



What happens to household formation in a recession? ☆

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ABSTRACT

While many studies have investigated the determinants of housing demand, very few studies have focused on how economic conditions affect the formation of potential households directly. Potential households may choose to delay entry into the housing market by remaining with one's parents during times of economic hardship or by combining with other persons to share housing costs. Using a variety of modeling approaches, we find that both the increase in the unemployment rate and the presence of recessions reduce the rate of household formation. Simulations suggest that these declines are substantively important. For example, in a recession, the likelihood that a young adult will form an independent household falls by 1–9% points depending on the age of the person. By way of comparison, if an individual is unemployed, the likelihood of leaving the parental home is up to 11% points lower.

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1. Introduction

The present economic downturn has been, by many measures, the most severe since the Great Depression. The housing market has been buffeted by large declines in real house prices, caused in part by the collapse of the housing finance system and by continued job losses. The recent period has also been marked by increases in defaults, foreclosures, and falling homeownership rates. As shown in Fig. 1, national homeownership rates have fallen from their peak of 69–66%. Not surprisingly, given the incidence of foreclosures, there has been a corresponding increase in the homeownership vacancy rate from a long term average of about 1.7% to about 2.6% over the past 3 years.

The numbers above suggest that there has been a net reduction in housing demand; however, these statistics provide an incomplete picture of housing demand. Housing demand is a function of many factors, including a household's socioeconomic status, life cycle changes, the housing market, and labor market conditions. Numerous studies (e.g., Henderson and Ioannides, 1983; Goodman, 1988; Jones, 1989; Linneman and Wachter, 1989) have investi-

gated how these factors influence housing choices. There is much less literature investigating how the housing and labor markets might influence the decision to live independently. The contention of this study is that using measures such as the change in homeownership or vacancy rates in the owner occupied or rental sectors to proxy for changes in housing demand can lead to misunderstanding of the mechanism by which housing demand may shift.

In the current crisis, there is evidence (Fig. 2) that the rate of household formation has fallen substantially. In the period of 2008–2010, the annual increase in the number of households fell to nearly zero. This contrasts with a normal rate of about 1% per year, and also contrasts with many previous recessions, where household growth did not dip below 1% (contra see the 1982 recession). Even more striking are the declines in the household formation of young adults (younger than age 35). These declines are evident in each of the last three recessions. Mykyta and Macartney (2011) also find that the rate of “doubling up” climbed to over 6% during the current recession compared to average rate of 2%.¹ Fig. 3 demonstrates that young adult men have substantially reduced their rates of household formation. The rate of young adult men living at home has grown rapidly from 14% to 19% from the beginning of the recession until 2011.

While the literature linking household formation and housing demand is limited, there exists a broader literature on the determinants of household formation summarized well in Billari and

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¹ Mykyta and Macartney (2011) define a household as doubling up if it adds an adult that is not the householder, spouse or cohabiting partner of the householder.

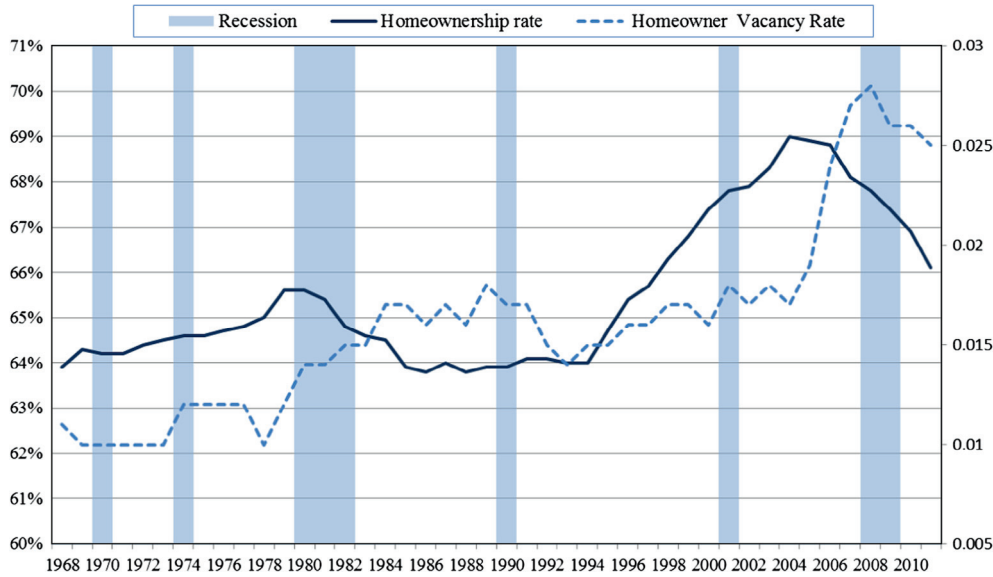


Fig. 1. Annual Homeownership Rates and Vacancy Rates for the United States, 1968–2011.

Data Source: US Census Bureau, Current Population Survey/Housing Vacancy Survey, Series H-111, Washington, DC 20233.

Recession Data Source: National Bureau of Economic Research, Inc., 1050 Massachusetts Ave., Cambridge, MA.

Liefbroer (2007).² This literature, discussed in greater detail below, highlights the role of individual demographic transitions, parental income and parental wealth. The most recent literature on household formation in the United States has focused on how changing household formation rates could influence homeownership rates over time. Both Haurin and Rosenthal (2008) and Myers and Yu (2010) note that the increase in homeownership rates in the 1990s and the early part of the previous decade could be due to reduced household formation rates among households. Both of these papers are forced to rely on cross sectional data, and are therefore not able to explicitly account for the economic and housing conditions that are likely to influence the decision to form an independent household.

The primary contribution of this study is to focus on the role of economic and housing market conditions in household formation. In so doing, we estimate models that jointly consider the decision of household formation and housing tenure choice as well as models that consider the decision to live independently in a dynamic context. We focus primarily on young adults because they are the group most likely to have the flexibility in work or school plans to adjust their rate of independence during economic downturns. In order to conduct this study, we utilize individual level geocoded data from the Panel Study of Income Dynamics (PSID) from 1975 to 2009, covering various economic cycles. The data also allow us to control for household and individual resources and demographic characteristics as suggest by previous literature. We are further

able to append various local data in order to estimate the role of economic and housing market conditions.

The estimates from the various modeling approaches consistently demonstrate that higher unemployment rates and recessionary periods reduce household formation in young adults. We posit that the additional depressive effect of recessionary periods is due to signals of future job uncertainty. The results also suggest that the impact of economic conditions on housing demand operates primarily through its impact on household formation for young adults. Simulations indicate household formation rates fall by 1–9% points depending on the age of the young adults during a recessionary period, and that each additional percentage point increase in the unemployment rate can lower the odds of establishing independence by 1–2% points. Finally, back of the envelope calculations suggest that the change in house prices has had little effect on household formation in the current downturn and that changes in the rate of household formation among young adults have actually served to keep homeownership rates from falling further.

2. Background

There are numerous ways independent households can form and make housing tenure choice (Fig. 4). New households can be formed either when children move out of their parents' home, when couples separate, or when unrelated individuals that previously shared a residence choose to live singly. The number of households can decline if two households combine, either through marriage, or by sharing a residence to reduce housing costs. As mentioned above, there is very little research on the relationship between household formation and housing demand as measured either by homeownership or changes in demand for living in multifamily housing.

The literature on household formation typically focuses on the reasons why a young adult will form an independent household. This literature suggests that the reasons are varied, ranging from individual trigger events and parental characteristics to housing market circumstances and changes in socioeconomic status. Studies agree that when children go to college, start working, get married, or have their own kids, they are more likely to move out of their parents' house and form independent households

² Billari and Liefbroer state, "The first class of determinants deals with young adults' involvement in parallel events, such as getting a job, going to college, and marriage, that trigger the decision to leave home (Goldscheider and Goldscheider, 1993). Often, leaving home and these triggering events even occur simultaneously, like when one leaves home to start living with a partner (Billari et al., 2001; De Jong Gierveld et al., 1991; Mulder and Wagner, 1993). The second class of determinants relates to the opportunities and constraints that either facilitate or impede the decision to leave the parental home, like housing market conditions (Jones, 1989; Mulder and Clark, 2000; Whittington and Peters, 1996), economic conditions (Aassve et al., 2002; Avery et al., 1992; Ermisch and Di Salvo, 1997; Johnson and DaVanzo, 1998), and the circumstances within the parental home (De Jong Gierveld et al., 1991; Goldscheider and DaVanzo, 1989; Goldscheider and Goldscheider, 1998; Murphy and Wang, 1998; Whittington and Peters, 1996). The final class of determinants deals with the propensity to leave home and focuses on the impact of cultural factors, like attitudes (Goldscheider and Goldscheider, 1989, 1993) and value orientations (Surkyn and Lesthaeghe, 2004)."

