rate of real earnings of 12.9 percent. In contrast, real earnings of low-income renters grow at 6.7 percent, the earnings of middle and high-income owners and renters grow at 3.6 percent and 2.6 percent respectively. Growth in real earnings is expected because these relatively young individuals are increasing their education and labor supply, and because they are gaining job tenure and labor market experience. Total family earnings also increase as individuals get married. An important conclusion drawn from this descriptive data is that for the typical low-income homeowner, the share of the household budget devoted to mortgage payments declines rapidly in the early years of homeownership. This is especially true for those families who finance their homes through fixed rate mortgages with constant nominal payments.

¹ Forty-one percent of our observations of first-time homeownership spells ended in terminations, the rest being censored. Of the censored observations, 91 percent of the spells were censored in 2000, the last year of our survey data.

Our second finding is that observable differences in household characteristics explain some, but not all of the increase in real earnings of low-income owner-occupiers relative to renters. The remaining difference in earnings between these two groups is associated with the difference in housing tenure status. However, as emphasized above, that portion of the difference could arise for two very different reasons: unobservable household attributes may draw select individuals into homeownership (e.g. families that anticipate high earnings growth rates to a degree not observed by the analyst) versus the possible impact of homeownership on work effort and income.

The third and somewhat broader set of findings concerns the degree to which observable household attributes and macroeconomic variables are associated with terminations of spells of first-time homeownership. This part of the study is related to the default literature, but is more general in two ways. First, while defaults lead to terminations of homeownership spells, not all involuntary terminations of homeownership result in mortgage default. Second, our study is based on 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. In our full sample that includes families of all incomes, falling earnings and house values accelerate the termination of homeownership and thus a move back to rental housing or living with parents. These effects are statistically significant and large. In contrast, terminations are less likely the greater the level of household earnings at the time of home purchase, the lower the mortgage interest rate, and the lower the state unemployment rate. Among the demographic variables, being (and remaining) married, greater education and cognitive ability, a smaller family size, and greater age of the respondent all reduce the likelihood of terminating a spell of ownership. Race, particularly being Black, substantially increases the hazard associated with termination of homeownership. In a smaller sample composed only of low-income individuals, these effects are less precisely estimated, although low earners do appear to be more sensitive to increased local unemployment and mortgage rates.

II. Earnings Growth Paths of New Homeowners

A. Earnings Growth Rates

In this section, we first compare the growth in earnings of owners with renters. We then compare the growth in earnings of low-income households with other households. A household's tenure is identified in the data set, and we measure the duration of spells spent as a renter or an owner. Our measure of earnings is the total labor market earnings of the respondent and spouse, if one is present.² The earnings data are converted to constant dollars, using the year 2000 as the base. In the estimation, we use the natural log of earnings as the dependent variable and thus the coefficients of explanatory variables that are measured in years (i.e. the duration variables) can be interpreted as

² Earnings include wages, salaries, commissions, tips, self-employment income, and farm and business income. An alternative measure is total family income, a "key" variable in the NLSY data set. The problem with this measure is that the percentage of the sample with missing values is substantially greater. 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. In contrast, earnings are recorded for nearly all respondents.

rates of growth. The sample is limited to respondents of age 21 or greater in any given survey year. The sample also is separated into low-earnings households and all other households. This separation is complicated by the fact that an individual's earnings change from one survey year to the next. To address this issue and to simplify the analysis, we classify each household as belonging to a single income category (e.g. low-income) throughout the panel based on the individual's earnings at age 25. To be precise, all households whose age-25 earnings are in the lowest quartile of this cohort's U.S. income distribution are classified as low-income households, while all others are referred to as "high" income.³ Because the NLSY over-samples minorities and low-income households, this classification of households is carried out based on a weighted distribution of earnings from the sample. This ensures that the 25th and 75th income percentiles are representative of the U.S.⁴ This also accounts for why the unweighted number of observations belonging to the low- and higher-income groups are not exactly equal to 25 and 75 percent of the total sample, respectively.

Do the earnings of low-income homeowners rise faster than the earnings of low-income renters? Do the earnings of low-income homeowners rise faster than the earnings of higher income households? We begin to answer these questions by reviewing sample means of the unweighted NLSY data as presented in Table 1.

³ Alternative definitions of low-income are of course possible. If the criterion was income or earnings measured at a younger age such as 21, a number of youths would still be enrolled in school and thus would be classified as low-income even though they would soon likely be moderate or high income. Using income at the time of home purchase would lead to an undefined measure for persistent renters.

⁴ The Hispanics in the NLSY are youths who were present in the U.S. in 1979. Some were immigrant youths; others were second (or higher) generation youths. The NLSY did not add individuals to the cohort over time, thus the earnings results for Hispanics from 1979 to 2000 represent the earnings of a cohort who have lived in the U.S. for a substantial time period.

Table 1
NLSY Unweighted Sample Means by Earnings Quartile
(Dollar values are in year-2000)

Variable	All Households	Low Earnings Quartile	Moderate and High Earnings Quartiles
Earnings	\$37,227	\$15,615	\$42,435
Log Earnings	9.25	6.04	9.96
Homeowner	0.44	0.18	0.50
Duration-own	1.87	0.62	2.13
Duration-rent	2.57	3.83	2.14
Black	0.24	0.41	0.20
Hispanic	0.14	0.15	0.14
Asian	0.01	0.01	0.01
Other Race	0.03	0.02	0.04
Male	0.48	0.41	0.50
Age	28.82	28.85	28.82
Education (HGC)*	12.94	12.04	13.12
Children	1.03	1.15	1.00
AFQT*	43.63	27.72	46.93
Never Married	0.32	0.53	0.28
Married	0.52	0.23	0.58
DWS*	0.16	0.24	0.14
Urban	0.79	0.78	0.79
Northeast	0.17	0.16	0.18
Northcentral	0.24	0.27	0.24
South	0.39	0.37	0.39
West	0.20	0.20	0.19
Sample Size	59,559	10,221	49,338

*AFQT = the score achieved on the Armed Forces Qualification Test, this composed of reading and mathematics achievement tests. HGC = Highest grade completed. DWS = Divorced, widowed, or separated.

In reviewing the samples means in Table 1, it is important to remember that the NLSY over-samples Blacks, Hispanics, and low-income households. The outcome is that the sample proportions of these households are high relative to the U.S. population. This further affects several of the other sample means for variables that are correlated with race and income (e.g. education).

