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**WHAT RENTERS NEED FOR HOUSING STABILITY: A LONGITUDINAL
ANALYSIS OF INVOLUNTARY RESIDENTIAL MOBILITY IN THE UNITED
STATES**

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Abstract

Due to the shortage of affordable housing in the United States, an increasing number of renters are struggling to maintain housing stability. However, few explanations exist for why some renters keep housing in response to increasing-housing-cost burdens where others involuntarily relocate. Applying hybrid models to a nationwide panel dataset, the Panel Study of Income Dynamics (PSID), this study estimates the effects of economic security, mobility, family composition, and personal vulnerabilities on involuntary residential mobility. The findings show that renters are more likely to experience involuntary residential mobility due to job insecurity, a deterioration in health conditions, a lack of savings, an absence of an automobile, living with non-family members, and more children within a family. These findings contribute to understanding variations in ability to maintain housing stability in the private housing market that is increasingly tight and inform housing researchers, policymakers, and local practitioners seeking the most effective intervention for preventing housing instability and its negative consequences.

Introduction

Due to rising housing costs, stagnated or declining incomes, and a lack of federal housing assistance, a number of renting families suffer from severe housing-cost burdens (Desmond, 2015). In 2014, 49 percent of all renters were cost burdened, paying more than 30 percent of their household incomes for housing costs, and 24 percent of the renters were severely cost burdened, spending more than half of their household incomes on housing costs (Joint Center for Housing Studies of Harvard University, 2015). Although the lack of affordable housing is commonplace, federal housing assistance is substantially insufficient; only 24 percent of the 19 million families eligible for the federal housing assistance are receiving any type of housing

supports (Joint Center for Housing Studies of Harvard University, 2013). The rest of them have to fend for themselves in the private housing market that is increasingly tight.

As a result of these trends, housing circumstances among low-income renters, perhaps lying at the bottom of rental housing markets have become highly unstable. Housing instability, as the antithesis of housing stability, usually refers to a variety of housing circumstances where families do not have enough *control* over their residential environments, so they have to move at undesirable times to undesirable places (Beer, 2011; Grier & Grier, 1978; Newman & Owen, 1982; Wiesel, 2014). In many studies, housing instability refers to various housing conditions, such as (1) circumstances where families suffer from high-housing-cost burdens, (2) situations where households reside in overcrowded or doubled-up housing, or (3) a harbinger of homelessness (Burgard, Seefeldt, & Zelner, 2012; ICPH, 2011; Reid, Vittinghoff, & Kushel, 2008; Rollins et al., 2012; Suglia, Duarte, & Sandel, 2011; Tsemberis, McHugo, Williams, Hanrahan, & Stefancic, 2007; Vijayaraghavan, Jacobs, Seligman, & Fernandez, 2011). Housing instability is often manifested in a sequence of residential moves that are unexpected, unintentional, and involuntary (Cohen & Wardrip, 2011; Phinney, 2013; Skelton, 2002).

A large amount of evidence consistently shows that an increasing number of low-income renters involuntarily leave their housing (Coulton, Theodos, & Turner, 2009; Desmond & Shollenberger, 2015; Phinney, 2009). For example, in Milwaukee, more than one of every eight renters experienced forced moves due to formal or informal eviction, landlord foreclosure, or building condemnation, from 2009 to 2011 (Desmond & Shollenberger, 2015). Evidence from the Women's Employment Study (WES) shows that, among female welfare recipients with children, one of every five families moved six or more times during a six-year period—or equivalently, at least once a year—and almost 40 percent of the families experienced forced moves—due to

eviction, homelessness, or doubling up—during the same period (Phinney, 2009). According to the Making Connections Initiative, a survey of low-income communities in 10 American cities, 46 percent of all families that changed their addresses during a three-year period moved in response to financial stress or problems in their rental housing arrangements (Coulton et al., 2009).

The prevalence of housing instability matters: housing instability is not just a consequence of poverty, but also a significant source of many problems that the poor face. Housing instability can negatively affect the educational environments of children (Cohen & Wardrip, 2011; Crowley, 2003), employment and job performance (Desmond & Gershenson, 2016a), physical and mental health (Burgard et al., 2012; Desmond & Kimbro, 2015; Rollins et al., 2012), social relationships, and subjective well-being (Oishi, 2010). At the neighborhood level, housing instability is associated with high rates of school turnover, neighborhood and community instability, and the concentration of poverty (Desmond, 2016).

Despite the prevalence of housing instability and its detrimental impacts, the question of how renters increasingly fail to maintain housing stability in the private rental housing market remains largely unanswered (Lubell, 2015). A few studies have examined unstable housing circumstances of poor families (S. Clark, 2010; Desmond, 2016; Skobba & Goetz, 2013). These studies do provide some insights into various circumstances wherein renting families suffer from housing instability: for example, a variety of reasons that force renting families to move out (S. Clark, 2010), various types of shared living arrangements among very low-income renters (Skobba & Goetz, 2013), or formal or informal conflicts between tenants and their landlords (Desmond, 2016). However, because these studies heavily rely on detailed interviews or surveys based on a small fraction of renting families, mostly very poor families, they barely explain how

typical their sample families are, to what extent their findings can be generalized, and how renters increasingly fail to maintain housing stability even though they were stably housed before.

For a number of housing policy researchers, how low-income households move has been an important subject. Numerous studies have examined public-driven residential displacement largely caused by housing redevelopment projects, or mobility patterns among subsidized households in particular policy contexts; for example, location outcomes among voucher holders (Galvez, 2011), among HOPE VI relocates (Kleit & Galvez, 2011), or among participants in the Moving to Opportunity (MTO) demonstration (Rosenblatt & DeLuca, 2012). Considering the long-lasting federal housing policies intended to disperse concentrated urban poverty (Goetz, 2003), this focus is reasonable. However, outside of the focus on subsidized renters, private-driven residential displacement occurring in the private rental housing market has been largely neglected, even though the majority of renting families suffer from a lack of affordable housing choices for long-stay housing—much before they consider moving to neighborhoods with high opportunities.

The Department of Housing and Urban Development (HUD) clearly sets housing stability as one of policy goals for “vulnerable population” (U.S. Department of Housing and Urban Development, 2014, p. 8). Yet, few explanations exist about what conditions renters should meet for housing stability in the private market. In many policy contexts, housing stability is often assumed that it would be achieved if housing policies provide affordable housing with decent residential quality (e.g., Cunningham & MacDonald (2012)). Under this assumption, many housing researchers have strived to figure out how to provide affordable units in an efficient way. However, an increasing amount of evidence—which will be discussed in detail

below—suggest that the condition for housing stability may be much complicated than previously thought. To be specific, increasing-housing-cost-burdens cause the displacement of some families and not others (Desmond & Gershenson, 2016b). If involuntary residential mobility (IRM) is not a simple consequence of a high housing cost burden, what other factors exist behind the housing burden? Finding answers to this question can be a prerequisite for the effective design of housing and social policies.

This study aims to explain variations in ability to maintain housing stability in the private rental market. To do so, this study empirically evaluates the effects of the potential household characteristics that could affect involuntary residential mobility but have been largely overlooked in the context of housing instability through testing several hypotheses about: (1) economic security (i.e., job stability, health conditions, and wealth), (2) mobility (i.e., car ownership), (3) family composition (i.e., shared living arrangements with families and non-families), and (4) personal vulnerabilities (i.e., racial minorities, immigrants, and families with children). By applying hybrid models to the nationwide panel dataset known as the Panel Study of Income Dynamics (PSID), this study contributes to understanding variations in ability to maintain housing stability and informs housing researchers, policymakers, and local practitioners seeking the most effective intervention for preventing housing instability and its negative consequences.

The Duality of Residential Mobility among Renting Families

For several decades, the large body of literature on residential mobility has tended to view residential mobility as an event that occurs voluntarily, and as an instrumental goal for generating wellbeing (Dieleman, 2001; Quercia & Rohe, 1993; Rossi, 1955; Speare, 1974).