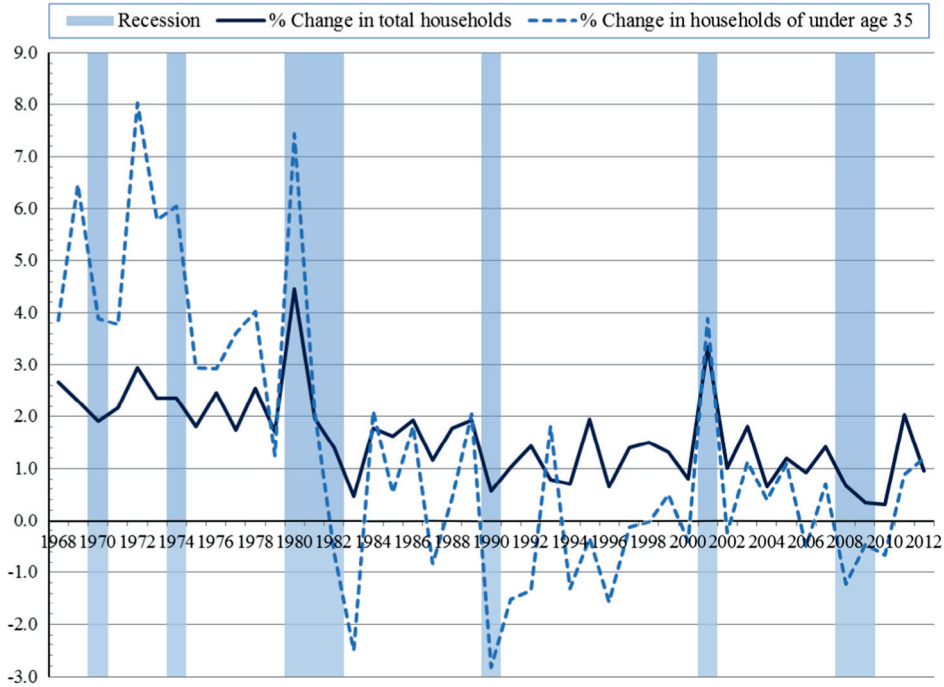


Fig. 2. Percent Change in Total Households and Age Group under 35, 1968–2010.
 Data Source: US Census Bureau, Current Population Survey, Annual Social and Economic Supplements.
 Recession Data Source: National Bureau of Economic Research, Inc., 1050 Massachusetts Ave., Cambridge, MA.

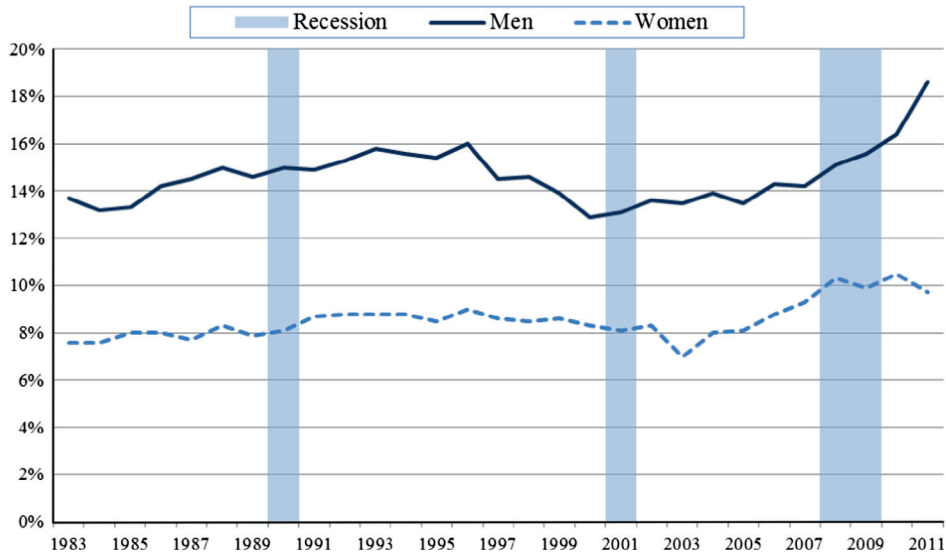


Fig. 3. Percent of Adults 25–34 Living at their Parental Home: 1983–2011.
 Data Source: US Census Bureau, Current Population Survey, 1983–2011 Annual Social and Economic Supplements.
 Note: In CPS data, unmarried college students living in dormitories are counted as living in their parent(s) home.

(Goldscheider and Goldscheider, 1993; Billari et al., 2001; Mulder and Wagner, 1993; De Jong Gierveld et al., 1991). Research has also found that demographic characteristics of children, such as gender (Murphy and Wang, 1998) and race (Goldscheider and DaVanzo, 1989), and family structure (Goldscheider and Goldscheider, 1998 and Murphy and Wang, 1998) predict the timing of when young adults establish independence.

It is theoretically ambiguous (and the current evidence is mixed) whether higher parental income and wealth would impact the household formation rates of their children. On the one hand, children whose parents have more resources may be better able to pay any transaction costs of establishing one's own residence

(De Jong Gierveld et al., 1991). On the other hand, children may remain residentially and financially dependent on their parents if their parents have more resources (Whittington and Peters, 1996). Finally, Avery et al. (1992) argue that the magnitude of the effect of parental resources is likely to depend on children's age.

The current evidence is also inconclusive concerning the impact of housing prices and rents on the timing of household formation. Mulder and Clark (2000) provide evidence that higher median house values at the county level decrease the probability that young adults in the United States leave the county, but remain in the state. Similarly, Ermisch (1999) finds that tighter housing

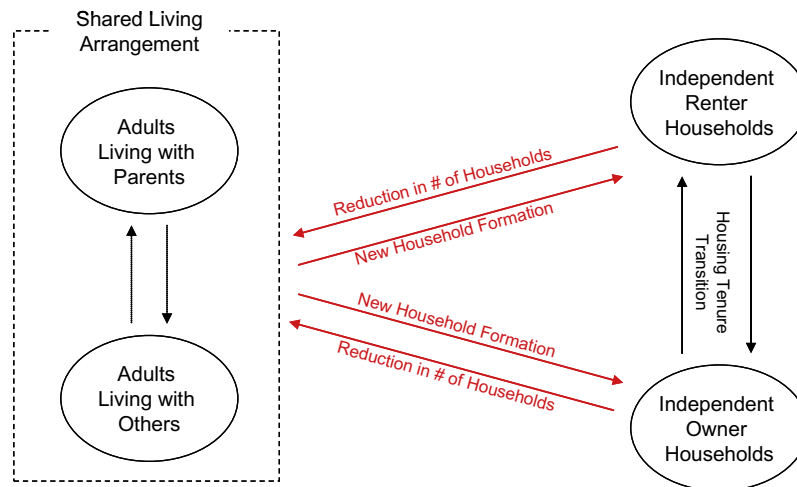


Fig. 4. Illustration of the Process of Household formation and Housing Tenure Choice.

markets lead to delays in leaving parental homes due to inelastic housing demand in Britain. Ermisch and Di Salvo (1997) also find that higher housing prices in local housing markets may delay women's formation of independent households. In the rental market, Haurin et al. (1993) find that higher rents at the MSA level have a significant negative impact on the likelihood that children move out of their parents' home, while Whittington and Peters (1996) find no significant impact of rental costs on the likelihood of leaving home.

At present, there are only two papers that test whether local labor market conditions influence household formation rates. It is theoretically plausible that weak labor markets would have both a direct effect on the unemployed and an indirect on the employed because of concerns about the security of one's job. However, there is limited evidence on this point. Using data from a sample of Britons born in 1958, Ermisch and Di Salvo (1997) find that higher regional unemployment rates reduce the likelihood of leaving home. On the contrary, Whittington and Peters (1996), using a sample of household over the period 1968–1988, report no significant relationship between state unemployment rates and the likelihood that children move out of their parental home.

In sum, despite weak or mixed evidence in the literature, we would expect that after controlling for other demographic factors, expensive housing markets and weak job markets would depress household formation. We would also expect the individual economic circumstances to have a larger impact than general economic conditions. Further, we posit that recessionary periods may have an additional impact beyond local unemployment rates because of the signal of future negative economic conditions. However, the literature does not give guidance as to whether adverse economic conditions are more likely to harm the demand for rental housing or owner-occupied housing. Because younger households are more likely to rent before owning, we might expect a larger depressive effect on the demand for rental housing in an economic downturn. Finally, we would expect higher house prices to reduce the demand for owner occupied housing, and would expect higher rents to reduce the number of individuals that would become a renter.

3. Data

In order to conduct a credible study of household formation, one needs data on the young adults, their parents, the economic environment and the housing market. The best US-based data

come from the Panel Study of Income Dynamics (PSID) as collected by the Survey Research Center at the University of Michigan. The PSID is a longitudinal dataset beginning in 1968 with approximately 4800 families and provides detailed family histories that include housing tenure choice. In addition to families in the original sample in the 1968 PSID data, the panel contains sample families that split off from the original 1968 families in later years and Latino sample families that are more recently added. While the PSID is a representative sample of US individuals (men, women, and children) and the family units in which they reside, it over-samples low-income and non-white families. To account for the over-sampling, the models are estimated using sample weights.

In this study, we use the individual young adult as the unit of analysis. Because the PSID data exist at both the individual and family levels, a unique ID is assigned for each family unit and the family is also observed over the years. The Family Identification Mapping System (FIMS) is used to merge data of young adult children with their parents. The FIMS provides identification codes for each of the family members by the type of relationship (e.g. biological parent, non-biological parent, biological grandparent, full sibling, half sibling). This FIMS ensures that our linking of young adults to their parents is straightforward and accurate.

Because children can be linked to their parents, both demographic characteristics for the parents and the young adult are used in the analysis. The parental variables that the literature suggests are important include the parent's marital status, parent's (father's) education, parental income, and housing tenure status of the parents. Because of the longitudinal nature of the data, we use a permanent income measure as the variable indicating the income of the parental household, using a 5-year moving average. Although not tested in the literature to date, we also include a measure of whether a parent is disabled, as one might expect a child may stay at home to help a disabled parent.