Comparing low-earnings households with those of higher earnings yields the expected differences in means. Average earnings are 260 percent greater in the higher earnings category than in the lowest earnings quartile.⁵ The percent owning is 2.7 times greater among households in the higher earnings

⁵ Earnings are top-coded in the NLSY. Top-coding occurs when the earnings of very high earnings households are not reported; rather, a truncated value or average of top-coded observations is reported.

category. The duration of time spent owning is smaller for low-income households; these durations being small because the spells are censored (that is, they are not complete when the survey ends in 2000). Low-earnings households are more likely to be Black, never married, and divorced/widowed/separated (DWS). Their highest grade completed (HGC) is one year less and there is a substantial difference in the AFQT (Armed Forces Qualification Test) scores between low- and higher-income households. This test measures ability and achievement in mathematics and reading and is scaled from 1 to 99.

Table 2 presents the first and simplest of our OLS regressions in which the dependent variable is the log level of total household earnings. Note that these regressions control only for housing tenure status (Homeowner) and the duration of a household's spell as either an owner-occupier (Duration-own) or renter (Duration-rent). Subsequent regressions will add controls for additional household attributes and other variables. Also, in all of the regressions to follow, housing tenure spells are measured as the total time spent in a particular type of tenure (owning or renting). In this regard, spells are not necessarily the time spent in a given dwelling unit. For example, a household that moves multiple times but always rents (or always owns) is defined as participating in a single spell.

In the first column of results, the sample includes respondents of all income levels. As expected, the coefficient of the indicator variable for homeownership is positive, large, and significant, with the obvious implication that those households that become homeowners have greater earnings at the beginning of a tenure spell than households who rent. We find that the coefficient of the measure of the duration of owning (Dur-own) is substantially greater than that of the duration of renting (Dur-rent). The point estimates suggest that owners' real earnings grow at the rate of 5.4 percent during each year of their spell of ownership, while renter's real earnings are basically flat.

Columns 2 and 3 separate households into low earners and others. The coefficients on Homeowner are positive and significant and that for low-earnings households is particularly large. The implication is that homeowners in the low-earner category have, on average, much greater earnings compared with renters in this category. We find that homeowners' earnings rise faster than do the earnings of renters for both groups, but the difference is much larger among low-earnings households. For low earners, the difference between owners and renters is 6.2 percentage points ($0.129 - 0.067$), compared with 1.0 percentage point for moderate and high earners ($0.036 - 0.026$). The annual rate of increase for low-earnings homeowners is particularly large, consistent with the interpretation that these households purchase their home in anticipation of sharp increases in their annual earnings. More generally, these results suggest that the earnings profiles of low-income homeowners differ substantially from that of other households.

This issue is not of substantial concern in this study because of our focus on low-income households. Also, top-coding is relatively rare in the NLSY; for example less than 3 percent of respondents' earnings and 2 percent of spouses' earnings are top-coded. The frequency of top coding increases somewhat over time because the cutoff value was stated in nominal terms and it did not increase while respondents' nominal (and real) income increased over time.

Table 2
OLS Regressions of Earnings with Linear Duration Effects
Dependent Variable: Log of Household Earnings
(Dollar values are in year-2000; t-statistics are in parentheses)

Variable	All Households	Low Earnings Quartile	Moderate and High Earnings Quartiles
Constant	8.408 (309.6)	5.218 (63.2)	9.300 (424.1)
Homeowner	1.722 (41.8)	2.689 (14.6)	1.058 (33.6)
Duration-own	0.054 (9.0)	0.129 (3.4)	0.036 (8.2)
Duration-rent	0.006 (1.2)	0.067 (4.6)	0.026 (6.3)
Adjusted R ²	0.10	0.06	0.07
Sample Size	59,559	10,221	49,338

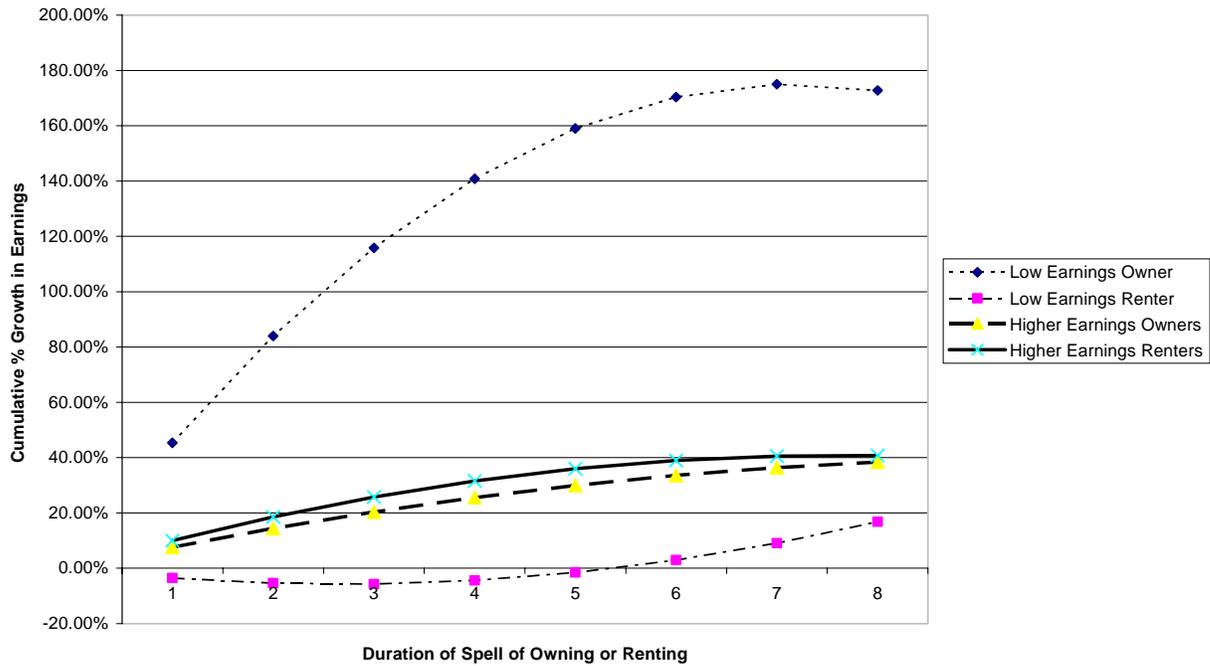
We next tested whether there was evidence of nonlinearities in the impact of tenure spell lengths on earnings by adding quadratic terms for the tenure-spell variables to the regressions. As reported in Table 3, the quadratic terms are significant and in some cases sizable, indicating substantial nonlinearities in the growth of earnings as duration rises. These findings are also displayed in Figure 1 where the growth in earnings as a function of tenure spell length is graphed for housing tenure spells up to eight years in length.⁶ In Table 3 the coefficient on Homeowner remains positive in all cases, but it is substantially smaller for the low-earnings group relative to the values reported in Table 2. Among mid- and upper-income families, the Duration coefficients are similar for owners and renters. This indicates that for higher income families, real earnings grow at a similar rate. This is also evident in Figure 1. Among low-income families, renters real earnings grow not at all or very slowly as the tenure spell lengthens. But in marked contrast, the coefficient on Duration-own is now much larger than in Table 2, and the combined coefficients on Duration-own and its' square imply a very high rate of earnings growth that is dampened by the sixth year as shown in Figure 1. These results suggest that, at least for our NLSY sample, the ability of new low-income homeowners to meet their mortgage payments subsequent to home purchase improves considerably with the duration of their owner-occupancy. This would be especially true for those families that took out standard fixed rate mortgage contracts since their nominal mortgage payments would remain constant over time. In conjunction with rising incomes, a fixed rate mortgage would result in a declining budget share for mortgage payments.