According to the classic *residential attainment* view, residential mobility has been regarded as “the process by which families adjust their housing to the housing needs that are generated by the

shifts in family composition that accompany life cycle changes.” (Rossi, 1955, p. 9) This perspective explains the large portion of residential moves that occur voluntarily and entail the improvement of residential environments, such as changing from being a renter to being a homeowner, or transitioning from a low-quality unit to a high-quality unit (W. Clark, Deurloo, & Dieleman, 2003). However, in current rental housing circumstances, where the number of low-income renters suffering from high-housing-cost burdens has surged beyond precedent, housing researchers increasingly emphasize the need for an alternative view that explains residential mobility in the context of housing instability (Coulton et al., 2009; Desmond, Gershenson, & Kiviat, 2015; Kleit, Kang, & Scally, 2016; Phinney, 2013; Skobba & Goetz, 2013).

In responding to the growing demand for an alternative view on residential mobility, Desmond and his colleagues (2015) propose a U-shaped relationship between household income and residential mobility. At one side of the relationship, renting families are likely to move (voluntary mobility) as their incomes increase, whereas as their incomes decrease, they are likely to be immobile (immobility/housing stability) due to decreasing housing options that they can afford. This pattern supports the conventional *residential attainment perspective*, arguing that residential mobility is a change for better well-being or living environments. At the other side of the relationship, as households’ incomes decline further, they are more likely to be displaced because they cannot afford their current dwellings (involuntary mobility), whereas as their incomes increase, they are likely to stay (immobility/housing stability). Desmond and his colleagues (2015) call this alternative relationship between income and mobility the *residential instability perspective*. This U-shaped relationship provides some insight into the double-sided meaning of residential mobility (Coulton et al., 2009). Residential mobility can be a symptom of positive changes in a family’s circumstances, such as being a homeowner for the first time,

moving to be close to a workplace, or trading up to a larger or better-quality housing unit. However, it can also be a symptom of housing instability, such as making consecutive moves due to eviction.

Much empirical evidence have identified these two different meanings embedded in low-income renters' residential moves (S. Clark, 2010; Coulton et al., 2009; Desmond & Shollenberger, 2015; Skobba & Goetz, 2013). For example, evidence from the Making Connections Initiative—focusing on low-income communities in 10 cities—suggests that, although 46 percent of all low-income renters who relocated during a three-year period were “churning movers,” who moved frequently due to financial stress or problems in their rental housing arrangements, 30 percent of the movers were “up-and-out movers,” who moved to new neighborhoods with low-poverty (Coulton et al., 2009, p. 12).

Even after these pioneering studies, many questions remain unanswered in the relationship between housing affordability and housing instability: Is residential mobility as a symptom of housing instability a simple consequence of an increasing-housing-cost-burden? Why can some people keep their housing in response to increasing-housing-cost burdens, whereas others involuntarily move out?

Determinants of Involuntary Residential Mobility

Existing studies have pointed out that housing choices for long-stay housing are highly limited, not just by monetary factors, but also by a broader set of destabilizing sources. However, few works have evaluated potential factors that influence residential mobility that occurs involuntarily. To challenge the presumption that renters involuntarily move out only because of increasing-housing-cost-burdens and specific the determinants addressed in this study, this section introduces a list of determinants of involuntary residential mobility. In choosing the

determinants, this study particularly focuses on the factors that have been widely known as constraints that many low-income households often confront in various contexts, but have not been conceptually and empirically linked to involuntary residential mobility. These factors are mainly derived from the review of several pioneering studies on household characteristics that are likely to be exposed to unstable housing circumstances—though defined by different measures. The factors reflect ability to have housing options that renters can maintain their residence at the first place, as well as ability to maintain their housing.

Economic Security

Hypothesis 1a. *All else equal, a renter will be more likely to experience involuntary residential mobility if the renter is unstably employed.* Economic security is an essential condition for most renters to maintain housing stability. Low-income families tend to work in entry-level, low-wage jobs that are less likely to be protected from termination, so their financial conditions can be insecure due to irregular working hours or insecure employment (Kalleberg, 2009). Evidence from the Milwaukee Area Renters Study (MARS) suggests that job loss is a valid predictor of eviction; to be specific, renting families who have lost their jobs are approximately twice as likely to be evicted than the average Milwaukee renter (Desmond & Gershenson, 2016b). Desmond and Gershenson provide two explanations for this significant effect of job loss on eviction after controlling for changes in household income. First, renting families who have lost their jobs have to move out of their housing due to the loss of predictable future income; in other words, they may think their incomes cannot be recovered in the short term, so they move out. Second, from a landlord's perspective, falling behind in rent due to job loss can be understood differently from other reasons for missing rent payments. Landlords may be uncertain of how their unemployed tenants will be able to catch up or pay their rent the next month, and they may

evict laid-off tenants more strictly than they do similar tenants who fall behind for other reasons. Thus, renters may be more likely to lose their housing when they and their landlords predict that they will not be able to recover from their income loss soon.

Hypothesis 1b. *All else equal, a renter will be more likely to experience involuntary residential mobility if the renter experiences a deterioration in health conditions that limits his or her type of work or the amount of work he or she can perform.* Conventionally, health conditions have been regarded as human capital (Becker, 1964). A large amount of evidence suggests that people in good health are more likely to be economically productive and to have higher incomes, whereas disability often reduces labor market productivity (see the review in Currie and Madrian (1999)). Moreover, a deterioration in health conditions may cause additional medical costs, which can directly raise housing-cost burdens. Therefore, renting families who experience a deterioration in their health conditions that affects their working performances may predict that they will not recover from their economic circumstances quickly and thus will have to move out of their current residences. Or, similar to the logic of the impact of job loss, from a landlord's perspective, these families are not able to pay their rents due to their health conditions, so the landlord may more strictly evict these families when they miss rent payments.

Hypothesis 1c. *All else equal, a renter will be less likely to experience involuntary residential mobility if the renter possesses more savings and wealth.* For several decades, building wealth has been regarded as a significant factor in helping poor families to achieve the individual well-being derived from long-term economic stability and social protections (McKernan & Sherraden, 2008; Sherraden, 1991). Undoubtedly, wealth can work as a financial cushion to sustain low-income households' lives during economic downturns and to help them to take advantage of the wide array of opportunities in society (Rosenheck, Bassuk, & Salomon,

1998). In a similar logic, wealth may help renters to cope with soaring-housing-cost burdens from a short-term perspective. Renters may be able to maintain housing stability via financial resources, derived from saving accounts, the sale of possessions, and various forms of credit, whereas a lack of wealth may place families at a heightened level of vulnerability to involuntary residential mobility.

Mobility

Hypothesis 2. *All else equal, a carless renter will be more likely to experience involuntary residential mobility.* Much evidence points out that an increasing number of affordable rental units have become located outside of central cities where families need personal vehicles to maintain their daily activities. For example, according to the Joint Center for Housing Studies of Harvard University (2015), most affordable single-family rental units—which is currently a major source of rental housing supply—exist in non-central cities; to be specific, 42 percent of units renting for less than \$400 a month are located in non-metro areas and 27 percent in the suburbs. Under these market circumstances, having a personal vehicle can be a vital condition for accessing affordable housing units, which may allow renting families to maintain housing stability.

Still, in many US cities, non-central areas are not sufficiently served by public transportation systems. In this context, numerous studies have pointed out that having a personal vehicle is substantially beneficial to low-income households through overcoming a *modal* mismatch. Personal automobiles positively facilitate searching for and commuting to jobs, which can directly increase the likelihood of finding and retaining employment (Grenge, 2010; Kawabata, 2009). Generally, automobile ownership is related to higher employment rates, higher

weekly hours worked, higher hourly earnings (Raphael & Rice, 2002), and shorter unemployment duration (Dawkins, Shen, & Sanchez, 2005).