For a portion of the time series, the PSID also provides detailed wealth information. The PSID wealth data have been found to be of high quality and to correspond well with other established wealth data such as the Survey of Consumer Finance and the Health Retirement Study (Juster et al., 1999). Housing wealth is equal to the home equity reported in this wealth data and financial wealth is measured as the sum of shares of stock in publicly held corporations, mutual funds or investment trusts, including stocks in IRAs, checking and savings accounts, and etc. The PSID wealth supplements are in 5 year intervals for the period 1984–1999, and then every other year after 1999. Thus, the wealth data is excluded from the analysis before 1984, and after 1984, we impute housing and

financial wealth by using a linear trend for those years that the data does not exist.

Next, we include the individual demographic variables of the young adult, which have been found to be important in the literature. Among these variables are age, education, gender, race, whether the young adult is a student, and a measure of the young adult's physical limitations. In addition, we include whether the individual was unemployed or not.³

Finally, this study uses the enhanced version of the PSID that includes the geographic identifiers (also referred to as geocodes). By linking to the geocodes, this analysis includes various measures of the economic cycle and neighborhood characteristics that would be relevant to household formation and housing tenure decisions. With respect to the economic cycle, we first include a categorical variable that indicates whether a particular year is a recession year as indicated by the National Bureau of Economic Research. Unemployment rates, average wages, and GDP growth rates by state are obtained from diverse sources including the National Bureau of Economic Research (BER) and US Bureau of Labor Statistics (BLS). While there are a number of variables that are available to describe housing market conditions, we include two measures, annual median house price and median gross rent for each state from the Census, that have been important in various studies.⁴ The complete list of variables and their summary statistics are presented in Appendix A1.

4. Results

To analyze the impact of both economic conditions and demographic characteristics, this study uses a variety of modeling approaches. We first use a multinomial logit (MNL) modeling framework (see Myers and Yu, 2010, for a similar modeling strategy) to assess the impact of socioeconomic characteristics and economic conditions on household formation. This model allows us to consider three distinct choices for a young adult i who is presently living with its parents at the time t , denoted by HF_{it} , such that

$HF_{it} = 0$ if a young adult i continues to live with its parents,
 $HF_{it} = 1$ if a young adult i forms an independent household as a renter,
 $HF_{it} = 2$ if a young adult i forms an independent household as a homeowner.⁵

In the MNL framework, the probability of the young adult i to choose the alternative j at the time t is given by:

$$p_{itj} = \text{Prob}(HF_{it} = j) = \frac{\exp(X_{it}\beta_j)}{[\sum \exp(X_{it}\beta_j)]}, \quad j = 0, 1, 2,$$

³ In some of the years (1975–1993), we are also able to include a variable that indicates the income level of the individual young adult. These results are not shown, but as expected the income level of the young adult is an important predictor of household formation. Instead of income, we include unemployment status because that is available in all years.

⁴ For 2000–2010, we used the data from American Community Survey instead of the Census data. In addition, we have tested whether housing market conditions within the closer distance from the current residence could affect household formation differently. While we used the annually interpolated Census for the census tract level data, we were able to account for the annual variation more precisely for the MSA level data by using Housing Price Index and Fair Market Rent.

⁵ It is important to note that there are other transitions that this analysis does not capture that were illustrated in Fig. 4. Specifically, this analysis does not measure the transitions from renter to owner status or owner to rental status among currently independent households. It also does not measure the factors that cause households to move between types of shared living or to move back in with someone else. There were not enough households in this latter category to obtain statistically precise results on the economic factors that might lead individuals to transition into some sort of shared living arrangement.

Table 1
Selected results of multinomial logit (MNL) models.

	Leaving Home & Own	Leaving Home & Rent
	Coef.	Coef.
<i>Individual economic characteristics</i>		
Unemployed	−0.518***	−0.439***
<i>Economic conditions</i>		
If Recession Year	−1.549***	−1.170***
State Real GDP Growth Rate	−0.003	−0.017**
State Unemployment Rate	−0.200***	−0.144***
State Average Real Wage/ 1,000	0.169***	0.094***
<i>Housing market conditions</i>		
ln(State Median Gross Rent)	−1.587	−2.631***
ln(State Median House Value)	−1.145**	0.161
State dummies		YES
Pseudo R2		8.81
No of individuals		10,544
No of obs.		38,588

Note:

1. Time period for the analysis is 1975–2009.
2. Results are weighted with using the PSID individual weights.
3. All standard errors are clustered at the individual level.
4. State-level housing market data are annually interpolated before 2000 because annual data are available only after 2000.

* $P < 0.10$.

** $P < 0.05$.

*** $P < 0.01$.

where X_{it} is the vector of the independent variables associated to the young adult i at the time t and β_j is the vector of parameters associated to the alternative j . Because $HF_{it} = 0$ is the base outcome, coefficients of all independent variables associated with each alternative choice are estimated with respect to this “remaining in the parental home” category. Hence, the vector of coefficients associated with it, β_0 , is normalized to zero without loss of generality.

Table 1 presents the results of the main MNL models. The overall results (Appendix A2) are consistent with the literature.⁶ Beginning with individual characteristics, females and non-minorities are more likely to form a new household.⁷ However, the propensity to become a renter household vs. an owner household is much different for minorities. Minorities are much less likely to form an owner household than a renter household. Females are also less likely to form an owner household, but the differences are much less stark. More highly educated young adults are more likely to leave home and/or become homeowners, as would be expected. The results also show that conditional on education, young adults that are older are less likely to form a renter household.

We conducted the analysis in the full sample (Appendix A2) and the post-1984 period (Appendix A3) when the parental wealth data and annual housing market data at the MSA level are available. Overall, the results across sample periods are similar, but the impact of the economic variables in the post-1984 results is much larger. This is likely due to the severity of the current recession. When we excluded the 2009 data, the results (not shown) are more similar to the full sample. This suggests that the impact of

⁶ In these specifications, we did our best to use the same controls that Mulder and Clark (2000) used in their study of household formation. Our estimates replicate their results nicely.

⁷ There is evidence (Fig. 3) that household formation behaviors related with the recessions vary between young men and women so we also estimated the MNL model separately for men and women. However, the results (not shown) suggest no significant variation in the effect of economic variables on household formation of men and women. The only notable difference is that women are more sensitive to housing market conditions than men, which is consistent with Ermisch and Di Salvo (1997).

Table 2
Selected results of racially-stratified MNL models.

	Whites		African Americans	
	Leaving home and own Coef.	Leaving home and rent Coef.	Leaving home and own Coef.	Leaving home and rent Coef.
<i>Individual economic characteristics</i>				
Unemployed	−0.570***	−0.557***	−0.114	−0.402***
<i>Economic conditions</i>				
If Recession Year	−1.458***	−1.101***	−2.040***	−1.283***
State Real GDP Growth Rate	−0.006	−0.012	0.018	−0.027*
State Unemployment Rate	−0.204***	−0.148***	−0.129*	−0.145***
State Average Real Wage/1000	0.154***	0.099***	0.166***	0.107***
<i>Housing market conditions</i>				
ln(State Median Gross Rent)	−1.973	−3.303***	−0.763	−1.607
ln(State Median House Value)	−0.593	0.295	−0.626	0.001
State dummies	YES		YES	
Pseudo R2	8.97		10.94	
No of individuals	5062		4802	
No of obs.	17,221		19,144	

Note:

1. Time period for the analysis is 1975–2009.
2. Results are weighted with using the PSID individual weights.
3. All standard errors are clustered at the individual level.
4. State-level housing market characteristics are annually interpolated before 2000 because annual data are available only after 2000.

** $P < 0.05$.

* $P < 0.10$.

*** $P < 0.01$.

economic conditions on household formation rates has been much more significant during the more recent recession than during the previous four recessions.

The impact of parental resources on household formation is mixed. As mentioned previously, it is theoretically ambiguous whether higher parental income and wealth would impact the household formation rates of their children. The results suggest that the youngest adults in our sample whose parents have higher income are more likely to remain at home. However, as children age, higher parental income increases the odds of forming owner households (Appendix A2) The effect sizes of parental income are similar, but smaller, when predicting the formation of renter households.

We find the opposite results for parents with higher levels of other wealth that includes equities in business, real estates except the main home, and vehicles as well as other assets (Appendix A3). Children with wealthier parents are more likely to form an owner household but less likely to form a renter household. At the same time, children whose parents own a house are more likely to become a new homeowner compared to those whose parents are a renter. This suggests that parental wealth is more important in helping children with the upfront costs of buying a house, but it is not clear why parental income does not have a similar effect. It is worth noting that the wealth effects are economically small.

Next, we focus on how the economic cycle impacts household formation. Table 1 demonstrates that being unemployed depresses household formation of both homeowners and renters fairly equally. Importantly, even after controlling for the state's unemployment rate, being in a recessionary period substantially lowers the rates of forming both owner and renter households. The results suggest that there is an additional impact of being in a recession that goes beyond the actual job loss or the risk of job loss associated with the unemployment rate because a current recession may signal a prolonged period of higher unemployment, and that the both ownership and rental markets are sensitive to these impacts. In addition, we find that higher wages in the state increase the probability that young adults form a new household, but in the same model a higher GDP growth rate slightly reduces the ren-

ter household formation rate suggesting that wage growth is the more salient economic factor to young adults. With respect to the housing market conditions, the results are consistent with predictions from economic theory. While higher house prices in the state of residence negatively affect the rates of forming an owner household, higher median rents lower renter household formation. When using annual measures of housing market conditions at the MSA level (Appendix A3), only Housing Price Index (HPI), but not Fair Market Rent, appears to lower both owner and renter household formation.