⁶ The sample contains spells up to 17 years, but the rate of occurrence of spells beyond 8 years is small and thus the estimation results are less reliable.

Table 3
OLS Regressions of Earnings with Nonlinear Duration Effects
Dependent Variable: Log of Household Earnings
(Dollar values are in year-2000; t-statistics are in parentheses)

Variable	All Households	Low Earnings Quartile	Moderate and High Earnings Quartiles
Constant	8.368 (201.3)	5.454 (42.9)	9.137 (272.97)
Homeowner	1.604 (25.6)	1.860 (6.8)	1.137 (23.7)
Dur-own	0.138 (7.1)	0.488 (4.2)	0.080 (5.6)
Dur-own-sq	-0.007 ((4.5)	-0.034 (3.3)	-0.004 (3.3)
Dur-rent	0.026 (1.6)	-0.043 (0.9)	0.107 (8.1)
Dur-rent-sq	-0.002 (1.3)	0.008 (2.4)	-0.007 (6.5)
Adjusted R ²	0.10	0.06	0.07
Sample Size	59,559	10,221	49,338

Figure 1: Growth in Household Earnings



B. Earnings Growth Rates Controlling for Household Attributes

We next investigate whether the observed differences in earnings growth rates for renters and owners are sensitive to controls for other characteristics of the respondents. For example, Murphy and Welch (1990) found that earnings profiles rise with age, but decline slightly as the individual approaches retirement. The usual econometric approach is to estimate a log earnings equation as a function of age and age squared. A vast literature also has examined the returns to schooling (Mincer 1974; Card 1999). Human capital theory predicts additional schooling results in greater wages. Our measure of schooling is the highest grade completed (HGC) by the respondent. We also include a measure of cognitive ability by including the AFQT test results reported in the NLSY for each individual.

D'Amico and Maxwell (1994) find that the wage-job experience profile is less steep for Blacks than whites. Light and Ureta (1995) show that the returns to schooling for minorities and women differ from that of whites and men. Loprest (1992) uses NLSY data and shows that wage growth is greater for men than women. Loprest also includes marital status as a control variable. We control for these variables as well.

Urban economic theory predicts that wages differ between urban and rural areas (Beeson and Eberts 1989). Also, there are spatial differences in nominal wage rates that can be controlled by including regional dummy variables (Hoehn, Berger, and Blomquist 1987; Roback 1988). Accordingly, we include an indicator of whether the respondent resides in an urban area and three regional dummy variables (omitting the West).⁷

Allowing for these and other effects, earnings can be expressed as:

$$(1) \quad \ln E_{it} = Z_{it}\beta_z + \alpha_i + \varepsilon_{it}$$

where Z_{it} is a vector of personal attributes for individual i in year t . The α_i term captures unobservable characteristics of individuals such as unmeasured innate ability and motivation. Researchers note that it is likely that education and other covariates (e.g. race) may be correlated with α_i , a problem that is sometimes referred to as “ability bias” (Blackburn and Newmark 1993). To address this problem, we draw on the panel nature of the NLSY by including person-specific fixed effects in the model. This approach controls for unobserved time-invariant attributes of the individuals, and in so doing, reduces the potential for omitted variable bias. However, it should also be noted that as a consequence of the fixed effect specification, time invariant variables such as Black, Hispanic, Male, and AFQT (a measure of cognitive ability) cannot be identified because their influence is captured by the person-specific components (α_i).

The fixed effect model can be formally tested against the simple OLS model using a specification test that evaluates the joint significance of the fixed effects. Results of this test indicate that the fixed effect model is clearly preferred to the OLS model. A related specification test also strongly favors the fixed effect model over a random effects specification in which the person-specific attributes are

⁷ Earnings are also affected by hours worked and wages. But these variables are endogenous and are not included in our estimation. This imparts a reduced form interpretation to our regressions, but one that is sufficient to still address the relationship between housing tenure spells and earnings.

treated as random error components.⁸ Thus, we report only the results for the fixed effects model in Table 4.

Table 4
Fixed Effects Regressions of Earnings with Nonlinear Duration Effects
Dependent Variable: Log of Household Earnings
(Dollar values are in year-2000; t-statistics are in parentheses)