Within the available literature, no study has examined the relationship between car ownership and housing stability. However, having a car may help renters to find and reside in affordable housing units distributed over a local housing market, whereas carless families may have to choose to reside near public transits (Rosenblatt & DeLuca, 2012). This difference in sets of available housing options may affect the ability to maintain housing stability among renters.

Shared Living Arrangements

For renters who struggle with paying their soaring rents, housing stability is closely linked to social ties. Conventionally, residential mobility entails changes in family composition, such as marriage (Rossi, 1955). In the case of involuntary residential mobility, it is also widely known household instability, such as separation, divorce, domestic abuse, or other household conflict factors—all of which are more likely to happen among low-income households—can trigger involuntary residential mobility. Desmond and Perkins (2015) find that housing instability tends to be accompanied by household instability—changes in the composition of adults living in a same housing unit. They find that more than half of renters experienced household composition change accompanied by a recent move in Milwaukee from 2009 to 2011.

Hypothesis 3. All else equal, a renter who lives with adult family members or non-family members will be less likely to experience involuntary residential mobility. Compared to the role of marital status discussed above, little is known about the role of shared living accommodations in triggering or reducing involuntary residential mobility even though many low-income renters choose to reside in to save money. Mykyta and Macartney (2011)'s work show that the rate of

doubled-up households tends to increase during the recent financial crisis. For young adults, living with parents can be one option for housing stability if they expect they cannot afford housing costs by themselves when they find units in private markets (Wagner & Mulder, 2015). When renters experience financial or social shocks, such as marriage dissolution (Feijten & van Ham, 2010), they often rely on their families, relatives, or friends. However, some qualitative works point out that these shared living arrangements do not always have a positive role in providing stable housing, especially, when these living arrangements rely heavily on weak social relationships. Sometimes, in response to a lack of housing options in private rental markets, low-income families decide to live with strangers to reduce their housing or living costs and to share some furniture, relying on informal agreements (Desmond, 2016; Skobba & Goetz, 2013). Such informal shared living accommodations are easily disturbed by small relationship conflicts, which may cause the low-income families to move out unexpectedly. These findings lead me to hypothesize that living with adult family members will likely help renting families to avoid involuntary residential mobility, whereas living with non-family members will likely push them to move out involuntarily.

Personal Vulnerabilities

Recently, a group of scholars emphasize several household characteristics that reflect a socially vulnerable status in private housing markets (McConnell, 2016; Pendall, Theodos, & Franks, 2012; Pendall, Theodos, & Hildner, 2016). In other words, some renting families often face fewer housing options in private rental markets due to their sociodemographic characteristics. Based on the review on existing studies, this study focuses particularly on examining the role of three sociodemographic characteristics in experiencing involuntary residential mobility.

Hypothesis 4a. *All else equal, a renter who is a member of a racial or ethnic minority*

will be more likely to experience involuntary residential mobility. Racial minorities often have higher levels of unemployment and fewer financial and social resources compared to their non-minority counterparts. Evidence from the American Community Survey shows that minority families likely have multiple vulnerabilities associated with precarious housing, such as living in overcrowded, deteriorated, or unaffordable housing (Pendall et al., 2012). Also, as a consequence of a long history of structural racism in housing markets (Massey & Denton, 1993), many African Americans often face racial discrimination in searching for housing units (Galster & Godfrey, 2005), which has contributed to racial segregation in many American cities. One logic behind this hypothesis is that, if landlords generally prefer to rent their homes to non-minority families could have stable jobs and incomes as landlords expect, landlords may more strictly evict minority families than non-minority families.

Hypothesis 4b. *All else equal, a renter who has more children in the family will be more likely to experience involuntary residential mobility.* The number of children can be a significant predictor of involuntary mobility. Landlords often refuse to accept families with children searching for one- or two-bedroom apartments due to the concerns about economic costs from overcrowding, such as wear-and-tear costs, the increased risk of damage to property, increased management costs, noise, increased demands for parking, and so on. They also often screen families with children, as they believe that children can cause problems: annoying neighbors or attracting unnecessary attention from the police and state agencies (Desmond, 2012).

Empirical evidence demonstrates that the two-person-per-bedroom standard—a widely used occupancy standard followed by private landlords since the HUD included this standard in the Keating Memo (see Iglesias (2012))—substantially limits the housing choices of families with children. According to the analysis that Sander and Iglesias conducted, 28 percent of

families in the US who are renters comprise three to five members, and 71 percent of the rental apartments consist of studio, one-bedroom, and two-bedroom units. As a result, families with children would violate this standard more than 20 times as often as other households would (Iglesias, 2012). Desmond and his colleagues (2013) show that, among tenants who appear in eviction court, a household with children is more likely to receive an eviction judgement than a household without children would in Milwaukee. Thus, I hypothesize that the number of children significantly raises the possibility of experiencing involuntary mobility.

Hypothesis 4c. *All else equal, a renter who is an immigrant will be more likely to experience involuntary residential mobility.* Immigrants, particularly immigrants after 1990, are widely known to likely suffer from housing instability. They are more likely to be renters and to have fewer financial and social resources than do native Americans. Moreover, they are considered not to be preferred tenants among landlords, as landlords have a clear incentive to screen their tenants' immigration statuses. If landlords rent to unauthorized immigrants, they have to pay penalties. As Oliveri (2009) points out, to avoid any difficulty with checking potential tenants' legal statuses, landlords sometimes refuse to rent to seemingly foreign families and discriminate against them based on accent, name, appearance, or other ethnic markers. According to the Fair Housing Act, national origin is a protected class, so that basically these discriminative practices against immigrant families are illegal, but it is still hard to prove that immigrant families' applications are rejected due to their nation origins—landlords may provide different reasons for rejection, such as insufficient income or a lack of employment information. .Due to the lack of financial and social resources as well as potential discrimination, therefore, immigrant families are more likely to suffer from housing instability (McConnell, 2016).

Data and Methods

This study employs longitudinal data from the Panel Study of Income Dynamics (PSID), which is a nationally representative survey of American families (South & Crowder, 1997). The PSID began in 1968 with approximately 5,000 families (about 18,000 individuals). The PSID contains detailed family-level information, such as residential mobility (e.g., why they moved), housing conditions (e.g., the number of people with whom they lived), and socioeconomic transitions (e.g., family dissolution or unemployment). One advantage of using the PSID is its longitudinal structure, which allows researchers to take advantage of the several statistical advantages, such as identifying causal relationships under weak statistical assumptions.

I delimit the PSID sample in the following ways (see Figure 1). First, I focus on PSID observations from 1999 to 2013, which constitute eight interviews with two-year gaps. This study period is used because in 1997 a large portion of the PSID sample was dropped and a new sample of immigrants—who constitute one group of interest in this study—started to enter the data. Also, information on utility costs and health conditions was not collected before 1997.

A second delimiter, this study focuses on renting families. Being a renter is defined as being a renter when a household responded in one survey year as well as in the next one. By this definition, my analysis does not include families who were residing outside of housing markets (e.g., living in shelters or being institutionalized) and those who were/became homeowners. Due to this selection rule, the panel structure happens to be unbalanced; in other words, renters were not tracked when they became homeowners, but they were tracked again if they became renters again.

Third, I drop the cases of families who refused or were not able to complete key questions relevant to the purpose of this study, such as questions about their reasons for moving, housing costs, and employment statuses. The final analytic sample contains 11,853 observations in 4,757 renting households.

[FIGURE 1 IS ABOUT HERE]

Analytic Approach

In addressing the research hypotheses, several methodological challenges exist. In this section, I explain what those challenges are and how they are addressed in this study. First, to measure the degree of involuntariness in a residential move and separate involuntary moves from others, this study incorporates multiple measures for housing circumstances and reasons for moves. After that, I introduce a list of independent variables that could affect the likelihood of whether a household experienced involuntary residential mobility. In the last part of this section, I explain the rationale behind applying hybrid models to the PSID renters and specify the model structure.