4.1. Racial differences in household formation

We next demonstrate the differences between African American and white individuals in the likelihood of becoming either a renter or owner household (Table 2: full results in Appendix A4). There are similarities in the role of socioeconomic characteristics between racial groups, but some significant differences in the impact of economic conditions. With respect to recessions, both African Americans and whites are less likely to form a new household, but the effect size is much larger for African Americans, especially new African American homeowners (Table 2). On the other hand, both personal job loss and the state unemployment rate have a larger impact for owner household formation for whites than for African Americans. These contrasting results may reflect changes in labor market access during different parts of the economic cycle, but much more research is needed to figure this out. Finally, higher rents affect the likelihood that young white adults enter the housing market, but the same is not true for young African American adults.

4.2. Additional modeling approaches

One of the primary concerns with using a MNL approach to jointly modeling household formation and housing tenure choice is that it relies on an independence of irrelevant alternatives assumption. It might well be the case that the decision to form a household is not independent of the decision to own or rent. One

Table 3
Selected results of heckman selection models.

Selection variable	No. selection variable		Parents' marital status		Wait time for public housing units	
	Housing tenure choice (own = 1) Coef.	Household formation (leaving home = 1) Coef.	Housing tenure choice (own = 1) Coef.	Household formation (leaving home = 1) Coef.	Housing tenure choice (own = 1) Coef.	Household formation (leaving home = 1) Coef.
<i>Individual economic characteristics</i>						
Unemployed	−0.134**	−0.227***	−0.032	−0.227***	−0.026	−0.125*
<i>Economic conditions</i>						
If Recession Year	−0.245*	−0.527***	−0.023	−0.533***	−0.696**	−2.198***
State Real GDP Growth Rate	−0.003	−0.010***	0.001	−0.009***	−0.015	−0.138***
State Unemployment Rate	−0.038**	−0.071***	−0.008	−0.072***	−0.051*	−0.150***
State Average Real Wage/ 1,000	0.022**	0.044***	0.003	0.044***	0.001	0.014
<i>Housing market conditions</i>						
ln(State Median Gross Rent)	0.008	−0.357**	0.190*	−0.368**		
ln(State Median House Value)	−0.105*	−0.004	−0.086*	0.003		
ln(MSA Fair Market Rent)					0.033	−0.035
MSA HPI					0.000	−0.003***
<i>Selection variables</i>						
Family structure (two-parent family = 0)						
One Parent, Widowed			0.056*			
One Parent, Others			0.145***			
One Parent, Single			−0.162***			
Wait time for public housing					−0.002*	
<i>Mills</i>						
Lambda (rho * sigma)	0.544*		0.019		0.279*	
Rho (correlation of the residuals of the two equations)	0.911		0.053		0.677	
Sigma (SE of the residuals of housing tenure equation)	0.597		0.359		0.411	
		Wald chi2(93) = 519.36 Prob > chi2 = 0.00000		Wald chi2(91) = 805.41 Prob > chi2 = 0.00000		Wald chi2(89) = 194.49 Prob > chi2 = 0.00000
No of Obs		38,588		38,588		4259

Note:

1. Time period for the analyses without a selection variable and with parents' marital status is 1975–2009 while the time period for the analysis with the wait time for public housing units is 1996–8, 2000, and 2004–8.

2. State-level housing market characteristics are annually interpolated before 2000 because annual data are available only after 2000.

* $P < 0.10$.

** $P < 0.05$.

*** $P < 0.01$.

approach to address these concerns is to estimate a Heckman-style selection model (Heckman, 1979). In this context, we jointly estimate the probability that someone chooses to form an independent household and decides whether to own or rent, where we only observe someone's housing tenure choice if they have decided to live independently from their parents. Formally, the log likelihood function that is estimated is the following:

$$L = \sum_{i \in S}^{HO_i=1} \ln[\Phi_2(X_i\beta, Z_i\gamma, \rho)] + \sum_{i \in S}^{HO_i=0} \ln[\Phi_2(-X_i\beta, Z_i\gamma, \rho)] + \sum_{i \notin S} \ln[1 - \Phi_1(Z_i\gamma)],$$

where S is the set of observations for which HO_i is observed. $HO_i = 1$ if a young adult chooses to be an owner, and $HO_i = 0$ if a young adult chooses to be a renter. Φ_1 is the standard cumulative normal and Φ_2 is the cumulative bivariate normal distribution function. In housing, Painter (2000) estimated developed a similar model, where one estimates the probability of a household choosing to own only if we observe a move in the previous 5 years.

A challenge in estimating a joint model of household formation and housing tenure choice is to derive an appropriate exclusion restriction. Haurin and Rosenthal (2008) identify their model solely on functional form assumptions. Here, we propose two variables that plausibly influence the decision to form an independent household, but do not directly influence a person's decision to

own or rent. First, we use parental marital status as previous research has shown that this is a predictor of household formation. The assumption with this approach is that the only way parental marital status influences housing tenure choice is through parental income and wealth. Second, we use the availability of Section 8 vouchers and public housing units to predict household formation. We argue that the length of these waiting lists would be unrelated to housing tenure choice as eligible households are unlikely to be able to buy a home. The only drawback with this second approach is that the waiting list data are only available for select years.⁸

Table 3 presents the results of the bivariate probit model with sample selection. The first model does not include a variable to separately identify the household formation decision from the housing tenure decision to present results comparable to the approach of Haurin and Rosenthal (2008). The results suggest that the economic variables predict both household formation and housing tenure choice, but that the impacts are largest for the household formation decision. We find that an individual's unemployment status reduces both household formation and, conditional on forming a household, reduces the likelihood of becoming a homeowner. Recessions lower the likelihood of form-

⁸ The HUD (Housing and Urban Development) User website provides the information on the number of average months to wait to get Section 8 and public housing units at the metropolitan statistical area level. However, the data is available only for several years including 1996–2008, 2000, 2004–2008.

ing an independent household, but have only a marginally significant effect ($p = 0.056$) on the decision to own. The state unemployment rate and the state average wage affect both decisions, but have stronger effects on household formation.

In next model, we include parental marital status in the decision to form an independent household. We first note that having a single parent lowers the probability of forming one's own household, and that having a widowed parent or other family structures increases such probability compared to residing in a two parent family. With respect to the economic variables, being unemployed, and facing an external environment with higher rents, higher unemployment rates, higher GDP growth rate, or a recession all lower the probability of household formation while the higher wages increases such probability. These results are largely consistent with the MNL model results. Worth noting is the fact that, conditional on forming a household, the only economic variables to influence housing tenure choice are rents and housing prices.

In the final model of Table 3, we present the results using the waiting times for public housing to identify the model.⁹ As was noted previously, the waiting list data are only available for a few years after 1996. We observe the expected effect that longer waiting times reduce household formation. Then, we find a larger depressive effect of recessions and higher unemployment rate on household formation compared to the model with the parents' marital status.¹⁰ These economic conditions also reduce the likelihood of buying conditional on having formed a household but the effect is much smaller. Overall, estimates from the Heckman selection model suggest that the economic variables have the largest influence on housing demand through their impact on household formation, rather than directly influencing housing tenure choice.

The previous modeling approaches do not take full advantage of the dynamic nature of the data. Because the decision to establish one's household is inherently dynamic, it is important to test a variety of modeling approaches to understand how the decision to establish one's household is impacted by changes in family circumstances and changes in the economy. A duration model approach has often been used in the literature to study the decision to establish one's own household (e.g., Mulder and Clark, 2000). It has the advantage of better capturing the underlying time dynamics of the decision to establish independence. At the same time, this modeling approach is unable to distinguish between the factors that might lead a young adult to own a home or to rent upon establishing their independence. However, the number of young adults that move into an owner household is small, so this drawback is unlikely to be detrimental to our understanding of the impact of economic conditions on household formation and housing demand. Estimates are obtained using the Cox (1972) proportional hazard model in STATA 12 with the `stcox` command.

As is evident in Appendix A6, the role of many of the socioeconomic characteristics is more pronounced in this dynamic model. As in Appendix A2, women and non-minorities are more likely to establish independence. It is also clear that as individuals acquire higher levels of education, they are more likely to establish independence. On the other hand, students and unemployed individuals are much less likely to establish independence. The effects of parental education and resources are very similar to the results in Appendix A2.

Finally, the impact of economic conditions is very consistent with the results using the multinomial framework (Table 1). High-

er real wages increase the likelihood of establishing independence while recessions, higher state level unemployment rates, and higher GDP growth rates lower this likelihood. Further, higher rents delay the household formation of young adults while house prices have an insignificant effect.

In results not shown, we also attempted to model the factors that lead households to leave independence and move back into a parent's home. The results are similar, and as expected. Individuals who are most at risk due to lower education, employment status, fewer resources from their parents are more likely to move back home. We also find that marital dissolution increases the likelihood of moving back in with one's parents. Finally, we find that higher state unemployment rates and living in a recessionary period increase the likelihood of moving back home.

4.3. Simulations

In order to provide estimates of the magnitude of the estimates in a partial equilibrium framework, the data are simulated to calculate the effect on household formation rates from changes in economic and demographic variables using the models presented in Table 1. In the first five rows of Table 4, changes in the economic and housing conditions are simulated by age group. Compared to the base case outlined in the table, young adults are much less likely to become a new owner or renter during a recession year. The simulations suggest that the probability of leaving home and becoming a renter during a recession is reduced by 3–9% points depending on the age of the individual. The owner household formation rates are also reduced by about 1% points during the recessions.