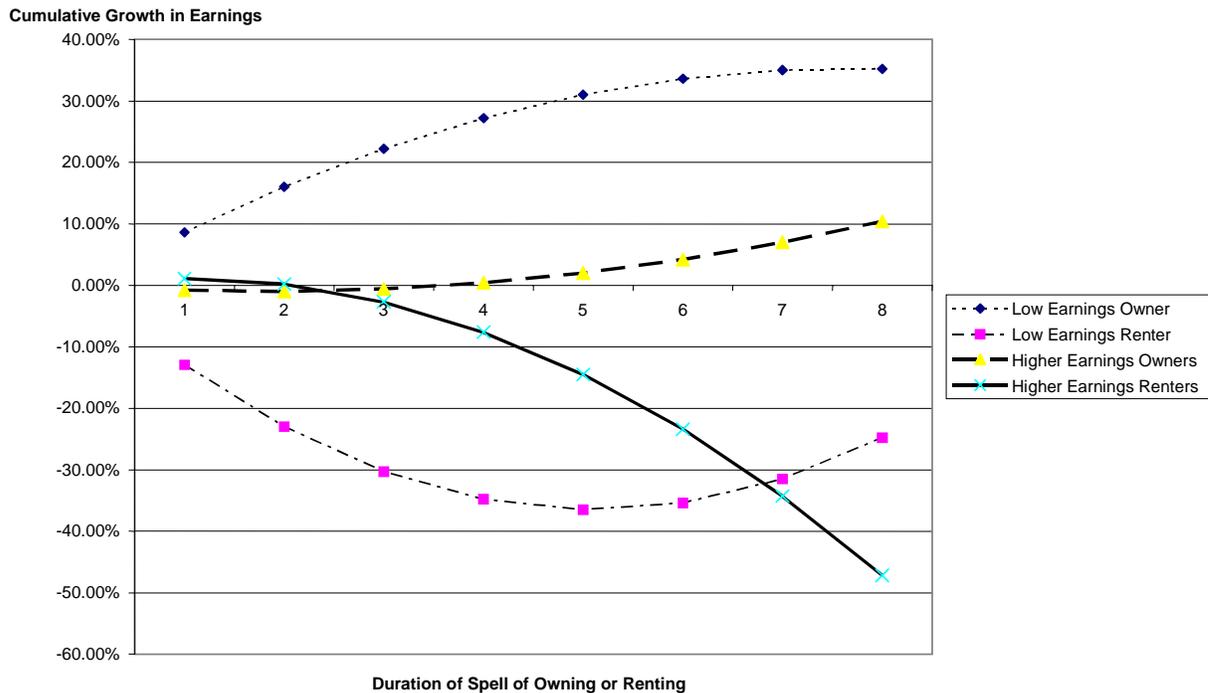
Variable	All Households	Low Earnings Quartile	Moderate and High Earnings Quartiles
Homeowner	0.162 (3.3)	0.061 (0.3)	0.245 (5.6)
Dur-own	-0.006 (0.4)	0.092 (1.0)	-0.011 (0.8)
Dur-own-sq	0.002 (1.3)	-0.006 (0.7)	0.003 (2.8)
Dur-rent	-0.033 (2.5)	-0.143 (3.5)	0.021 (1.7)
Dur-rent-sq	0.005 (4.7)	0.014 (4.9)	-0.010 (1.0)
HGC	-0.661 (6.1)	-0.683 (2.2)	-0.826 (7.5)
HGC-sq	0.028 (7.4)	0.033 (2.9)	0.032 (8.7)
Age	0.223 (5.8)	-0.035 (0.2)	0.330 (9.4)
Age-sq	-0.003 (5.2)	0.002 (0.9)	-0.006 (9.3)
Black*HGC	-0.203 (0.8)	-1.169 (1.8)	0.032 (0.1)
Black*HGC-sq	0.010 (1.1)	0.047 (1.9)	-0.001 (0.1)
Children	-0.160 (9.9)	-0.384 (6.6)	-0.094 (6.3)
Never married	-1.223 (28.8)	-2.375 (14.3)	-1.049 (27.4)
DWS	-1.668 (42.3)	-3.337 (21.6)	-1.332 (37.5)
Urban	0.229 (4.7)	0.733 (3.9)	0.124 (2.8)
Northeast	-0.238 (2.2)	0.125 (0.3)	-0.287 (2.9)
Northcentral	-0.272 (2.9)	-0.462 (1.3)	-0.248 (2.9)
South	-0.150 (1.7)	0.024 (0.1)	-0.219 (2.8)
Sample size	59,559	10,221	49,338
# of Individuals	7,145	1,220	5,927
Adjusted R ²	0.57	0.52	0.39

The results for the full sample, which consists of 7,145 individuals and 59,559 observations show that homeowners have 16 percent greater earnings than renters. Although statistically significant, this estimate is notably lower than the values in Tables 2 and 3.

⁸ The Likelihood Ratio test statistic for the comparison of the fixed effects model with the simple OLS model is Chi-squared with value of 40,831 and 7,144 degrees of freedom. The simple model is strongly rejected with $p = 0.000$. A Hausman test is used to compare the fixed effect with the random effect models with H_0 being the random effects specification and H_1 the fixed effects model. The value of the test statistic is 744.9 with 18 degrees of freedom, where high values favor the fixed effect model. The p value is 0.000. Thus, the results suggest strong support for the fixed effect model.

Figure 2 plots the growth in earnings attributable to an increase in the housing tenure duration as implied by the Duration coefficients in Table 4. These plots are provided for both renters and owners, and also low- and higher-income families. Observe that for both income groups, but especially for low-income families, as the housing tenure spell continues, earnings grow more rapidly for owners than for renters. Note further that this difference between owners and renters is significant even though the Duration-own coefficients themselves are not significantly different from zero. This is because the Duration-rent coefficients imply a significant decline in real earnings as a rental tenure spell advances. One possible explanation for the large difference in growth paths is that low-earning families that anticipate future income growth select into homeownership, while those that foresee no growth or falling real income choose to remain renters. An alternative explanation is that low-earnings households that choose to become owners increase their labor supply post-purchase, resulting in greater earnings. Our analysis does not separate out these differences in causality. High earning renters also show a loss of real earnings the longer the duration of the rental spell, while higher-income owners experience a modest increase in earnings as their duration of owning increases.

Figure 2: Growth in Household Earnings, Fixed Effects Model



In the full sample model in Table 4, the control variables have the expected coefficients based on human capital theory. Education levels greater than 12 years increases earnings. Black respondents benefit from additional education more so than whites.⁹ A similar effect is found for additional age (a proxy for job experience). Additional children depress household earnings, likely because of an associated reduction in labor supply. Singles of all types (never married, widowed, divorced,

⁹ Tests for interactions of Black with age and interactions of Hispanic and Asian with HGC and age showed no impact.

separated) earn less than married couples. Respondents living in urban areas earn more and there is an earnings premium in the West (the omitted category).

The conclusion drawn from this analysis is that the typical low-income household in the NLSY has enjoyed rising real earnings during its spell of ownership as shown by the regression results in Table 2. Thus, the mortgage payment-to-income ratio for these families has likely fallen, helping these households to sustain their spells of ownership. Some of this growth in earnings results from changes in the household's characteristics such as aging (a proxy for greater job experience), attending and completing college, and getting married. Some of the growth in earnings is associated more closely with being a homeowner, either because of a direct causal effect of homeownership on work effort and earnings, or because households that anticipate higher future earnings become homeowners. However, our finding that real earnings grow for the typical low-earning homeowner does not imply that all low-income homeowners will enjoy greater earnings. Some spells of ownership end and we next analyze the causes of termination.

III. The Sensitivity of Low-income Homeowners' Tenure Choice to Socio-Economic Shocks

The analysis in section II of this report indicates that the real earnings of low-income families tend to rise relative to low-income renters following a home purchase. Although this increase in earnings bodes well for the typical respondent, there are of course variations in earnings paths around this mean. This section reports on the propensity of homeowners to remain owner-occupiers in the face of changes in their economic and socio-demographic characteristics.

A. Simple Descriptive Statistics

We first present some basic statistics describing some of the correlates of homeownership terminations by low-income homeowners. Among those respondents identified as having low earnings (using the definition in section II), almost all began the survey period as renters. About half of low-earnings households changed tenure status sometime during the NLSY survey period.

The first observation is that, among low-income households, earnings fell during the year-to-year period when ownership ceased. Thus, the representative low-income homeownership respondent in year t reported lower earnings in year $t+1$ if a transition to renting occurred during that period. For the 298 cases of low-income terminations in our sample, the average decrease in earnings in the year of a termination was \$13,629, or about 37 percent of average low-income earnings. This decrease also contrasts with the general upward trend of earnings (\$887 annually) among all households. Because we expect low-income respondents to have stretched their income when committing to a mortgage payment, this relationship of decreasing income and loss of ownership is not surprising.