Dependent Variable: Involuntary Residential Mobility

The objective of this study is to understand unstable housing circumstances where renters involuntarily move out. In understanding housing instability, however, one challenge is determining how to measure the degree of involuntariness for a residential move. A total of 5,925 observations in the analytic sample undertook residential moves—including both voluntary and involuntary moves. To sort out reliable involuntary moves from all moves, I consider 1) whether a household was in unstable housing conditions at *year t*, and 2) a retrospective answer for why the renter moved between the times of two surveys conducted at *t* and *t+2* years (see Figure 1).

First, I consider a move to be potentially involuntary only when it occurred under one of the following unstable housing circumstances: (1) a renter was paying more than half of his or her household income for housing, (2) the persons-per-room (PPR) was more than 1.5, or (3) a renter lived with another household (Blake, Kellerson, & Simic, 2007; Kleit et al., 2016). These conditions are widely known as insecure housing circumstances in the existing literature. This selection rule allowed to separate 2,155 residential moves from the other moves that did not occur under any of these unstable housing circumstances.

Second, I regard a move as an involuntary move only when a household moved for non-progressive reasons, following the Freeman's measure of residential displacement (2005). Basically, the PSID data provide nine different reasons for a renter's move.¹ Among those, three answers that reflect non-progressive motivations for moving can be conceptually associated with non-progressive residential mobility as Freeman applies: (1) renters moved because they defined themselves as homeless, (2) renters moved due to outside events, including demolition, eviction, health-related reasons, divorce, or other involuntary reasons, and (3) renters moved for less rent or space. Based on this definition, I identify 616 involuntary residential moves (about 5.20 percent of the eligible sample) from all other moves.

Taking into account both subjective motivations and objective housing conditions of a single move, I believe, can minimize potential bias from possible measurement errors in measuring the degree of involuntariness for the move. Thus, the dependent variable is whether a household involuntarily moved out between t and $t+2$ years. In this study, the other residential

¹ The nine reasons include (1) purposive productive reasons, such as to take another job, (2) job-related reasons, such as to get nearer to work, (3) expansion of housing, such as more space, (4) contraction of housing, such as less rent, (5) other housing-related reasons, such as to want to own home, (6) neighborhood of housing, such as better neighborhoods, (7) involuntary reasons, such as eviction, (8) ambiguous reasons, such as to save money, and (9) homeless.

moves are assumed to be a voluntary or purposive move that reflects more control over residential circumstances than involuntary residential mobility and are regarded as being same as other tenants' decision to stay.

Independent Variables

To address hypotheses 1a-c, I include the following variables (Table 1): (1) a binary variable that measures whether a household head miss work in year $t-1$ because he/she is unemployed, including looking for work, temporarily laid off, or not looking for work (*job insecurity*) (2) a binary variable that measures whether a household head has any health condition that limits the type of work or the amount of work that he/she can do in year t (*health condition*), and (3) a numeric variable that measures the amounts of all account savings (*savings*), other wealth (*wealth*), and debts (*debts*) in year t . Savings include cash assets in all accounts, wealth indicates all other assets than savings (e.g., value of individual retirement account [IRA]/annuity, non-IRA stock, and business/farm), and debts cover debts for the entire family (e.g., credit/store card debt, student loan, and medical bills).

To address hypothesis 2, I include a binary variable that measures whether a household owns or leases a car or other vehicle for personal use in year t (*car ownership*).

To address hypotheses 3, I include numeric variables that measures the number of adult family members who were living together and were neither household heads nor their marriage partners (*the number of adult family members*), and the number of non-family members who were living together in year t (*the number of non-family members*).

With respect to hypotheses 4a-c, I include variables that measure personal vulnerability characteristics. First, I include two dummy variables that account for the race of a household head: whether a household head is African American (*African American*), and whether the race of a household head is non-Black and non-White, such as American Indian, Asian, or Latino (*other minorities*). Second, all renting families in the immigrant sample of the PSID data are assigned to the immigrant group, which is captured by a dummy variable (*Immigrants*, 1 if yes). Lastly, I include a variable that measures the number of children under age 18 within a household (*the number of children in a household*).

Controls

To estimate unbiased and consistent estimates of the variables related to the research hypotheses, it needs to control for the factors that influence the likelihood of experiencing involuntary residential mobility.

First of all, I control for two components of housing-cost-burdens: household income and monthly rent. Changes in these two components directly affect the likelihood of involuntary residential mobility through increasing or decreasing the housing burdens. Household income is measured by the total amount of income during the previous year from all income sources in year t (*household income*). Monthly rent indicates the total amount of rent and utility costs for electricity, heating, water, sewer, and others per month in year t (*rent*).²

Second, to control for situations where a household has multiple income sources, I include two dummy variables that measure the family employment structure in year t : (1)

² In analytic models, the monthly rent variable is decomposed into two variables; household-specific means of monthly rent and deviations from the household-specific mean. The mean part controls for changes in monthly rent over time within a household and the deviation part controls for overall levels of rental market segments that the household belongs to (e.g., overall housing and neighborhood qualities).

whether both a household head and a marriage partner were employed (*dual-income family*) and (2) whether either a household head or a marriage partner was employed (*single-income family*)—whether neither a household head nor a marriage partner was unemployed in the labor force serves as a reference group.

In a similar logic, to control for potential effects from marital status, I include two dummy variables: (1) whether a household head was married (*married*) and (2) whether a household head was dissolved (*marriage dissolved*), including being widowed, divorced, annulled, and separated—whether a household head was single serves as a reference group (*single*).

Since a household receives housing assistance, the household likely avoids involuntary residential mobility. So, I control for the effects of housing assistance by including a variable that indicates whether a household lives in a housing unit that is subsidized by government (*housing assistance*). To separate the effect of stipends given to people who were not work eligible, I include a variable that indicates whether a household received any income from Supplemental Security Income (SSI), which provides stipends to low-income people who are aged 65 or older, blind, or disabled (*receiving SSI*).

Lastly, I control for potential year-specific effects, such as effects of the financial crisis that began in 2007, or effects of regime changes, by including dummy variables for each year (*year*). Moreover, I control for state-specific effects, such as living in rust-belt cities, or landlord-tenant policy approaches at a state level (Hatch, 2016), by including dummy variables for state (*state*).

Hybrid Model

In the process of addressing the research hypotheses, one methodological challenge is that the personal vulnerability characteristics rarely changed over time. First, the variable of being immigrant is time-invariant.³ Second, the variables of being racial or ethnic minorities and the number of children within a household also hardly changed over time, probably through interracial marriage, marriage dissolution of interracial couples, having another child, or leaving parents' home⁴. More important, the research objective is to estimate the effects, not of the life transitions above, but of being racial or ethnic minorities or having more children within a household compared to those without those characteristics. In this context, variations between households are particularly vital to identify contextual effects of personal vulnerabilities, which would provide descriptive information about the differentiated patterns of involuntary residential mobility across different populations.

To apply the analytical approach that needs to consider within- and between-variations simultaneously, this study employs *the hybrid model approach* (Allison, 2009), also called *group mean centering* in the hierarchical modeling literature (Raudenbush & Bryk, 2002), or the *within-between random effects model* in a few studies (Bell & Jones, 2015). Additionally, the hybrid approach is widely known to be much more flexible and efficient compared to conventional panel approaches when researchers handle highly unbalanced panel data (Luke, 2004). Given the unbalanced structure of the sample in this study, the hybrid model could be a more flexible and efficient way of achieving the purpose of this study.

³ The standard deviation of being immigrants between the sample households is 0.283 and the standard deviation within the sample households is zero.

⁴ The standard deviations of (1) being African American, (2) being other racial and ethnic minorities, and (3) the number of children within a household between the sample households are 0.498, 0.247, and 1.183 respectively. The standard deviations of the variables within the sample households are 0.056, 0.082, 0.495 respectively.