Increasing the unemployment rate by about 1% point also lowers the probability of establishing one's own household as a renter by about 1–2% points across age groups and as an owner by up to 1.3% points. In addition, a drop in the real wage by about \$3000 leads to lower household formation rates for both owners and renters by about 1–2% points. Consistently, the effects are largest for the age ranges 21–24 and 25–29. Finally, we find moderate effects of decreasing the house prices and rents. When the house prices are \$34,000 lower, young adults are more likely to form an owner household by 0.3–0.8% points. On the other hand, when the rents are \$90 lower, the renter household formation rate is increased by 2–3% points.

By way of comparison, the estimates are also used to simulate changes in individual characteristics of young adults. The effect of an individual being unemployed is much larger than the general effects of higher unemployment rates in one's state, as one would expect. If an individual is unemployed, the probability of establishing a new renter household falls from 4% to 11% points, with the biggest impacts in the Age 21–24 category. The effects are smaller for forming owner households, but the rate still falls by about 50% if an individual is unemployed.

Females are more likely to form renter households (2–11% points higher) across all age ranges. They are also more likely to be part of an owner household (1–2% point) from ages 18–29, but are less likely to become an owner if still living at home at age 30. Finally, non-white households are less likely to become an owner or renter. The predicted reduction in the probability for non-white households becoming an owner household is similar to the predicted reduction in becoming a renter (up to about 3.3% points).

The impacts of large changes in parental income are not as large and inconsistent across age groups. As evidenced in Table 4, individuals whose parents have incomes \$63,000 more than the average are up to 5% points less likely to form a renter household but this effect is only distinct for individuals under 20. On the other hand, individuals over 30 are more likely to become a homeowner

⁹ We did not find Section 8 voucher waiting list data to predict household formation. This might be due to the poor quality of the data, as was suggested by HUD staff.

¹⁰ Since the only recession year included in the model with the wait time for public housing units is the most recent recession, the external variables from this recession may have dominated the results.

Table 4
Selected results of simulation of MNL models.

	Age 18–20		Age 21–24		Age 25–29		Age 30–35	
	Leaving home and own	Leaving home and rent	Leaving home and own	Leaving home and rent	Leaving home and own	Leaving home and rent	Leaving home and own	Leaving home and rent
Base Case*	0.030	0.178	0.061	0.256	0.076	0.181	0.079	0.096
If Recession Year = 1	0.023	0.116	0.046	0.162	0.057	0.117	0.060	0.062
State Unemployment Rate = 7.65% (+1/2 S.D.)	0.025	0.159	0.052	0.233	0.064	0.164	0.065	0.086
State Average Real Wage = \$29,141 (–1/2 S.D.)	0.023	0.161	0.048	0.237	0.060	0.166	0.061	0.087
State Median Gross Rent = \$529 (–1/2 S.D.)	0.036	0.205	0.072	0.289	0.090	0.207	0.095	0.111
State Median House Value = \$86,601 (–1/2 S.D.)	0.034	0.166	0.068	0.240	0.084	0.168	0.086	0.089
Unemployed = 1	0.014	0.098	0.030	0.151	0.036	0.103	0.036	0.052
Female = 1	0.051	0.286	0.087	0.285	0.086	0.249	0.030	0.124
Non-White = 1	0.017	0.160	0.036	0.237	0.044	0.167	0.045	0.088
Parental Income = \$122,450 (+1/2 S.D.)	0.021	0.128	0.066	0.262	0.095	0.170	0.148	0.068
Family Size = 6 (+1/2 S.D.)	0.035	0.187	0.069	0.267	0.086	0.189	0.090	0.101

Note:

1. Base Case: Female = 0, Non-White = 0, Education = College, Unemployed = 0; Father's Education = High School, Parental Income = \$58,497, Family Size = 4.5, Parental Tenure/House Value = Own/Middle 33%; Recession = 0, State Unemployment Rate = 6.63%, State Average Real Wage = \$32,255, State Median Gross Rent = \$619, State Median House Value = \$120,838.

2. Results are presented in bold if they are statistically significant in the multinomial logit model (Table 1).

if their parents have higher incomes. This suggests different roles of parental wealth as a young adult ages. Similarly, individuals who have 1.5 more family members above the mean are up to 1.1% points more likely to form a renter household.

In sum, the most important individual characteristic predicting changes in household formation is whether an individual is unemployed. However, recessions have very large impacts on the rate of household formation. Higher unemployment rates also predict lower household formation, suggesting that even after the official recession is over, lower rates of household formation may persist. Given the fact that the present recession includes unemployment rate increases of almost 6% points in some places and large declines in the wage levels in most places, it is not surprising that we have observed the decline in household formation during the 2008–2010 period.

Finally, we use our simulation results and data from the Current Population Survey to perform a back of the envelope calculation to provide guidance regarding the magnitude of the reduction in homeownership because of the reduced number of households that enter the housing market.¹¹ Because the reduction in rental demand is greater than the reduction in ownership demand for young adults during the most recent recession, homeownership rates would have actually increased by 1% point for this group of households. Hence, the actual drop in overall homeownership rates would be explained by housing tenure transitions of households from other age groups. One would also expect the collapse in housing prices to lead to higher demand for owner-occupied housing. However, our back of the envelope calculation suggests that this effect is smaller than .1% point. Thus, the dominant economic factor on household formation is clearly the recession and the associated rising unemployment rates.

¹¹ A number of actual data are used including the number of young adults living at their parental homes, household size by age of householder, and housing tenure status by age of householder. We also use the probability of leaving and own and the probability of leaving and rent from Table 4. Then, we compute the changes in ownership demand and rental demand among newly formed young households during the recession years (2008–2009) compared to the non-recession year (2007), and estimate how these changes lead to change in homeownership rates. Detailed results are available upon the request.

5. Discussion and concluding comments

The model estimates and simulations derived from them suggest that economic conditions are an economically significant predictor of the household formation rates of young adults. The MNL models estimated in the PSID, using data covering 6 recessions, suggest that recessions lowered household formation rates, and in turn, depressed housing demand, particularly in the rental sector. The magnitude of the decline is not inconsequential. Household formation rates are reduced by up to 22% points when individuals do not have a job, and are reduced by up to 19% points during a recession. The models using the Heckman correction approach (Table 3) suggested that changes in economic conditions are more important for household formation than they are for the decision to own or rent. This suggests that for young adults, household formation is a primary driver of housing demand.

It is important to remember that this analysis did not capture all household transitions that were illustrated in Fig. 4, and therefore future research continues to be necessary to understand the factors that cause individuals to move between shared living arrangements and independence. Specifically, this analysis does not measure the transitions from renter to owner status or from owner to renter status among currently independent households. It also does not measure the factors that cause households to move between types of shared living. However, the results using the duration models estimating how the economic environment affects the likelihood that individuals will either move out of their parents' home or move back to it, do confirm the main results of this study.

Future research will also need to answer the question concerning how long it takes for household formation and housing demand to recover after a recession. A recent working paper (Choi and Painter, 2012) estimates a vector autoregressive model to discover the relationship between household formation, unemployment rates, and house prices. The results suggest that normal rates of household formation will occur even after a spike in unemployment rates within 2 years because of demographic forces, but the standards errors are large enough that one cannot rule out no effect in the times series. The paper also

Table A1
Summary statistics.

	Whole sample		Sub-sample (Year \geq 1984)	
	Mean	S.D.	Mean	S.D.
<i>Individual demographic characteristics</i>				
Female	0.429	0.495	0.430	0.495
Non-white	0.534	0.499	0.512	0.500
Education Dummies (less than high school = 0)				
College Degree	0.195	0.396	0.202	0.401
Some College	0.280	0.449	0.312	0.463
High School	0.464	0.499	0.465	0.499
Age Dummies (18–20 = 0)				
21–24	0.309	0.462	0.317	0.465
25–29	0.125	0.330	0.144	0.351
30–35	0.061	0.239	0.073	0.260
Female * Age Dummies (18–20 = 0)				
Female and 21–24	0.126	0.331	0.133	0.339
Female and 25–29	0.047	0.211	0.053	0.224
Female and 30–35	0.024	0.152	0.027	0.163
Student	0.274	0.446	0.363	0.481
Health (Poor or Disabled)	0.018	0.133	0.030	0.169
Missing Health Information	0.474	0.499	0.132	0.338
<i>Individual economic characteristics</i>				
Unemployed	0.193	0.395	0.119	0.324
Missing Unemployed Information	0.012	0.111	0.018	0.133
<i>Family demographic characteristics</i>				
Father's Education Dummies (less than high school = 0)				
College degree	0.106	0.308	0.123	0.329
Some College	0.099	0.298	0.122	0.327
High School	0.306	0.461	0.300	0.458
Missing Father's Education Information	0.357	0.479	0.364	0.481
Family Size	4.492	2.214	4.040	1.782
Family structure (two-parent family = 0)				
One Parent, Widowed	0.100	0.300	0.079	0.270
One Parent, Others	0.272	0.445	0.297	0.457
Parental Health (Poor or Disabled)	0.291	0.515	0.318	0.543
<i>Family economic characteristics</i>				
5-year Moving Average of Parent's Family Income/10,000	5.850	12.791	6.569	16.217
Family Tenure/House Value Dummies (rent = 0)				
Own, House Value Lower 33%	0.211	0.408	0.212	0.409
Own, House Value Middle 33%	0.204	0.403	0.213	0.410
Own, House Value Upper 33%	0.235	0.424	0.236	0.425
Parent's Housing Wealth/10,000			6.788	11.500
Parent's Financial Wealth/10,000			4.334	45.471
Parent's Other Wealth/10,000			9.835	62.456
Age Dummies * Parent's Income (18–20 = 0)				
21–24 * Parent's Income/10,000	1.898	4.610	2.181	5.377
25–29 * Parent's Income/10,000	0.669	2.389	0.842	2.788
30–35 * Parent's Income/10,000	0.260	1.315	0.332	1.537
Member of Low-Income Sample	0.499	0.500	0.439	0.496
<i>Family locational characteristics</i>				
City size (500,000 and over = 0)				
100,000–499,999	0.241	0.428	0.272	0.445
50,000–99,999	0.110	0.312	0.107	0.309
25,000–49,999	0.075	0.264	0.093	0.290
10,000–24,999	0.094	0.292	0.121	0.326
Under 10,000	0.138	0.344	0.140	0.347
Missing City Size Information	0.127	0.333	0.210	0.407
<i>Economic conditions</i>				
If Recession Year	0.182	0.386	0.116	0.320
State Real GDP Growth Rate	3.049	3.247	3.182	2.760
State Unemployment Rate	6.636	2.023	6.251	1.817
State Average Real Wage/1,000	32.255	6.229	34.516	6.226
<i>Housing market conditions</i>				
ln(State Median Gross Rent)	6.397	0.209	6.475	0.196
ln(State Median House Value)	11.666	0.415	11.784	0.438