Changing family income can be the result of various factors such as decreased hours worked (unemployment or selecting to be out of the labor force), decreased wages, or a change in the number of earners. In our sample, we find that low-income respondent's annual weeks worked decreased in

the year of termination of ownership (-4.5), this change contrasting with no change for the sample as a whole. Another potential cause of lost household earnings is the termination of a marriage. Of those low-income respondents terminating homeownership, twice as many ended a marriage as became married during the year of termination of ownership. For the entire sample just the opposite occurred, twice as many married than ended a marriage. Thus, we expect both the end of a marriage and the associated loss of household income contributed to the termination of some spells of homeownership.

Other interesting changes occurred to low-income households in the year of termination of a spell of ownership. Household wealth fell, on average, by \$15,440 compared with a typical annual gain of \$2,077 for all homeowners. During the year of termination, real mortgage rates rose on average by 0.48 percentage points, while during the overall sample horizon, the average change in mortgage rates was -0.08 percentage points per year. Economic conditions tended to be poor during the years when low income households terminated their ownership spells as state unemployment rates rose by 0.47 percentage points. In contrast, for the full sample horizon, the typical annual change in the state unemployment rate was a decline of 0.05 percentage points.

B. A Model of Terminations of the First Homeownership Spell

We next turn to a more formal analysis of the cause of terminations of first spells of homeownership. Our emphasis is on measuring the impact of changes in household earnings and wealth. The effects of changes in other economic variables also are measured, including changes in state unemployment rates, mortgage rates, and house values. We include a set of socio-demographic control variables including race/ethnicity, marital status, health, and family size. Measures of cognitive ability (the AFQT score) and educational achievement also are included.

We continue to use the NLSY data. Wealth data are first reported in 1985 and respondents are followed until 2000. The first ownership spell must begin within the sample period and it either terminates or is censored when our survey data ends in 2000 or the respondent drops out of the sample. Changing from one owned home to another does not terminate a spell of ownership.¹⁰ Earnings, wealth, and house value are deflated for inflation, with 2000 used as the base year.

In the data, we observe each year whether a household continues its spell of ownership or terminates it. Thus, the dependent variable for a household is a series of observations of 1's (spell continues) and, if the spell terminates, then a 0. If it does not terminate, the spell is considered censored, this addressed in the estimation technique. The estimation method uses the Cox proportional hazard model with time varying covariates. This model allows the baseline hazard rate to vary over time in ways that best reflect the data; that is, it is not constrained to follow any particular shape.¹¹

¹⁰ To identify intra-spell durations of stay in a particular home, we used additional geographic data available from the Center for Human Resource Research at Ohio State University.

¹¹ This flexibility stands in contrast to the more restrictive parametric duration analysis models where the form of the hazard rate must be specified.

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. Explanatory variables (covariates) shift the hazard rate proportionally; for example, marriage might shift the hazard rate of a termination downwards by 10 percent throughout the spell. We express the impact of the covariates as hazard ratios. If the ratio is 1.0, then the covariate has no effect on the hazard rate. If the ratio is greater than 1.0, then a one unit change in the covariate “causes” the hazard rate to rise by the amount that the ratio’s value exceeds unity. Symmetrically, if the ratio is less than one, the covariate causes the hazard rate to fall. Standard significance tests can be calculated for the hazard ratios. The interpretation of a hazard ratio is particularly easy for a dummy variable because its value changes from 0 to 1. For example, if the hazard ratio for Black is 1.20, then Black respondents have a 20 percent greater hazard rate throughout the spell and thus are more likely to have a relatively short duration of stay in ownership.

Our measures of the economic variables include both the amount at the time of home purchase and the change in amount through the survey date. Specifically, for variable x we include both x_0 and $x_t - x_0$, where t is the current survey year and the start of the spell of ownership is period 0. In effect, we are including x_t , but separating it into a component that reflects the continuing influence of the value of the variable at the beginning of the spell and a component that reflects the influence of *changes* in the variable. One example is household earnings where the initial value (Earnings₀) is important because it indicates the level of resources upon which the household can draw throughout the period (e.g. for mortgage payments and special needs such as home maintenance and health costs). Also, we expect post-purchase changes in earnings to be important because a household commits to a mortgage payment based on its earnings at the beginning of the spell. Increased earnings should create a cushion, reflecting the greater affordability of the mortgage. Decreased earnings could lead to problems making mortgage payments and a greater likelihood of terminating the spell of ownership. We test for asymmetric responses to increases and decreases in the covariates by including separate measures for rising and falling values of x : increases in x are measured by (Up- x) and decreases in x are measured by (Down- x). Specifically,

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

We use the absolute value to Down- x to simplify the interpretation in the estimation. For example, we expect the hazard ratio to be less than 1 for Earnings₀ because greater earnings at the time of home purchase should cause the hazard rate of termination to be smaller throughout the spell of ownership. We expect the hazard ratio of Up-earnings to be less than 1 because it provides an additional cushion against unforeseen expenses. Finally, we expect the hazard ratio for Down-earnings to be greater than 1 because a greater decrease in earnings (i.e. increase in the absolute value of Down-earnings) should increase the hazard rate of terminating ownership.

Other economic variables include the amount and changes in non-housing real wealth and the state unemployment rate. Additional wealth at the time of home purchase should provide a fund against which households can draw in times of need, allowing them to maintain their spell of homeownership. Increases in wealth post-purchase also should add to this cushion and thus reduce the hazard rate, while falling wealth signals that household expenditures exceed income, suggesting a greater likelihood of not being able to continue making mortgage payments. The state unemployment

rate and changes in the rate reflect local macroeconomic conditions. Changes in rates may affect a household's behavior through effects on household expectations about the growth of future earnings and future house price appreciation. We expect the hazard ratios for U_{rate0} to be less than 1, for U_{rate} to be greater than 1, and for $Down-U_{rate}$ to be less than 1.

The NLSY data set does not report the type of mortgage held by homeowners, nor do we know whether the loan has a fixed or adjustable interest rate. Presumably, some of these young and relatively mobile households selected adjustable rate mortgages. Thus, rising national interest rates (we use the rate for 30 year fixed-rate mortgages) results in increased monthly mortgage payments for those with ARMs, 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 location.¹² Falling mortgage interest rates are associated with lower monthly payments if a household has an ARM, this reducing the likelihood of a termination.

Our final economic variable measures the amount of price appreciation of the respondent's house. Appreciation creates wealth, which may be drawn upon for extraordinary expenses, helping to extend spells of ownership. 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. We test for the separate effects of positive and negative house price changes (measured by the respondent's estimate of value) on the hazard rate of terminating homeownership.