Conventionally, scholars in many disciplines have widely used the fixed-effects (FE) approach to analyze panel data. To avoid the problem of heterogeneity bias, the FE approach controls out all between-entity effects with the variance, leading to dummy variables for all entities (Allison, 2009). Because the FE approach only estimates within-effects by using variations within entities, this approach can completely avoid omitted bias from time-invariant variations across entities. With this statistical advantage, the FE approach allows researchers to estimate more robust results than other cross-sectional approaches.

However, applying the FE approach often has its costs. By removing or controlling out the higher-level variance, FE models necessarily lose a large amount of important information obtained from higher-level variance. Moreover, through the FE approach, researchers cannot estimate the general between-effects of the variables that are not changed or are rarely changed over time, which may indicate significant contextual effects. As mentioned above, this limitation of the FE approach is critical in the context of this study, estimating the effects of personal vulnerability characteristics that rarely change over time.

As an alternative analytic approach, the hybrid model allows to overcome the limitation of the FE approach, while simultaneously maintaining the advantages of using panel data—providing policy-relevant inferences under weaker statistical assumptions than do statistical models. In this modeling approach, each variable is decomposed into two parts: (1) deviations from their household-specific means—i.e., within components—and (2) household-specific means of the time-varying variables—i.e., between components. This decomposition allows to estimate the between-effects derived from variations between households, as well as the within-effects derived from variations within each household separately.

In this study, since personal vulnerability characteristics show small variations within each household, I transform those variables into a form of household-specific means and consider them time-invariant variables (“ z_j ” in the Equation 2). Other than these variables, I decompose the other independent variables into two parts: (1) deviations from their household-specific means (“ $x_{ij} - \bar{x}_j$ ” in Equation 1), and (2) household-specific means (“ \bar{x}_j ” in Equation 2). After the decomposition, the set of deviations from household-specific means is used to estimate within-effects of the independent variables other than personal vulnerability characteristics as a conventional FE model does. The set of the household-specific means is used as a control variable to estimate the contextual effects of the personal vulnerability variables (Bell & Jones, 2015). The basic model structure is as follows:

$$\text{Equation 1: } y_{ij} = \beta_{0j} + \beta_{1j}(x_{ij} - \bar{x}_j) + e_{ij} \text{ and}$$

$$\text{Equation 2: } \beta_{0j} = \beta_0 + \beta_2 z_j + \beta_3 \bar{x}_j + u_j,$$

where y_{ij} is the dependent variable (in this study, whether a household experienced involuntary residential mobility between t and $t+2$ years), x_{ij} refers to a series of the independent variables other than personal vulnerabilities, \bar{x}_j is household-specific means of the independent variables other than personal vulnerabilities, z_j indicates household-specific means of the personal vulnerability characteristics, β_0 is an intercept, β_{1j} refers to coefficients that indicate within-effects of x_{ij} , β_2 refers to coefficients that indicate effects of personal vulnerabilities, β_3 refers to coefficients that indicate between-effects of x_{ij} , u_j is a random coefficient for household j , and e_{ij} is a residual for observation i of household j . To control for year- and state-specific effects, the hybrid models in this study include dummy variables for each year and state; to be specific, the year dummies are included in all analytic models, but the state dummies are only included

when the models estimate between-effects of personal vulnerabilities that are derived from variations between households, perhaps living in different states.

Additionally, unlike the standard hybrid model, I apply the hybrid model as a form of a logistic model to avoid any statistical problems generated by the nonlinear outcome. Compared to linear hybrid models, non-linear hybrid models may not work well under certain conditions, but the expected bias would be marginal in most common data situations (Allison, 2014).

Results

Table 2 presents the results from six hybrid models. Here, because household-specific means of the independent variables other than personal vulnerabilities are used as a control variable (“ β_3 ” in Equation 2), the estimated coefficients of those variables are not presented.

First, I begin with a model that includes only the control variables associated with a housing-cost-burden, household employment structure, and housing and welfare policies (Model 1). Not surprisingly, renters are more likely to experience involuntary residential mobility, as their rents increase and as their household incomes decrease over time. Model 1 also displays the significant effect of housing assistance—receiving rent subsidies or living in public housing. However, being single-income households, being dual-income households, and receiving subsidies from SSI did not have a significant relationship with involuntary residential mobility. Therefore, these variables are not retained in the remaining models.

To address hypotheses 1a-c, I estimate the effects of job insecurity, limiting health condition, savings, wealth, and debts. Model 2 displays evidence showing that renters are more likely to experience involuntary residential mobility when their jobs become insecure than when

their jobs are secure. The estimated coefficient shows that being unstably employed increases the log-odds of involuntary mobility by 0.276—even after controlling for household income.

In addition, Model 2 shows that renters are more likely to experience involuntary mobility when their health conditions for working performance are limited compared to when the conditions are not—after controlling for household income and job insecurity. Even though this effect is marginally significant, perhaps due to the correlation between limiting health conditions and job insecurity, the estimated coefficient shows that being in deteriorated health conditions increases the log-odds of involuntary mobility by 0.350.⁵

Model 2 also supports the argument that savings can work as a financial cushion helping renting families to maintain housing stability; having \$1,000 in saving accounts reduces the likelihood of moving out involuntarily by 0.022. However, I find no significant effect of wealth and debts. This result implies that compared to other types of wealth, having more savings, which are a type of wealth that can be easily converted to cash, directly reduces the likelihood of involuntary mobility.

To address hypothesis 2, Model 2 displays the significant effect of having a car which significantly reduces the likelihood of experiencing involuntary moves by 0.426. It means a renter is less likely to experience involuntary mobility when the renter has a vehicle compared to when the renter does not.

⁵ Statistically speaking, estimating coefficients by using variations within a household must sacrifice statistical efficiency to achieve unbiasedness of the coefficients (Plümper & Troeger, 2007). Even though the hybrid models in this study include a large number of observations for estimation, only a limited number of them are actually used to estimate coefficients of deviations from household-specific means, which directly affect the efficiency of each model. Thus, in this study, I decide to interpret the significant findings at the 10 percent significant level, some of which may not be strong evidence.

To address hypothesis 3, Model 3 estimates the effects of family composition characteristics on involuntary mobility. It presents evidence showing that more non-family members the renter lives with, the more likely they are to move involuntarily. However, Model 3 shows no evidence on significant effects of being married, being dissolved, and living with adult family members on involuntary mobility.

To address hypotheses 4a-c, I add the personal vulnerability variables as a form of household-specific means of the variables to the previous model. Also, Model 4 includes state dummies to control for state-specific effects that could affect variations *between* households.⁶ Model 4 displays evidence showing that renters having more children are at higher risk of involuntary residential mobility. The result shows that, as a family has one more child, the log-odd of involuntary mobility increases by 0.149. Different from my expectation, Model 4 shows that African-American renters are less likely to experience involuntary mobility. To specify this significant effect of being African American, I additionally estimate several interaction terms in the following model. Other minority and immigrant families show no significant relationship with involuntary residential mobility.

Based on the result that involuntary residential mobility is closely related to two groups, African American households and households with children, I estimate two additional models. These models are intended to explore potential differentiated effects among these groups. Here, I present only significant results.

Model 5 adds several interaction terms between being African-American and other independent variables. To begin with, the effect size of housing costs is larger among African-

⁶ Because no involuntary mobility occurs in some states, 150 observations are dropped.

American households; this means they tend to easily experience involuntary residential mobility in response to changes in housing costs. To be specific, the estimated coefficient of the interaction term means the difference between the log-odds ratio corresponding to a change in rent by \$1,000 among White households and the log-odds ratio corresponding to a change in rent by \$1,000 among amongst African American households and the difference shows the log-odds ratio among African American households are higher than White households by 0.420.

In Model 5, the effect of wealth other than savings among White households appears to be significant—savings do not show any significant difference. This change means White households that have larger amounts of wealth are less likely to experience involuntary residential mobility. However, this positive effect is largely cancelled out among African-American families. Moreover, by adding the interaction terms, the effect of being married ends up being significant among White households; in other words, White renters are less likely to experience involuntary residential mobility when they are married. This positive effect of marriage found among White households, however, is largely cancelled out among African-American renters.

