Mortgage Lending and Non-Borrower Household Income

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Abstract

Recent literature on doubled-up families in the US has focused on households that take in and provide support for adult children or economically displaced relatives. From recent American Community Survey (ACS) data, however, we find that in a growing number of households, a substantial proportion of total income comes from additional adults other than the homeowner / head of household or their spouse. These extended-income households (EIHs), which are more prevalent in low-income and minority populations, are at a relative disadvantage in mortgage lending because the non-borrower income is traditionally not evaluated, and so the applicant may face a DTI ceiling that does not reflect their actual resources. Tracking households from 2005 to 2013 in the American Housing Survey (AHS), we see that EIHs are able to partially hedge against idiosyncratic negative shocks to a borrower's income, but this capability declines during periods of high unemployment, such as after the Great Recession. But even during these periods, borrowers in EIHs whose mortgages were underwater were more likely to stay in their homes than comparable homeowners in non-EIHs. These results imply that lenders could qualify borrowers in EIHs for larger mortgage loans without incurring credit risk beyond that for otherwise comparable borrowers. This could potentially expand homeownership opportunities for underserved communities.

Section 1. Introduction

The demographics of household formation in the United States have been changing dramatically over the past few decades. It is estimated that over 80 percent of new households formed between 2010 and 2030 will be nonwhite, and 43 percent will be Hispanic (Goodman et al, 2015). The majority of those new households are expected to be renters rather than homeowners, and gaps in homeownership rates between racial and ethnic groups are expected to remain high, with projected rates in 2030 of 40% for Blacks and 48% for Hispanics vs 70% for non-Hispanic whites. (Goodman et al, 2015).

Lower ownership rates among minority groups are of particular concern because of the demonstrated links between these rates and disparities in wealth. For example, an analysis of 25 years of data from the Panel Study of Income Dynamics (PSID) shows that homeownership differences were the largest driver of the wealth gap between blacks and whites (Shapiro, 2013). Measured as the ratio of median net worth, this gap rose from 11-to-1 in 2004 to 19-to-1 in 2009, and the corresponding wealth gap between Hispanics and non-Hispanic whites climbed from 7-1 to 15-1 over the same period (Taylor, 2011).

However, minority families, along with those of lower incomes, may have difficulty transitioning from the rental market to homeownership in the current environment. Mortgage lending standards tightened considerably after the financial crisis of 2008. Potential first-time buyers can face barriers if they have impaired credit or are lacking a traditional credit history, as the mean borrower credit score for approved loans has gone up by about 50 points since the crisis (Rappaport and Willen, 2014). The tightening credit box has disproportionally affected African-American and Hispanic borrowers, whose share of the purchase mortgage market fell from 20% to 12% between 2006 and 2013 (Bhutta and Ringo, 2014).

Home buyers may also have trouble qualifying for a mortgage if the ratio of their total debt service payments to monthly gross income (the so-called back-end debt to income or DTI ratio) is too high. Debt payment to income ratios are commonly used as a risk factor in automated underwriting (AU) systems, where they are evaluated in the context of other loan and borrower characteristics such as down payment amounts and credit scores. An additional hurdle for borrowers stems from Dodd-Frank regulations that were put in place to prevent a return to risky lending practices of the subprime era. Under Dodd-Frank, lenders must retain five percent of the credit risk associated with mortgages that they sell to investors, unless those loans meet the standards of a QRM (qualified residential mortgage). One of the requirements for a QRM is that the borrower's back-end DTI ratio must not exceed 43%, regardless of any other factors. The only exceptions to this rule are granted to loans

guaranteed by government agencies such as FHA, or by the government sponsored enterprises Fannie Mae and Freddie Mac, which have continued to operate under government conservatorship since 2008 (CFPB 2013).

Restrictions based on DTI may inadvertently result in a higher rate of mortgage disqualification for otherwise well-qualified low-income and minority borrowers who have sources of income that are not recognized by standard underwriting practices. In particular, we consider the scenario where the prospective borrower lives in an extended-family household in which there is some pooling of income or expenses. The borrower's own documented income, exhibited by tax returns or pay stubs, can then under-represent their actual level of resources in relation to monthly expenses.

Suppose, for example, that two sisters, Jane and Sue, are in a shared household, with both contributing to the monthly rent and other expenses. If they were receiving government rent vouchers under their state's Section 8 program, then both sisters would be expected to contribute 30% of their gross income towards monthly housing costs. Similarly, to qualify for assistance under a state's low-income housing program that receives funding from HUD, both of their incomes would be combined and checked against the program eligibility threshold, even if Jane was the sole borrower.

Under traditional lending standards, however, if Jane wanted to purchase a home on her own but continue to live with Sue, Jane would generally not be able to include any of Sue's financial contributions to the household in her mortgage application, as Sue would be a non-borrower. In some cases, the payments may be countable as "boarder income", but the rules surrounding such income are modeled on those for rental properties and tend to have stringent documentation requirements. For example, under FHA rules, Sue would need to sign a lease, and Jane would need to declare Sue's contributions as rental income on her taxes for two years. (See Appendix III for more details.) For many households with a non-nuclear family structure, a formally documented series of rent payments of this sort are unlikely to exist, even if members are sharing expenses in some way. The same situation could apply to unmarried, cohabitating partners or friends.