Demographic variables in the estimation include indicators of race and ethnicity (Black, Hispanic, Asian), male, family size, age, respondent's highest grade completed (HGC), AFQT score (measuring cognitive ability and achievement), and current marital status (Married). We also include indicators of changes in marital status including *Getmarried*, *GetDWS* (become divorced/widowed/separated), and changes in health (*Getsick*), all taking the value of 1 only in the year of the event and thus testing for a short term response.

Full Sample Results

In the full sample, there are 3,479 respondents who purchased a house during the sample period.¹³ Variable means, standard deviations, and estimation results are presented in Table 5. In the fourth column, we estimate a very simple form of the Cox regression with the only covariates being three indicators of race and ethnicity. Each of their hazards ratios is roughly 1.4, indicating that compared with whites, these minority groups have about a 40 percent greater hazard rate of terminating a spell of first homeownership. These substantial racial differences could be the result of the many economic and demographic differences among these groups.

¹² Increased mortgage interest rates also tend to lock homeowners into their current residence as they try to avoid moving and purchasing a house with the new higher interest rate. However, we focus on the duration in a spell of ownership, where a single spell may comprise multiple homes. Thus, the lock-in hypothesis is not applicable to our study.

¹³ Households that purchased a home prior to 1985 are excluded from our analysis.

The second set of estimation results controls for a large number of economic and socio-demographic characteristics of respondents' households. The hazard ratios for Hispanic and Asian are no longer significant after including the set of control variables, but both remain greater than 1.0. The hazard ratio of Black remains statistically significant and is still large, 30 percent above the rate for white respondents. Thus, even with this large set of control variables, we find that Black homeowners are still at greater risk for terminating a spell of first-time ownership. 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 listed in Table 5.

Haurin et al. (2003) 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 in a manner that we do not identify in this study. For example, discrimination may increase the cost of securing a mortgage, either because of less attractive characteristics of the loan contract, or greater search costs. This would leave marginal Black homeowners more exposed to the influence of negative shocks. An alternative explanation is that policies designed to encourage homeownership among disadvantaged households could draw more marginal households in the pool of homeowners. Under this scenario, if the distribution of unobserved negative shocks is the same for white and minority households, the difference in applicant pools would not be captured by the included control variables. This would result in higher estimated termination rates among minorities. A third possibility is that responses to negative shocks differ among racial and ethnic groups. White households may have more resources to call upon, 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 ownership experiences. A fourth possibility for the higher estimated Black termination rate is that of racial segregation in the housing market. Black families, for example, are well known to be disproportionately located in inner city urban neighborhoods in which much of the housing stock is old. Housing in these neighborhoods may be more subject to unexpectedly high maintenance costs, reducing the ability of families to sustain homeownership.

Table 5
Termination of First Homeownership Spell: Full Sample
Proportional Hazards Estimation
(Dollar values are in year-2000; Robust t-statistics are in parentheses)

Covariates	Mean	Standard Deviation	Hazard Ratio	P> z 	Hazard Ratio	P> z
Black	0.15	0.36	1.462	0.000	1.303	0.000
Hispanic	0.14	0.35	1.380	0.000	1.022	0.763
Asian	0.01	0.10	1.389	0.147	1.182	0.437
Male	0.51	0.50	-	-	1.047	0.354
AFQT	51.73	28.11	-	-	0.995	0.000
Age0	27.57	3.79	-	-	0.936	0.000
Family size	3.17	1.36	-	-	1.108	0.000
HGC	13.81	2.41	-	-	0.968	0.025
Married	0.82	0.39	-	-	0.526	0.000
Getmarried	0.02	0.14	-	-	1.285	0.157
GetDWS	0.01	0.12	-	-	1.398	0.028
Getsick	0.01	0.12	-	-	1.222	0.294
Earnings0 (\$0000)	4.82	3.08	-	-	0.931	0.000
Up-earnings (\$0000)	1.29	2.64	-	-	0.991	0.633
Down-earnings (\$0000)	0.37	1.29	-	-	1.110	0.000
Wealth0 (\$0000)	3.98	8.98	-	-	0.996	0.362
Up-wealth (\$0000)	3.34	10.28	-	-	0.993	0.202
Down-wealth (\$0000)	1.21	5.94	-	-	1.007	0.249
Mrate0	6.32	1.41	-	-	1.164	0.000
Up-mrate	0.09	0.25	-	-	1.296	0.029
Down-mrate	1.01	1.20	-	-	0.847	0.000
Urate0	6.19	1.65	-	-	1.116	0.000
Up-Urate	0.39	0.89	-	-	1.175	0.000
Down-Urate	0.81	1.14	-	-	0.824	0.000
Up-housevalue (\$0000)	2.22	6.62	-	-	0.986	0.128
Down-housevalue (\$0000)	1.07	4.03	-	-	1.013	0.070
Respondents	3,479					
Observations	16,550					

Observable economic factors also play an important role in explaining why spells of first time homeownership end. Greater household earnings at the time of purchase significantly lower the hazard ratio (6.9 percent per \$10,000 of annual earnings). If a household's real earnings are lower than they were in the year of purchase (Down-earnings), then the likelihood of ownership terminating

is greater by 11 percent per \$10,000 change.¹⁴ In contrast, increased real earnings (Up-earnings) have no effect on the hazard rate. Given that a household qualified for the mortgage with its earnings at the time of purchase, it is not particularly surprising that increased earnings have no additional effect.

We included three variables capturing the level and changes in non-housing wealth. The amount of wealth at the time of home purchase is not statistically significant. Upward and downward changes in wealth have the expected hazard ratios relative to the benchmark level of 1.0, but neither is statistically significant. Thus, there is only a suggestion that wealth acts as a buffer.

The initial level of the mortgage rate and changes in the rate over time significantly influence termination rates.¹⁵ The estimation indicates that an increase in the initial mortgage interest rate by one percentage point raises the hazard rate by 16 percent. If the rate increases after home purchase, the effect is much larger: a 30 percent increase in the hazard rate per percentage point increase in the mortgage rate.¹⁶ Symmetrically, falling mortgage interest rates reduce the likelihood of termination of the ownership spell by 15 percent per one percentage point decline in the rate. These results strongly suggest that households' likelihoods of continuing a spell of homeownership are quite sensitive to changes in mortgage interest rates.

Termination rates also are quite sensitive to changes in the economic environment of the respondent's home state. A one-percentage point greater unemployment rate at the time of home purchase raises the hazard rate by 12 percent. An increase in the rate by a percentage point following the purchase year raises the hazard rate by another 18 percent, while a reduction in the unemployment rate by a point reduces the hazard rate by 18 percent. Thus, spells of ownership are highly sensitive to changes in the local macroeconomic environment, even after controlling for household earnings. A theoretical explanation for this finding is that a greater unemployment rate signals lower job security. Greater job security is a factor in raising the demand for homeownership; thus, the loss of this security could reduce the demand for ownership and increase the likelihood of a termination.¹⁷

The final economic variable is a measure of the change in the respondent's house value.¹⁸ House price appreciation should help to cushion negative income shocks while falling house prices may

¹⁴ We tried a variety of alternative measures, decomposing earnings into hours worked and wages, and separating men's from women's earnings. The most consistent estimation results occurred when only total family earnings were included.