Model 6 adds several interaction terms between the number of children within a household and other variables. Here, I only present the significant results. In Model 6, the effect size of household income becomes relatively small as households have more children; in other words, households that have more children tend to easily experience involuntary residential mobility in response to changes in household incomes. Moreover, renters that have more children are much more likely to experience involuntary residential mobility after their marriage relationships are dissolved compared to renters that have less children.

Regarding the findings introduced above, I estimate several additional models to address several issues (not presented). First, some may be concerned about the possibility that the positive effect of having a car comes from selling the car. To separate out this effect of having an automobile, so called *wealth* effect, I estimate another model based on Model 3 by including one more variable that measures whether a renter sold a car between year t and year $t+2$. The result shows no significant effect of selling a car and, whereas the effect of having a car ($\beta=-0.492$, $SE=0.215$) remains significant at the 5 percent significant level after controlling for the effect of selling a car.

One concern may exist about the negative effect of the number of non-family members who are living together. The operationalized definition of involuntary mobility in this study already considers doubled-up housing situations as one type of unstable housing circumstances before experiencing involuntary residential mobility, so this operationalization may influence the result. To reduce any statistical problem from this endogeneity, I estimate another model considering only two types of unstable housing circumstances in measuring involuntary residential mobility, a severe-housing-cost-burden and living in overcrowded housing. With this modified definition, the result still shows that the number of non-family members that are living together ($\beta=0.250$, $SE= 0.75$) significantly increases the likelihood of experiencing involuntary residential mobility at the 0.1 percent significance level.

Lastly, I estimate weighted hybrid logistic models, even though some statisticians are skeptical about whether weighting actually improves panel analyses (Himelein, 2014). As a result, I find no real difference in the estimated coefficients of key independent variables.

Discussion and Policy Implications

Due to the shortage of affordable housing in the United States, an increasing number of renters are struggling with housing instability. However, few explanations exist for why some renters keep housing in response to increasing-housing-cost burdens whereas others move. Applying hybrid models to a nationwide panel dataset, this study investigates empirically the effects of economic security, mobility, family composition, and personal vulnerabilities on involuntary residential mobility. Through this examination, I find several findings that overturn the common presumption that housing instability is a simple consequence of a high-housing-cost burden, although that is part of the picture.

First, the findings consistently support the argument that renters are more likely to experience involuntary residential mobility when they face the loss of predictable future income and have no wealth to cover the loss. To be specific, insecure employment, a deterioration in health conditions, and a lack of savings significantly increase the likelihood of involuntary mobility. These results imply that an increasing-housing-cost burden as a shock is more likely to cause involuntary residential mobility when the shock is combined with the absence of ability to respond to the shock. For example, as presented in Table 3, the predicted probability of experiencing involuntary mobility increases about five percent when a renter experiences an income loss that entails job insecurity and limiting health conditions compared to when the renter experiences only the income loss—under the assumption that a monthly rent increases by \$1,000 and a household income decreases by \$5,000. The findings also imply that involuntary residential mobility is the problem that intensifies along with widening health and wealth disparities in the United States.

[TABLE 3 IS ABOUT HERE]

Second, car ownership works as a significant condition for renters to avoid involuntary residential mobility. By having a car, renters may be able to choose housing units that they can afford in the first place, or their relocation may be perceived as more purposive and intentional due to extended housing options. On the contrary, carless renters may have to choose housing units near existing public transit lines for commuting or daily activities, even though they cannot fully afford those units. Table 3 shows that the predicted probability of experiencing involuntary mobility increases about three percent when a renter has no personal vehicle compared to when the renter has at least one vehicle.

Third, involuntary residential mobility is closely associated with family or non-family members with which renters live. The findings support the argument that, for some renters, housing stability depends on the stability of social relationships (Skobba & Goetz, 2013). The results show no evidence suggesting that shared living arrangements help households avoiding involuntary residential mobility. Rather, the results show that they are much more likely to experience involuntary residential mobility as renters live with more non-family members that reflect housing circumstances relying on relatively unstable social relationships. For example, Table 3 shows that the predicted probability of experiencing involuntary mobility when a renter experiences soars as the number of non-family members that a household lives with increases. The number of adult family members that renters live with reduces the likelihood of experiencing involuntary residential mobility, but this coefficient is not significant. These results are consistent with the mixed role of shared living arrangements in the existing literature; those arrangements could help renters being stable housed, but those could cause renters to move out.

Fourth, households with more children are particularly more likely to experience involuntary mobility. It implies that potential barriers that hinder larger households from

achieving housing stability exist. The barriers could be a lack of rental units for larger families, a lack of affordable childcare services, or discriminative practices against children by landlords.

Table 3 indicates that the predicted probability of experiencing involuntary mobility increases by about five percent when a household has three children compared to when the household has no child. This result supports the argument by Iglesias (2012) that the two-person-per-bedroom standard—a widely used occupancy standard followed by private landlords—substantially limits the housing choices of families with children. This finding is also consistent with the literature showing high rates of eviction among families with children (Desmond et al., 2013).

Fifth, the results suggest that changes in household income and rents affect involuntary residential mobility differently across different populations; to be specific, African-American households are more likely to experience involuntary mobility in response to changes in rent, and households that have more children are more likely to experience involuntary mobility in response to changes in household income.

Sixth, even though the focus of this study is not on evaluating the role of marital status in housing instability, the findings suggest that involuntary residential mobility is closely associated with marriage and marriage dissolution events. To be specific, African-American households are more likely to experience involuntary mobility after they are married, and households that have more children are more likely to experience involuntary mobility when their marriage relationships are dissolved. This result is consistent with the finding of Desmond and Perkins (2015) suggesting that housing instability is associated with household instability in different ways across sociodemographic groups.

This study has several limitations. First, the estimated coefficients of the personal vulnerability variables may not be completely free from omitted bias from time-invariant factors.

This remaining variation between households can be explained by the factors that affect a landlord's screening process, such as a criminal record, an eviction record, or credit problems, each of which rarely changes from a short-term perspective and has not been included in the analytic models. As described in the Desmond (2016)'s work, oftentimes landlords use websites for checking the criminal, eviction, or legal records or credit histories of applicants by paying a few dollars. Due to the lack of available data on these topics, however, the empirical models cannot take these factors into account. Second, because the PSID data has two-year gaps, the analytic models do not consider any moves that happened in the time between the two survey waves. This limitation may underestimate the seriousness of housing instability among renters who have to move multiple times within a year. In addition, the sample of this study excludes households that became living outside of housing markets due to involuntary residential mobility because the PSID data does not provide specific reasons for why a household became outside of housing markets. This selection rule may underestimate the results of this study by excluding households that suffer from the most severe degree of housing instability. Third, due to the data availability, this paper does not clearly explain which one is the main source of involuntary residential mobility is, limited housing options or the ability to maintain residence. Renters may experience involuntary residential mobility because they had to choose housing units due to limited housing options at the first place. However, they may experience involuntary residential mobility because they are not capable to maintain their residence—in other words, they tend to be strictly evicted.

Despite the study limitations, this study responds to the policy need for understanding the mechanisms of housing instability. This study underscores the need for housing researchers and policymakers to focus their attention on detailed dynamics within a household as an indicator of

the ability that allows renting families to maintain housing stability. To be specific, housing researchers and policymakers can identify differentiated housing needs for housing stability by asking detailed questions; for example, how many members within a family have the ability to work, what kinds of jobs they can do, how vulnerable a family's financial circumstance is to minor shocks, how many months a household can pay rents without income, with whom a household is living, with whom the household lived before, how stable the relationship with them is, how many children the household has, and so on. These questions could help understanding how to measure the vulnerability to involuntary residential mobility among unsubsidized renters.