finds little change in housing prices due to the reduction in household formation.

Despite the need for ongoing research, these results have important implications for both public policy and housing industry professionals. The results suggest that the demand for multifamily housing gets hit the hardest in a recession.

This is suggested by the larger fraction of renters among newly formed households and thus a higher drop in renter demand during the recessions. The implication of this is that when household formation returns to normal levels, homeownership rates are likely to decline before improving in the future.

Table A2
Full results of multinomial logit (MNL) models.

	Leaving home and own		Leaving home and rent	
	Coef.	St.error	Coef.	St.error
<i>Individual demographic characteristics</i>				
Female	0.710	0.128***	0.662	0.058***
Non-white	-0.888	0.144***	-0.266	0.061***
Education dummies (less than high school = 0)				
College degree	1.118	0.261***	0.713	0.102***
Some College	0.678	0.248***	0.228	0.093**
High School	0.933	0.246***	0.352	0.091***
Age dummies (18–20 = 0)				
21–24	0.313	0.179*	0.114	0.104
25–29	0.282	0.231	-0.269	0.140*
30–35	-0.202	0.379	-0.723	0.311**
Female * Age Dummies (18–20 = 0)				
Female and 21–24	-0.258	0.174	-0.449	0.086***
Female and 25–29	-0.394	0.246	-0.150	0.138
Female and 30–35	-1.701	0.410***	-0.408	0.288
Student	-0.302	0.097***	-0.128	0.047***
Health (Poor or Disabled)	-0.167	0.309	-0.242	0.165
Missing Health Information	0.428	0.140***	0.385	0.073***
<i>Individual economic characteristics</i>				
Unemployed	-0.518	0.175***	-0.439	0.076***
Missing Unemployed Information	-0.047	0.402	-0.184	0.192
<i>Family demographic characteristics</i>				
Father's Education Dummies (less than high school = 0)				
College degree	-0.416	0.185**	0.178	0.098*
Some College	-0.376	0.177**	0.145	0.097
High School	-0.103	0.150	0.095	0.087
Missing Father's Education Information	-0.665	0.188***	-0.246	0.095***
Family Size	0.093	0.026***	0.049	0.013***
Family structure (two-parent family = 0)				
One Parent, Widowed	0.076	0.172	0.063	0.086
One Parent, Others	0.117	0.138	0.163	0.062***
Parental Health (Poor or Disabled)	0.054	0.073	-0.002	0.041
<i>Family economic characteristics</i>				
5-year Moving Average of Parent's Family Income/10,000	-0.075	0.021***	-0.061	0.013***
Family Tenure/House Value Dummies (rent = 0)				
Own, House Value Lower 33%	0.352	0.136**	0.067	0.068
Own, House Value Middle 33%	0.414	0.136***	-0.115	0.062*
Own, House Value Upper 33%	0.276	0.141*	-0.062	0.067
Age Dummies * Parent's Income (18–20 = 0)				
21–24 * Parent's Income/10,000	0.090	0.020***	0.071	0.012***
25–29 * Parent's Income/10,000	0.114	0.024***	0.059	0.016***
30–35 * Parent's Income/10,000	0.189	0.046***	0.016	0.046
Member of Low-Income Sample	-0.509	0.122***	-0.096	0.056*
<i>Family locational characteristics</i>				
City size (500,000 and over = 0)				
100,000–499,999	0.172	0.164	0.099	0.068
50,000–99,999	0.334	0.186*	0.130	0.085
25,000–49,999	0.068	0.194	-0.046	0.086
10,000–24,999	0.242	0.179	-0.024	0.084
Under 10,000	0.619	0.176***	0.120	0.084
Missing City Size Information	0.026	0.184	-0.222	0.081***
<i>Economic conditions</i>				
Year Dummies (68–74 = 0)				
75–79				
80–84				
85–89				
90–94				
95–99				
00–04				
05–09				
If Recession Year	-1.549	0.175***	-1.170	0.077***
State Real GDP Growth Rate	-0.003	0.015	-0.017	0.007***
State Unemployment Rate	-0.200	0.036***	-0.144	0.016***
State Average Real Wage/1,000	0.169	0.022***	0.094	0.010***
<i>Housing market conditions</i>				
ln(State Median Gross Rent)	-1.587	1.221	-2.631	0.589***
ln(State Median House Value)	-1.145	0.463**	0.161	0.231
State dummies	YES			
Pseudo R ²	8.81			

(continued on next page)

Table A2 (continued)

	Leaving home and own		Leaving home and rent	
	Coef.	St.error	Coef.	St.error
No of individuals	10,544			
No of obs.	38,588			

Note:

1. Time period for the analysis is 1975–2009.
2. Results are weighted with using the PSID individual weights.
3. All standard errors are clustered at the individual level.
4. State-level housing market data are annually interpolated before 2000 because annual data are available only after 2000.

* $P < 0.10$.** $P < 0.05$.*** $P < 0.01$.

Table A3

Full Results of Multinomial Logit (MNL) Models after 1984.

	Leaving home and own		Leaving home and rent	
	Coef.	St.error	Coef.	St.error
<i>Individual demographic characteristics</i>				
Female	0.471	0.202**	0.535	0.093***
Non-white	-0.904	0.239***	-0.263	0.107**
Education Dummies (less than high school = 0)				
College degree	0.819	0.551	0.679	0.263**
Some College	0.383	0.530	0.132	0.249
High School	0.584	0.521	0.232	0.249
Age Dummies (18–20 = 0)				
21–24	0.498	0.248**	0.031	0.149
25–29	0.289	0.368	-0.426	0.224*
30–35	-0.521	0.782	-0.609	0.392
Female * Age Dummies (18–20 = 0)				
Female and 21–24	-0.118	0.265	-0.253	0.139*
Female and 25–29	-0.751	0.391*	-0.018	0.234
Female and 30–35	-1.942	0.878**	-0.614	0.475
Student	-0.456	0.139***	-0.151	0.074***
Health (Poor or Disabled)	-0.610	0.460	-0.270	0.234
Missing Health Information	0.272	0.251	0.157	0.140
<i>Individual economic characteristics</i>				
Unemployed	-0.083	0.265	-0.144	0.134
Missing Unemployed Information	-0.128	0.560	-0.283	0.301
<i>Family demographic characteristics</i>				
Father's Education Dummies (less than high school = 0)				
College degree	-0.500	0.313	0.155	0.192
Some College	-0.633	0.308**	0.321	0.188**
High School	-0.198	0.273	0.193	0.178
Missing Father's Education Information	-0.739	0.334**	0.094	0.186
Family Size	0.109	0.043**	0.015	0.023
Family structure (two-parent family = 0)				
One Parent, Widowed	0.061	0.288	0.056	0.160
One Parent, Others	0.560	0.199***	0.026	0.100
Parental Health (Poor or Disabled)	0.065	0.115	-0.083	0.067
<i>Family economic characteristics</i>				
5-year Moving Average of Parent's Family Income/10,000	-0.041	0.023*	-0.052	0.014***
Family Tenure/House Value Dummies (rent = 0)				
Own, House Value Lower 33%	0.474	0.216**	0.021	0.110
Own, House Value Middle 33%	0.649	0.219***	-0.174	0.104*
Own, House Value Upper 33%	0.441	0.253*	-0.188	0.132*
Parent's Housing Wealth/10,000	-0.003	0.008	0.002	0.005
Parent's Financial Wealth/10,000	0.000	0.002	0.000	0.001
Parent's Other Wealth/10,000	0.001	0.001*	-0.001	0.000*
Age Dummies * Parent's Income (18–20 = 0)				
21–24 * Parent's Income/10,000	0.069	0.023***	0.069	0.015***
25–29 * Parent's Income/10,000	0.129	0.035***	0.048	0.027*
30–35 * Parent's Income/10,000	0.156	0.100	-0.010	0.057
Member of Low-Income Sample	-0.341	0.217	0.147	0.109
<i>Family locational characteristics</i>				
City size (500,000 and over = 0)				
100,000–499,999	0.975	0.388**	-0.023	0.142
50,000–99,999	1.228	0.408***	0.044	0.169
25,000–49,999	0.739	0.417*	-0.007	0.160
10,000–24,999	1.044	0.386***	-0.112	0.174

Table A3 (continued)

	Leaving home and own		Leaving home and rent	
	Coef.	St.error	Coef.	St.error
Under 10,000	1.603	0.397***	0.042	0.164
Missing City Size Information	0.683	0.393*	-0.267	0.154*
<i>Economic conditions</i>				
If Recession Year	-3.920	0.698***	-3.531	0.326***
State Real GDP Growth Rate	0.029	0.029	-0.044	0.015***
State Unemployment Rate	-0.200	0.070***	-0.269	0.036***
State Average Real Wage/1,000	0.164	0.028***	0.106	0.013***
<i>Housing market conditions</i>				
ln(MSA Fair Market Rent)	0.063	0.459	0.150	0.250
MSA HPI	-0.008	0.003***	-0.004	0.001***
State dummies	YES			
Pseudo R2	13.45			
No of individuals	4627			
No of obs.	13,434			

Note:

1. Time period for the analysis is 1984–2009.

2. Results are weighted with using the PSID individual weights.

3. All standard errors are clustered at the individual level.

* $P < 0.10$.** $P < 0.05$.*** $P < 0.01$.