¹⁵ Recall that the change in the mortgage rate equals the difference between the then current rate and the rate in the year of home purchase.

¹⁶ It should be noted that the rates moved downward more often and farther than they moved upwards during the sample period, perhaps conveying more confidence to the coefficient of Down-mrate.

¹⁷ 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.

¹⁸ We also tried some measures of the extent that a household was financially extended at the time of house purchase. Neither the ratio of the initial house value to income nor the mortgage debt to income ratio was near statistical significance.

signal that housing is a poor investment choice in that locality. We find that the hazard ratio of the price appreciation variable is less than one as expected (0.986), but the significance level is only 0.13. Falling house prices raise the termination probability by 1.3 percent per \$10,000 of price change ($p = 0.07$).¹⁹

Among the socio-demographic variables, greater education and ability (AFQT score) reduce the hazard of terminating a spell of homeownership. One year of additional education reduces the rate by 3.2 percent and 10 points of additional AFQT score (about one-third of the standard deviation) reduces it by 5.3 percent. Additional age at the time of home purchase has a substantial effect on reducing the hazard rate by 6.4 percent per year. Greater family size increases the likelihood of termination; each additional family member raises the hazard by 10.8 percent and thus shortens the expected duration of the spell of ownership.

Respondents who are married have a hazard rate 47 percent below singles, a very large effect (recall that changes in earnings are separately controlled). However, those whose marriage ends during the spell are more likely to terminate ownership in the year of marital breakup as their hazard ratio is 40 percent higher than for respondents in stable marriages. Thus, for the respondents with a marital breakup, the termination of being married (Married changes from 1 to 0) and the one-year effect of GetDWS implies an extremely high combined hazard rate of ending a spell of ownership in the year of divorce, widowhood, or separation. Marriage subsequent to the purchase of a home causes two variables to change their values: Married changes from 0 to 1 (lowering the hazard rate) and Getmarried equals 1 only in the year of marriage (raising the hazard rate). Combining the effects, we find that in the year of marriage, a homeownership respondent has a hazard rate somewhat lower than that of a single owner, but thereafter, a much lower hazard rate (Married remains equal to 1 and Getmarried equals 0). One explanation of why marriage is disruptive in its first year is that it can lead to geographic relocation by at least one of the partners and possibly to a short term spell of renting.

Low-income Sample Results

The above analysis is repeated for the low-earnings sample of respondents with results reported in Table 6. We again find the high hazard rate for Blacks in the estimation that contains all of the control variables. The significance levels generally are lower in the low-earnings sample, likely due to the smaller sample size. Among the economic variables, the ones that are statistically significant and raise the hazard rate are a high initial state unemployment rate, an increasing state unemployment rate, and low household earnings at the time of home purchase. Effects consistent with expectations but not statistically significant are found for changes in family earnings, the initial level of mortgage rates, and changes in mortgage rates. Changes in wealth and house value have no effect on terminations among low-income households. In contrast, the point estimates suggest that negative events such as falling earnings, bad health, and rising mortgage rates are likely to increase the risk of terminations; that is, the sensitivity of low earners is to selected negative events.

¹⁹ We note there are a few articles that find evidence for nominal loss aversion behavior (Engelhardt 2003). This occurs when a homeowner will not sell a house whose price has fallen, and thus the spell of ownership would continue. However, our measure is of real house price change, thus our findings of a greater termination rate when real house prices fall do not contradict Engelhardt's findings because real prices may be falling while nominal prices are not.

The baseline hazard rate for low-earnings households is shown in Figure 3. This is the underlying hazard rate that is shifted proportionally by the covariates. It is greatest in the early years of a spell, peaking around 2.5 years into the spell at around seven percent, and then falling monotonically. Thus, survival as a homeowner during the initial years of first-time ownership leads to subsequent periods of time when the probability of a termination is much lower. The baseline hazard for higher earnings households is similar in shape, with a slightly sharper peak around three years, but it is everywhere lower.

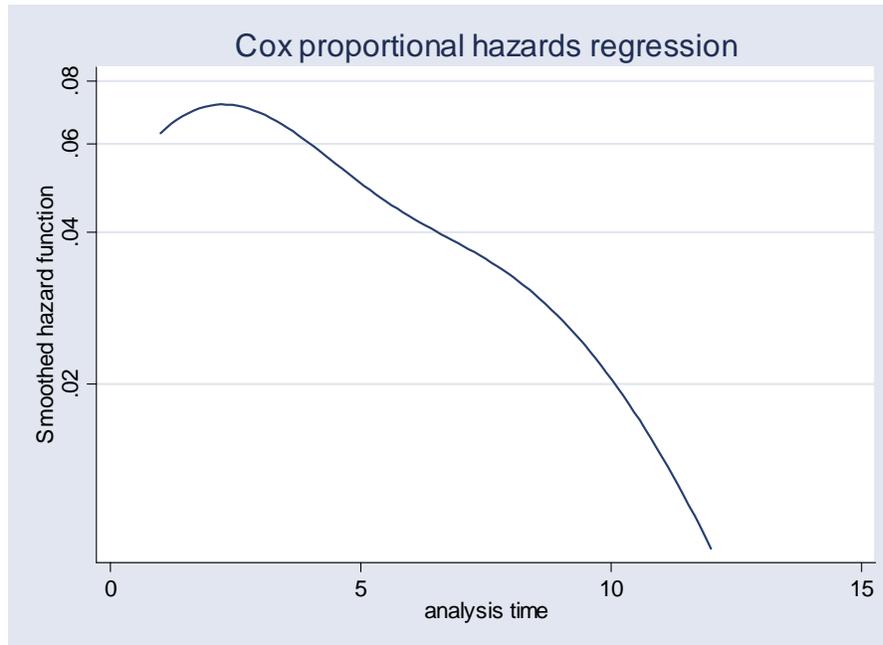
Table 6 contains two other sets of results, based on alternative definitions of low-income households. The first alternative is to limit the sample to youths with 12 or fewer years of education. This definition clearly includes both low and many middle income households, thus it is more expansive than the bottom quartile of earners. The second alternative is to limit the sample to youths with the lowest quartile of AFQT scores. This measure approximates a permanent income variable. The sample size is slightly more expansive than the low earnings definition of low income.