This study highlights the necessity of investigating exactly why households with children are more likely to experience involuntary residential mobility. One explanation is that rental housing options are substantially limited among them. A few housing scholars have pointed out that the burden of those occupancy standards is disproportionately on families with children. These families may have to maintain living in larger apartments even though they cannot afford those units (Iglesias, 2012), or they may have to violate occupancy limits created and enforced by landlords which makes them lying at even weaker positions in the relationship with their landlords (Desmond, 2012). In the similar context, housing researchers and policymakers need to pay attention to whether generalizable patterns of discrimination against families with children exist in rental housing markets. Even though the Fair Housing Act clearly prohibits landlords refusing applicants due to family composition, particularly the existence of children, as Desmond's qualitative study (2012) identifies, the discrimination against families with children happens implicitly and frequently.

Lastly, the positive effect of having an automobile is noteworthy, as supporting car ownership can be a more actionable tool compared to the economic and sociodemographic characteristics discussed above. Policymakers may need to think about improving the access to personal vehicles as an alternative way of providing affordable housing and achieving housing instability. This approach may reduce barriers against newly supplied rental housing units located outside of central cities. Moreover, having a car provides housing stability through stabilizing household income and employment (Dawkins et al., 2005). Although few housing policy studies have examined the relationship between having an automobile and housing options in private markets, among subsidized renters, having a car is a crucial condition for living in a better neighborhood; they are likely to live and stay in areas with lower poverty rates, higher social statuses, stronger housing markets, and lower health risks (Pendall et al., 2014).

Moreover, the role of having an automobile as a policy tool in reducing housing instability needs to be understood in trade-off relationships between transportation and housing costs. Recently, housing researchers have increasingly examined these relationships by using the Location Affordability Index (LAI), which provides information about combined cost of housing and transportation (e.g., Greenlee and Wilson (2016)). The development of LAI could help understanding whether/how exactly car ownership helps renters achieving housing stability.

Many questions remain unanswered about why certain renters are more likely to move involuntarily. First, it is possible that household characteristics, not measured in this research, such as a criminal record, an eviction record, or credit problems, predict involuntary residential mobility. Second, more thought should be dedicated to trade-off relationships between transportation and housing costs that could affect involuntary residential mobility. For example, if low-income renters move to affordable housing units through bearing more transportation

costs, does that decision enable the renters to maintain housing stability? Third, although some researchers have examined spatial variation in rental housing market, mostly controlled out or not measured in this study, we have very little information on how local housing market characteristics, such as market tightness, compression of rents, diversity of unit sizes, or renter protections, affect housing instability. To understand the variations, we may need to examine in what market conditions renters experience housing instability.

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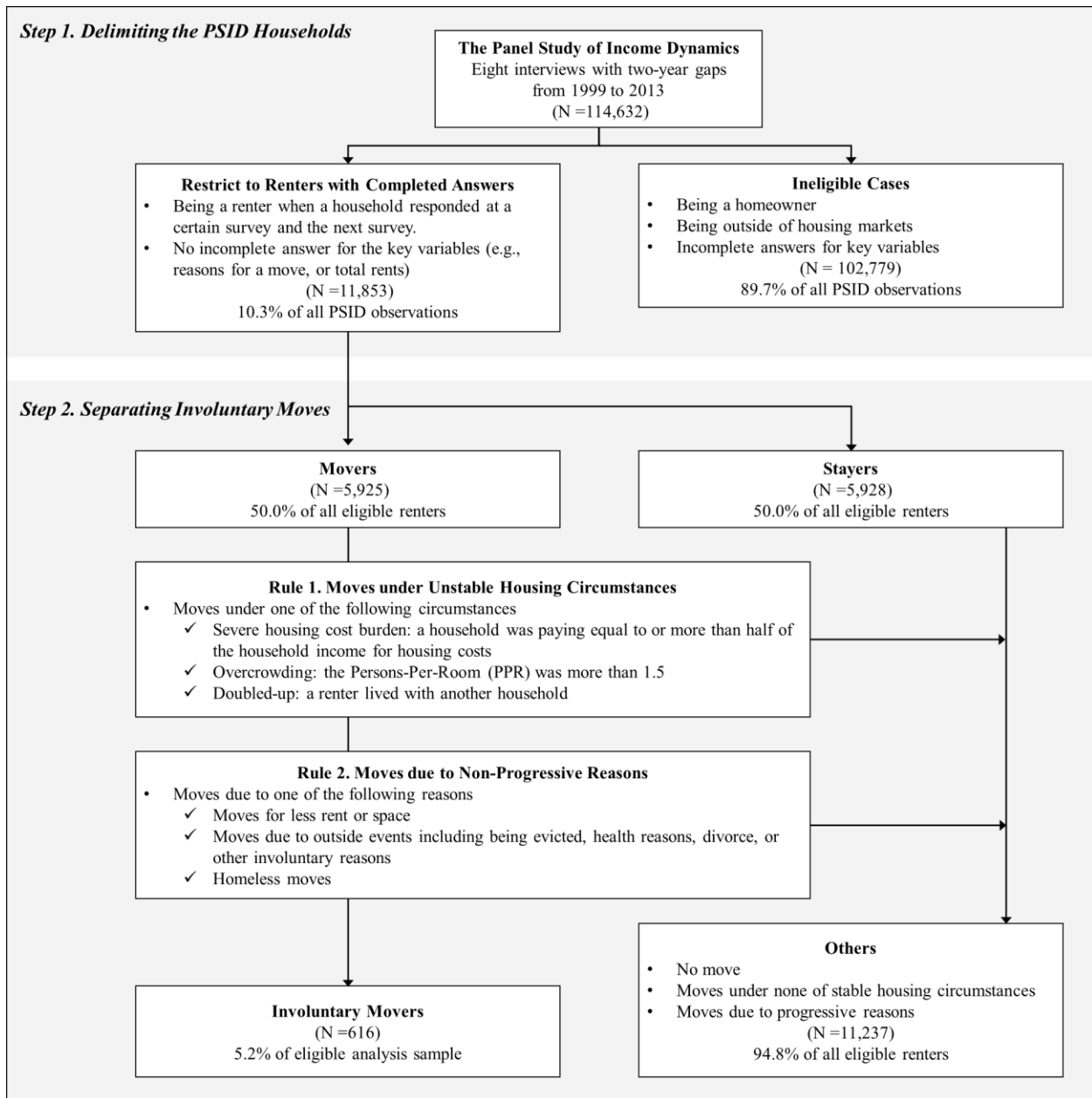
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Figure 1. Description of Analytic Sample Selection and Categorization of Residential Mobility



Note 1. Each observation is a household living in rental housing units. By this definition, the sample does not include households who were residing outside of housing markets (e.g., living in shelters or being institutionalized) and those who were/became homeowners.