Table A4

Full results of racially-stratified MNL models.

	Whites				African Americans			
	Leaving home and own		Leaving home and rent		Leaving home and own		Leaving home and rent	
	Coef.	St.error	Coef.	St.error	Coef.	St.error	Coef.	St.error
<i>Individual demographic characteristics</i>								
Female	0.611	0.137***	0.614	0.066***	1.402	0.313***	0.985	0.138***
Education Dummies (less than high school = 0)								
College degree	1.267	0.304***	0.808	0.123***	0.651	0.490	0.518	0.246**
Some College	0.823	0.291***	0.268	0.114**	0.362	0.432	0.258	0.187
High School	1.087	0.288***	0.376	0.114	0.376	0.435	0.352	0.177**
Age Dummies (18–20 = 0)								
21–24	0.246	0.201	0.064	0.132	0.568	0.458	0.429	0.198
25–29	0.087	0.258	-0.349	0.184*	0.529	0.702	0.057	0.252
30–35	-0.156	0.465	-1.097	0.475**	-0.270	0.571	-0.301	0.369
Female * Age Dummies (18–20 = 0)								
Female and 21–24	-0.188	0.188	-0.403	0.099***	-0.933	0.459**	-0.860	0.191***
Female and 25–29	-0.149	0.276	-0.046	0.173	-1.439	0.548***	-0.653	0.248
Female and 30–35	-1.660	0.501***	-0.209	0.382	-0.927	0.635	-0.762	0.464
Student	-0.338	0.103***	-0.151	0.054***	0.093	0.256	-0.014	0.107
Health (Poor or Disabled)	-0.203	0.334	-0.240	0.191	0.563	0.686	-0.041	0.312
Missing Health Information	0.405	0.152***	0.405	0.086***	0.942	0.368**	0.250	0.144*
<i>Individual economic characteristics</i>								
Unemployed	-0.570	0.215***	-0.557	0.106***	-0.114	0.294	-0.402	0.111***
Missing Unemployed Information	0.143	0.435	-0.167	0.266	-0.634	0.637	-0.014	0.258
<i>Family demographic characteristics</i>								
Father's Education Dummies (less than high school = 0)								
College degree	-0.517	0.227**	-0.121	0.144	-0.859	0.522	0.514	0.213**
Some College	-0.492	0.224**	-0.152	0.145	0.087	0.396	0.222	0.172
High School	-0.152	0.200	-0.165	0.136	-0.014	0.270	0.202	0.138
Missing Father's Education Information	-0.788	0.245***	-0.477	0.151***	-0.213	0.324	-0.415	0.149***
Family Size	0.112	0.033***	0.054	0.018***	-0.021	0.052	0.066	0.021***
Family structure (two-parent family = 0)								
One Parent, Widowed	0.229	0.206	0.140	0.114	-0.602	0.365*	-0.083	0.142
One Parent, Others	0.251	0.152*	0.096	0.077	-0.345	0.316	0.294	0.126**
Parental Health (Poor or Disabled)	0.132	0.080*	-0.053	0.051	-0.363	0.197*	0.142	0.084*
<i>Family economic characteristics</i>								
5-year Moving Average of Parent's Family Income/10,000	-0.074	0.022***	-0.062	0.015***	-0.105	0.062*	-0.099	0.033***
Family Tenure/House Value Dummies (rent = 0)								
Own, House Value Lower 33%	0.372	0.161**	0.070	0.089	0.219	0.272	0.080	0.112
Own, House Value Middle 33%	0.459	0.157***	-0.060	0.078	0.167	0.336	-0.224	0.129*
Own, House Value Upper 33%	0.367	0.162**	-0.002	0.081	-0.577	0.463	0.096	0.171

(continued on next page)

Table A4 (continued)

	Whites				African Americans			
	Leaving home and own		Leaving home and rent		Leaving home and own		Leaving home and rent	
	Coef.	St.error	Coef.	St.error	Coef.	St.error	Coef.	St.error
Age Dummies * Parent's Income (18–20 = 0)								
21–24 * Parent's Income/10,000	0.090	0.022***	0.074	0.015***	0.197	0.073***	0.064	0.034*
25–29 * Parent's Income/10,000	0.110	0.026***	0.060	0.020***	0.320	0.092***	0.131	0.047***
30–35 * Parent's Income/10,000	0.161	0.054***	0.037	0.065	0.272	0.123**	0.080	0.092
Member of Low-Income Sample	–0.557	0.155***	–0.108	0.076	0.053	0.308	–0.194	0.106*
<i>Family locational characteristics</i>								
City size (500,000 and over = 0)								
100,000–499,999	0.177	0.190	0.124	0.087	0.250	0.425	0.001	0.148
50,000–99,999	0.310	0.208	0.166	0.099*	0.307	0.568	0.062	0.200
25,000–49,999	0.002	0.211	–0.021	0.100	0.396	0.540	–0.254	0.249
10,000–24,999	0.153	0.198	0.032	0.099	0.721	0.505	–0.624	0.196***
Under 10,000	0.506	0.198**	0.199	0.101**	1.058	0.471**	–0.333	0.170*
Missing City Size Information	–0.045	0.203	–0.125	0.098	0.206	0.482	–0.776	0.173***
<i>Economic conditions</i>								
If Recession Year	–1.458	0.189***	–1.101	0.090***	–2.040	0.307***	–1.283	0.173***
State Real GDP Growth Rate	–0.006	0.016	–0.012	0.008	0.018	0.034	–0.027	0.014*
State Unemployment Rate	–0.204	0.039***	–0.148	0.019***	–0.129	0.077*	–0.145	0.031***
State Average Real Wage/1,000	0.154	0.024***	0.099	0.013***	0.166	0.049***	0.107	0.022***
<i>Housing market conditions</i>								
ln(State Median Gross Rent)	–1.973	1.305	–3.303	0.723***	–0.763	4.009	–1.607	1.092
ln(State Median House Value)	–0.593	0.520	0.295	0.292	–0.626	1.327	0.001	0.514
State dummies	YES				YES			
Pseudo R2	8.97				10.94			
No of individuals	5062				4802			
No of obs.	17,221				19,144			

Note:

1. Time period for the analysis is 1975–2009.

2. Results are weighted with using the PSID individual weights.

3. All standard errors are clustered at the individual level.

4. State-level housing market data are annually interpolated before 2000 because annual data are available only after 2000.

* $P < 0.10$.** $P < 0.05$.*** $P < 0.01$.

Table A5

Full results of heckman selection models.

Selection variable	No. selection variable				Parents' marital status				Wait time for public housing units			
	Housing tenure choice (own = 1)		Household formation (leaving home = 1)		Housing tenure choice (own = 1)		Household formation (leaving home = 1)		Housing tenure choice (own = 1)		Household formation (leaving home = 1)	
	Coef.	St.error	Coef.	St.error	Coef.	St.error	Coef.	St.error	Coef.	St.error	Coef.	St.error
<i>Individual demographic characteristics</i>												
Female	0.175	0.088**	0.373	0.023***	0.020	0.031	0.364	0.023***	0.058	0.059	0.376	0.071***
Nor-white	–0.154	0.045***	–0.180	0.023***	–0.081	0.019***	–0.181	0.023***	–0.158	0.051***	–0.127	0.089
Education Dummies (less than high school = 0)												
College degree	0.233	0.117**	0.496	0.039***	0.034	0.045	0.510	0.039***	0.003	0.109	0.341	0.190*
Some College	0.139	0.062**	0.241	0.033***	0.038	0.028	0.252	0.033***	–0.080	0.099	0.023	0.175
High School	0.184	0.078**	0.316	0.031***	0.051	0.031	0.317	0.031***	–0.051	0.097	0.025	0.172
Age Dummies (18–20 = 0)												
21–24	0.084	0.038**	0.137	0.031***	0.028	0.020	0.136	0.031***	0.051	0.062	0.142	0.107
25–29	0.032	0.031	0.016	0.043	0.031	0.025	0.011	0.043	0.025	0.073	0.011	0.147
30–35	0.010	0.068	–0.161	0.070	0.088	0.048*	–0.181	0.070***	0.089	0.168	–0.277	0.226
Female * Age Dummies (18–20 = 0)												
Female & 21–24	–0.093	0.054*	–0.201	0.034***	–0.008	0.025	–0.205	0.034***	0.032	0.059	–0.137	0.108
Female & 25–29	–0.111	0.067*	–0.244	0.048***	–0.009	0.034	–0.246	0.048***	–0.029	0.093	–0.424	0.158
Female & 30–35	–0.194	0.112*	–0.405	0.078***	–0.028	0.061	–0.409	0.078***	0.138	0.181	–0.616	0.271***
Student	–0.059	0.027**	–0.106	0.019***	–0.015	0.013	–0.099	0.019***	–0.016	0.029	–0.010	0.057
Health (Poor or Disabled)	–0.032	0.047	–0.086	0.057	–0.004	0.037	–0.136	0.056**	–0.218	0.125*	–0.249	0.216
Missing Health Information	0.112	0.065*	0.274	0.027***	0.003	0.027	0.277	0.027***				
<i>Individual economic characteristics</i>												
Unemployed	–0.134	0.055**	–0.227	0.021***	–0.032	0.023	–0.227	0.024***	–0.026	0.040	–0.125	0.070*
Missing Unemployed Information	–0.012	0.050	–0.017	0.069	–0.002	0.041	0.009	0.069	–0.003	0.104	0.353	0.197*
<i>Family demographic characteristics</i>												

Table A6
Results of duration models.