In both of these new cases, the results tend to be very similar to those in Table 5 for the full sample. Focusing on the low AFQT sample, economic variables tending to extend spells of ownership include: high earnings and low mortgage and unemployment rates at the time of purchase, falling mortgage and unemployment rates, and rising house values ($p = 0.08$). Falling earnings and rising unemployment rates lead to early terminations. Among the demographic variables, spells of ownership are longer for individuals with a higher AFQT score, greater age, smaller families, more education ($p = 0.10$) and who are married. Terminations are more likely for respondents who are Black, Hispanic ($p = 0.10$), and who get divorced, widowed, or are separated. The results for low education respondents are very similar, with there being more support for the hypothesis that rising mortgage rates end ownership spells early. Among the socio-demographic variables, marriage again has a very important influence on the hazard rate. Additional education and age at the time of home purchase reduce the hazard of termination. Higher AFQT scores have the same effect, but $p=0.13$ for low-earnings households.

Table 6
Termination of First Homeownership Spell: Low-earnings Sample
Proportional Hazards Estimation
(Dollar values are in year-2000; Robust t-statistics are in parentheses)

Covariates	Low Earnings		Low Education		Low AFQT	
	Hazard Ratio	P> z	Hazard Ratio	P> z	Hazard Ratio	P> z
Black	1.368	0.019	1.286	0.003	1.280	0.009
Hispanic	0.963	0.801	0.992	0.924	1.164	0.104
Asian	1.193	0.542	1.145	0.594	0.899	0.733
Male	1.026	0.811	1.064	0.315	1.019	0.761
AFQT	0.995	0.131	0.994	0.001	0.995	0.009
Age0	0.909	0.000	0.936	0.000	0.942	0.000
Family size	1.051	0.086	1.092	0.000	1.104	0.000
HGC	0.945	0.058	0.961	0.078	0.970	0.095
Married	0.657	0.001	0.546	0.000	0.540	0.000
Getmarried	0.904	0.843	1.187	0.459	1.336	0.184
GetDWS	1.266	0.492	1.404	0.049	1.544	0.019
Getsick	1.465	0.239	1.211	0.354	1.047	0.859
Earnings0	0.877	0.003	0.897	0.000	0.934	0.000
Up-earnings	0.966	0.372	0.950	0.177	0.993	0.710
Down-earnings	1.087	0.203	1.136	0.000	1.094	0.001
Wealth0	0.994	0.395	1.000	0.966	0.994	0.269
Up-wealth	1.005	0.631	0.986	0.206	0.994	0.309
Down-wealth	1.001	0.952	1.004	0.706	1.009	0.161
Mrate0	1.075	0.184	1.130	0.000	1.166	0.000
Up-mrate	1.394	0.104	1.537	0.002	1.153	0.358
Down-mrate	0.891	0.276	0.888	0.023	0.861	0.002
Urate0	1.122	0.001	1.117	0.000	1.119	0.000
Up-Urate	1.333	0.001	1.146	0.003	1.219	0.000
Down-Urate	0.982	0.833	0.820	0.000	0.828	0.000
Up-housevalue	0.998	0.935	0.978	0.178	0.982	0.079
Down-housevalue	0.996	0.804	1.028	0.014	1.011	0.186
Respondents	691		1,925		968	
Observations	2,276		8,358		3,502	

Figure 3: Baseline Hazard Rate for Low-earnings Households



IV. Conclusions and Policy Implications

The first part of the analysis found that family earnings among the lowest income quartile of relatively young homeowners tend to rise rapidly following the purchase of their first homes. Moreover, even after controlling for a variety of household characteristics, there is still a tendency for earnings to rise faster for low-income owners than low-income renters. This increase in earnings suggests that, on average, these households will be able to sustain their spell of ownership even when faced with unexpected maintenance costs or other expenses. The factors that contribute to this gain include increased age (a proxy for job experience), additional education, and marriage.

We also find that many homeowners return to renting or living with relatives. The rate of terminations varies over the duration of a homeownership spell, peaking around the third year of ownership. At the peak, the rate of failures of low-income households who survived as an owner to that time is about 7 percent. The rate of terminations falls off after the third year, down to 5 percent in year five and 2 percent in the tenth year of a spell of homeownership. Thus, there is a significant risk of ending ownership spells through the seventh year.

A number of economic and socio-demographic factors contribute to this risk. Among low-income households, those with the lowest earnings at the time of purchase have a notably higher risk of exiting homeownership. A rising unemployment rate also increases the hazard of a termination. This variable may pick up expectations of future job prospects and earnings by the individual. Also, it may reflect the prospects for future house price appreciation; thus, higher unemployment rates may suggest that investing in housing is not optimal from a wealth portfolio perspective. There is evidence, stronger in the full sample, that a rising mortgage rate raises the rate of exiting ownership.

Among the demographic factors, marriage lowers the hazard of ending a spell of ownership in the years following the marriage, and terminations of marriage increase the hazard rate of ending a spell of homeownership. Levels of education and knowledge make a difference in the full sample, and while their effects are similar in the low-income sample, they are less precisely estimated.

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

Nevertheless, even recognizing that 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 are likely not welcomed by individual families. This is likely the case with the influence of increasing mortgage interest rates, for example.

We find that Black households have a much greater hazard rate of terminating a spell of homeownership, even after controlling for a large number of economic and demographic variables. Although we do not identify the cause of this result, this is certainly something that bears additional research and policy attention. It is possible, for example, that discrimination may reduce the ability of Black families to sustain homeownership even after clearing the initial hurdle of purchasing a home. One possible mechanism by which this could occur is if discrimination results in reduced job security. Alternatively, it is possible that public policies designed to facilitate homeownership among minority and low-income families have drawn a disproportionate number of marginal minority homebuyers into owner-occupied housing. Such families would be more sensitive to the influence of adverse shocks. If this is the cause of the race-related result, then pre- and post-ownership counseling programs may be appropriate, especially ones targeted at how to manage negative shocks to household finances, including reduced income, unexpected home maintenance, and rising interest rates. Such a policy initiative would also be consistent with our finding that education and knowledge extend spells of homeownership for all owner-occupiers.

Regarding policy, our finding that the initial mortgage interest rate and changes in that rate are an important determinant of terminations suggests that low-income (often inner city) borrowers need access to prime lenders. The presence of subprime lenders may facilitate low-income households securing a home loan, but our results suggest that a one percentage point higher initial interest rate increases the probability of termination of the spell by 16 percent annually.

There also are risks associated with ARMS. While a falling mortgage interest rate decreases the probability of a termination, a rising rate increases the probability by twice the amount. Offsetting this effect is that often the initial interest rate on an ARM is lower than a FRM, reducing the probability of termination of a spell of ownership. It is reasonable to extrapolate our results to conclude that low-income households holding an adjustable rate mortgage are exposed to substantial risk of an interest rate hike and the resulting higher probability of terminating their spell of ownership.

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