Table 1. Independent Variables and Weighted Descriptive Statistics

Variable Name	Involuntary Movers				Others			
	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
<i>Economic Insecurity</i>								
Job insecurity	0.240	0.427	0.000	1.000	0.120	0.325	0.000	1.000
Limiting health condition	0.271	0.445	0.000	1.000	0.184	0.388	0.000	1.000
Savings (unit: \$1,000)	1.925	7.671	0.000	1.000	6.184	31.025	0.000	800.000
Wealth except savings (unit: \$1,000)	5.243	14.068	0	330.200	26.056	137.698	0.000	3815.785
Debt (unit: \$1,000)	8.151	26.272	0	250.000	9.148	28.444	0.000	1000.000
<i>Mobility</i>								
Car ownership	0.625	0.485	0.000	1.000	0.773	0.419	0.000	1.000
<i>Marital Status</i>								
Married	0.101	0.305	0.000	1.000	0.223	0.416	0.000	1.000
Marriage dissolved	0.295	0.456	0.000	1.000	0.342	0.474	0.000	1.000
Single (reference category)	0.602	0.490	0.000	1.000	0.435	0.496	0.000	1.000
<i>Shared Living Arrangements</i>								
The number of adult family members	0.817	1.233	0.000	4.000	0.247	0.549	0.000	5.000
The number of non-family members	0.602	0.490	0.000	7.000	0.286	0.872	0.000	10.000
<i>Personal Vulnerabilities</i>								
Black	0.333	0.472	0.000	1.000	0.257	0.437	0.000	1.000
Other non-Black minorities	0.089	0.285	0.000	1.000	0.096	0.294	0.000	1.000
Immigrant	0.105	0.307	0.000	1.000	0.116	0.320	0.000	1.000
The number of children in a household	0.640	1.217	0.000	7.000	0.596	1.069	0.000	11.000
<i>Housing Cost Burden</i>								
Household income (unit: \$1,000)	28.148	23.311	0.000	178.906	41.241	39.096	0.000	602.000
Monthly rent (unit: \$1,000)	0.691	0.486	0.020	4.000	0.717	0.565	0.024	22.495
<i>Household Employment Structure</i>								
Single-income households	0.606	0.489	0.000	1.000	0.620	0.486	0.000	1.000
Dual-income households	0.041	0.198	0.000	1.000	0.131	0.338	0.000	1.000
<i>Housing and welfare policies</i>								
Receiving housing assistance	0.120	0.326	0.000	1.000	0.169	0.375	0.000	1.000
Receiving SSI	0.010	0.098	0.000	1.000	0.071	0.257	0.000	1.000
N	613				11,164			

Note 1: Descriptive statistics are weighted by using the PSID family weights.

Note 2: Because households who return to the PSID study after skipping one or more surveys, so called reappears, have no weight value, three households are dropped in the group of involuntary movers

Note 3: Observations in the group of others include those who did not relocate between t and $t+2$ years and those who move due to progressive reasons or who move under stable housing circumstances.

Table 2. Hybrid Logistic Regression Models of Experiencing Involuntary Mobility

Variable	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
<i>Dependent Variable: whether a household experienced an involuntary residential mobility between year t and t+2 (yes=1)</i>												
Deviations from household-specific means (β_{1j} in Equation 1)												
Housing Cost Burden												
Monthly rent (unit: \$1,000)	0.752***	0.214	0.859***	0.215	1.358***	0.224	1.304***	0.225	0.935***	0.291	0.911**	0.290
Household income (unit: \$1,000)	-0.009*	0.004	-0.008*	0.004	-0.008*	0.004	-0.008*	0.004	-0.007+	0.004	-0.012**	0.005
Household Employment Structure												
Single-income households (yes=1)	-0.021	0.176										
Dual-income households (yes=1)	-0.360	0.327										
Housing and Welfare Policies												
Receiving housing assistance (yes=1)	-1.005***	0.205	-1.006***	0.206	-0.777***	0.208	-0.758***	0.208	-0.717***	0.209	-0.725***	0.208
Receiving SSI (yes=1)	0.215	0.241										
Economic Insecurity												
Job insecurity (yes=1)			0.276*	0.141	0.293*	0.143	0.289*	0.143	0.293*	0.144	0.279+	0.143
Limiting health condition (yes=1)			0.350+	0.201	0.366+	0.207	0.371+	0.210	0.363+	0.210	0.363+	0.210
Savings (unit: \$1,000)			-0.022*	0.009	-0.024*	0.010	-0.023*	0.009	-0.021*	0.009	-0.020*	0.009
Wealth (unit: \$1,000)			-0.002	0.003	-0.002	0.003	-0.002	0.003	-0.008+	0.004	-0.009*	0.004
Debts (unit: \$1,000)			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mobility												
Car ownership (yes=1)			-0.426*	0.177	-0.366*	0.181	-0.367*	0.179	-0.409*	0.180	-0.421*	0.180
Marital Status (reference: single)												
Married (yes=1)					-0.230	0.471	-0.251	0.461	-1.462*	0.636	-1.355*	0.624
Marriage Dissolved (yes=1)					-0.514	0.551	-0.553	0.542	-1.529+	0.843	-2.192*	0.910
Shared Living Arrangements												
The number of adult family members					-0.077	0.135	-0.080	0.135	-0.106	0.136	-0.122	0.133
The number of non-family members					0.476***	0.060	0.484***	0.060	0.497***	0.061	0.495***	0.061
Personal Vulnerabilities (β_2 in Equation 2)												
African American (yes=1) (reference: White American)							-0.247*	0.124	-0.278*	0.126	-0.296*	0.126
Other non-African American minorities (yes=1)							-0.193	0.270	-0.219	0.271	-0.216	0.272
Immigrant (yes=1)							-0.104	0.233	-0.068	0.233	-0.087	0.233
The number of children in household							0.149***	0.040	0.144***	0.040	0.125**	0.040

Interaction Terms between Deviations from household-specific means and being African American													
African American × Monthly rent										0.420*	2.070	0.420+	1.890
African American × Wealth										0.007*	2.270	0.008	0.890
African American × Married										0.887**	2.570	0.874*	2.320
African American × Dissolved										1.101	1.540	1.088	1.150
Interaction Terms between Family Composition and the number of children in a family													
The number of children in household × Household income												0.003*	2.240
The number of children in household × Wealth												0.004+	1.860
The number of children in household × Married												0.389	0.930
The number of children in household × Dissolved												0.337*	2.020
Household-specific means ⁷ (β_3 in Equation 3)	Included		Included		Included		Included		Included		Included		
Year dummy variables	Included		Included		Included		Included		Included		Included		
State dummy variables	Not included		Not included		Not included		Included		Included		Included		
Intercept (β_0)	-3.585***	0.264	-3.581***	0.266	-3.682***	0.279	-3.056***	0.727	-3.016***	0.731	-2.920***	0.733	
Random Coefficient (u_j)	0.514*	0.200	0.574**	0.205	0.609**	0.212	0.444*	0.202	0.476*	0.206	0.471*	0.206	
ICC	0.135**	0.045	0.149**	0.045	0.156***	0.046	0.119*	0.048	0.126**	0.048	0.125**	0.048	
Log Likelihood	-2242.721		-2214.249		-2149.322		-2105.273		-2096.2368		-2090.460		
BIC	4673.050		4672.385		4617.573		4950.627		4970.027		4986.577		
N ⁸	11,853 (4,757)		11,853 (4,757)		11,853 (4,757)		11,709 (4,701)		11,709 (4,701)		11,709 (4,701)		

Note 1. ICC: Interclass correlation, BIC: Bayesian Information Criterion, β_0 : Constant, U_0 : Level-2 random coefficient.

Note 2. + p <0.10, * p <0.05, ** p <0.01, *** p <0.001

⁷ Household-specific means include the means of the independent variables other than personal vulnerability characteristics.

⁸ The numbers of N indicate the total numbers of observations used in each model and the numbers in parenthesis indicate the total numbers of households used in each model.

Table 3. Predicted Probabilities of Experiencing Involuntary Residential Mobility from Model 4

Type	Condition	Predicted Probability
<i>Base hypothetical condition: a monthly rent increases by \$1,000 and a household income decreases by \$5,000</i>		
Economic Security	Only income loss (-\$5,000)	0.113
	Income loss (-\$5,000) + Job insecurity (<i>yes=1</i>)	0.144
	Income loss (-\$5,000) + Limiting health conditions (<i>yes=1</i>)	0.154
	Income loss (-\$5,000) + Job insecurity (<i>yes=1</i>) + Limiting health conditions (<i>yes=1</i>)	0.193
	No savings and other wealth	0.113
	\$20,000 savings	0.076
	\$20,000 wealth other than savings	0.109
Mobility	\$20,000 savings + \$20,000 wealth other than savings	0.073
	Having no automobile	0.113
	Having at least one automobile	0.083
Shared Living Arrangements	Not living with non-family members	0.113
	Living with one non-family member	0.167
	Living with four non-family members	0.424
The Number of Children	Having no child	0.100
	Having one child	0.114
	Having three children	0.148

Note. Other variables in Model 3 are set to their mean values.