	Hazard ratio	Coef.	St.error
<i>Individual demographic characteristics</i>			
Female	1.610	0.476	0.067***
Non-white	0.807	-0.215	0.051***
Education Dummies (less than high school = 0)			
College degree	1.909	0.646	0.093***
Some College	1.551	0.439	0.090***
High School	1.600	0.470	0.092***
Age Dummies (18–20 = 0)			
21–24	1.083	0.080	0.125
25–29	0.478	-0.737	0.180***
30–35	0.175	-1.741	0.328***
Female * Age Dummies (18–20 = 0)			
Female and 21–24	0.743	-0.297	0.079***
Female and 25–29	0.868	-0.142	0.108
Female and 30–35	0.652	-0.428	0.226*
Student	0.911	-0.093	0.041**
Health (Poor or Disabled)	0.779	-0.250	0.147*
Missing Health Information	1.327	0.283	0.064***
<i>Individual economic characteristics</i>			
Unemployed	0.693	-0.367	0.073***
Missing Unemployed Information	0.796	-0.228	0.167
<i>Family demographic characteristics</i>			
Father's Education Dummies (less than high school = 0)			
College degree	1.166	0.153	0.081*
Some College	1.061	0.059	0.081
High School	1.065	0.063	0.073
Missing Father's Education Information	0.744	-0.295	0.084***
Family Size	1.035	0.035	0.011***
Family structure (two-parent family = 0)			
One Parent, Widowed	1.062	0.060	0.067
One Parent, Others	1.023	0.023	0.052
Parental Health (Poor or Disabled)	0.998	-0.002	0.033
<i>Family economic characteristics</i>			
Parent's Family Income/10,000	0.969	-0.031	0.014**
Family Tenure/House Value Dummies (rent = 0)			
Own, House Value Lower 33%	1.106	0.101	0.057*
Own, House Value Middle 33%	1.070	0.068	0.053
Own, House Value Upper 33%	1.083	0.080	0.055
Age Dummies * Parent's Income (18–20 = 0)			
21–24 * Parent's Income/10,000	1.036	0.035	0.013***
25–29 * Parent's Income/10,000	1.038	0.037	0.014***
30–35 * Parent's Income/10,000	1.046	0.045	0.031
Member of Low-Income Sample	0.857	-0.154	0.050***
<i>Family locational characteristics</i>			
City size (500,000 and over = 0)			
100,000–499,999	1.125	0.117	0.057**
50,000–99,999	1.159	0.148	0.068**
25,000–49,999	1.006	0.006	0.072
10,000–24,999	1.022	0.022	0.069
Under 10,000	1.242	0.217	0.067***
Missing City Size Information	1.214	0.194	0.067***
Economic conditions			
If Recession Year	0.403	-0.908	0.072***
State Real GDP Growth Rate	0.990	-0.010	0.006*
State Unemployment Rate	0.924	-0.079	0.013***
State Average Real Wage/1,000	1.023	0.023	0.009***
<i>Housing market conditions</i>			
ln(State Median Gross Rent)	0.264	-1.331	0.487***
ln(State Median House Value)	0.997	-0.003	0.181
State Dummies	YES		
Log pseudolikelihood	-43,322		
	Wald chi2(93) = 1238.82		
No of individuals	7894		

Note:

- Results are weighted with using the PSID individual weights.
- State-level housing market characteristics are annually interpolated before 2000 because annual data are available only after 2000.

* $P < 0.10$.

** $P < 0.05$.

*** $P < 0.01$.

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Appendix A.

See Tables A1–A6.

References

- Aassve, A., Billari, F.C., Mazzucco, S., Ongaro, F., 2002. Leaving home: a comparative analysis of ECHP data. *Journal of European Social Policy* 12, 259–275.
- Avery, R., Goldscheider, F.K., Speare, A., 1992. Feathered nest/gilded cage: parental income and leaving home in the transition to adulthood. *Demography* 29, 375–388.
- Billari, F.C., Liefbroer, A.C., 2007. Should i stay or should i go? The impact of age norms on leaving home. *Demography* 44 (1), 181–198.
- Billari, F.C., Philipov, D., Baizán, P., 2001. Leaving home in Europe. The experience of cohorts born around 1960. *International Journal of Population Geography* 7, 339–356.
- Choi, J.H., Painter, G., 2012. Household Formation and Unemployment Rate: A Vector Autoregressive Approach. Working Paper.
- Cox, D.R., 1972. Regression models and life-tables. *Journal of the Royal Statistical Society* 34 (B), 187–220.
- De Jong Gierveld, J., Liefbroer, A.C., Beekink, E., 1991. The effect of parental resources on patterns of leaving home among young adults in the Netherlands. *European Sociological Review* 7, 55–71.
- Ermisch, J., Di Salvo, P., 1997. The economic determinants of young people's household formation. *Economica* 64, 627–644.
- Ermisch, J., 1999. Prices, parents, and young people's household formation. *Journal of Urban Economics* 45 (1), 47–71.
- Goldscheider, F.K., DaVanzo, J., 1989. Pathways to independent living in early adulthood: marriage, semiautonomy, and premarital residential independence. *Demography* 26, 597–614.
- Goldscheider, F.K., Goldscheider, C., 1989. Family structure and conflict: nest-leaving expectations of young adults and their parents. *Journal of Marriage and the Family* 51, 87–97.
- Goldscheider, F.K., Goldscheider, C., 1993. Leaving Home Before Marriage: Ethnicity, Familism and Generational Relationships. University of Wisconsin Press, Madison, WI.
- Goldscheider, F.K., Goldscheider, C., 1998. The effects of childhood family structure on leaving and returning home. *Journal of Marriage and the Family* 60, 745–756.
- Goodman, A.C., 1988. An econometric model of housing price, permanent income, tenure choice, and housing demand. *Journal of Urban Economics* 23, 237–253.
- Haurin, D.R., Hendershott, P.H., Kim, D., 1993. The impact of real rents and wages on household formation. *Review of Economics and Statistics* 75, 284–293.
- Haurin, D.R., Rosenthal, S., 2008. The influence of household formation on homeownership rates across time and race. *Real Estate Economics* 35 (4), 411–450.
- Heckman, J.J., 1979. Sample selection bias as a specification error. *Econometrica* 47 (1), 153–161.
- Henderson, J.V., Ioannides, Y.M., 1983. A model of housing tenure choice. *American Economic Review* 73, 98–111.
- Johnson, R.W., DaVanzo, J., 1998. Economic and cultural influences on the decision to leave home in peninsular Malaysia. *Demography* 35, 97–114.
- Jones, L.D., 1989. Current wealth and tenure choice. *Real Estate Economics* 17 (1), 17–40.
- Juster, F.T., Smith, J.P., Stafford, F., 1999. The measurement and structure of household wealth. *Labour Economics* 6, 253–276.
- Linneman, P., Wachter, S., 1989. The impacts of borrowing constraints on homeownership. *Real Estate Economics* 17 (4), 389–402.
- Mulder, C.H., Clark, W.A.V., 2000. Leaving home and leaving the state: evidence from the United States. *International Journal of Population Geography* 6, 423–437.
- Mulder, C.H., Wagner, M., 1993. Migration and marriage in the life course: a method for studying synchronized events. *European Journal of Population* 9, 55–76.
- Murphy, M., Wang, D., 1998. Family and sociodemographic influences on patterns of leaving home in postwar Britain. *Demography* 35, 293–305.
- Myers, D., Yu, Z., 2010. Misleading comparisons of homeownership rates between groups and over time? The effects of variable household formation. *Urban Studies* 47, 2615–2640.

- Mykyta, L., Macartney, S., 2011. The Effects of Recession on Household Composition: “Doubling Up” and Economic Well-Being. SEHSD Working Paper Number 2011–4.
- Painter, G., 2000. Tenure choice with sample selection: differences among alternative samples. *Journal of Housing Economics* 9 (3), 197–213.
- Surkyn, J., Lesthaeghe, R., 2004. Values Orientations and the Second Demographic Transition (SDT) in Northern, Western and Southern Europe: An Update. Vrije Universiteit Brussel, Interface Demography, 2002.
- Whittington, L.A., Peters, H.E., 1996. Economic incentives for financial and residential independence. *Demography* 33, 82–97.