The goal of our research has been to gauge the population of potential homeowners who might fall into this gap in existing lending criteria due to their household structure and its income distribution. We want to understand the characteristics of these households, how they form and break up, and whether the contributions of non-borrowers are stable enough to be considered as a factor in the borrower's ability to pay. We define an extended-income household (EIH) as one in which non-borrower income is at least 30% of that of the borrower(s) – so that the non-borrower contributions could make a significant difference in the ability to pay a mortgage.[1]

What is an appropriate way to evaluate such households for a mortgage loan, so that they are given fair and equal access to credit, without having the lender take on additional risk? (That is, the performance of a loan that is qualified using non-borrower income will not be worse than that of an otherwise comparable loan with the same credit characteristics.) Since non-borrower income has not been considered for underwriting in the past, data on such incomes does not exist within public or proprietary loan performance databases. Instead, we must turn to public survey data on US households.

To frame our analysis, Section 2 of this paper reviews existing research that relates to extended-family or other shared household types. Section 3 presents our findings on the prevalence and characteristics of EIHs. These are based on analysis of single-year (1% population sample) microdata from the American Community Survey (ACS), primarily using the most recent available results from 2013, but in some cases going back to 2007. The ACS allows us to distinguish EIHs from other shared households in which non-borrowers do not have significant income, and from nuclear households. This is because income from each family member is captured separately in the ACS interview. Furthermore, the relatively large sample size ensures that we can

[1] A 30% ratio of non-borrower to borrower income is the same threshold that is used to define an Extended Income Household under Fannie Mae's HomeReady™ program for low and moderate income borrowers (See Appendix III).

obtain an accurate estimate of the proportion of households that are EIHs for specific demographic groups or geographic areas.

Since the ACS only provides cross-sectional snapshots of the EIH population, we have turned to a different data source in order to analyze the evolution of such households over time, and to assess their relative risk of mortgage default. This is the bi-annual American Housing Survey (AHS). The AHS is a panel of about 50,000 housing units. For families that remain at the same residence over a two year period or longer, and are successfully interviewed, the AHS thus gives us a view of how the incomes, expenses, and living conditions of those households have changed.

Although the AHS was begun in the 1980s, it has only recorded fully separate income figures for each household member since the 2005 survey. Because of this, we have made use of only the most recent five surveys, spanning from 2005 through 2013. Section 4 of the paper presents an analysis of AHS households whose mortgages were underwater during this period, with the purpose of obtaining indirect indicators of loan performance for EIHs. Section 5 evaluates the relative stability of various EIH income measures, and Section 6 presents our conclusions.

Section 2: Literature Review

To understand the financial circumstances of extended-income households, it is useful to employ a multi-disciplinary approach, making use of research on immigration, demography, and the sociology of the family. People may form extended-family and other shared living arrangements for a variety of overlapping reasons. The rate at which these households are formed or break up varies over time in a complex fashion, as some of the driving motivations are tied to current economic conditions, while others are associated with longer-term demographic and social trends. We therefore review studies that look at multi-generational family patterns among different ethnic groups, at challenges facing the millennial generation of young adults, and at the effects of the Great Recession on household doubling-up.

The rise of extended-family and other shared household structures within the United States has been documented by researchers over the past two decades. In a widely-cited article entitled “Beyond the nuclear family” (2001), the sociologist Vern Bengston challenged the pervasive academic theory of “family decline” in the US as being too-narrowly focused on the nuclear family model. He argued that, while rates of divorce and single parenthood had certainly increased, support structures in many American families were not necessarily weakening, but were instead transforming into more diverse, multi-generational patterns. Bengston cited three main drivers for this transformation: demographic changes in an aging society where people experience “longer years of shared lives” with parents and grandparents, the proliferation of new extended-family relationships stemming from remarriages and step-parenting, and continuing bonds of solidarity and support across multiple generations, as evidenced in the Longitudinal Study of Generations (LSOG). This creates the potential for grandparents and other extended family members to step in and provide support for a disabled relative, a single parent, or a couple holding down multiple jobs. He hypothesized that “for many Americans, multigenerational bonds are becoming more important than nuclear family ties for well-being and support over the course of their lives.”

An illuminating study by Yoshinori Kamo (2000) used public-use microdata from the 1990 US Census to create a typology of extended-family households and explore the connections between social norms of different racial and ethnic group norms and the formation of these household types. In his classification, a “downward extension” occurs when an adult child either remains in, or returns to, their parents’ household, typically for financial support or help with child care, if they themselves have become a parent. Conversely, an “upward extension” takes place when householders (i.e., the homeowners or renters) take in parents who may be widowed, ill, disabled, or otherwise economically vulnerable or in need of support. Finally, a “horizontal” structure can be formed if someone moves in with a sibling after losing a job, or if a newly relocated family member comes to live with a relative of the same generation.

Kamo found that the overall prevalence of extended-family patterns was considerably higher among minority households than among non-Hispanic whites (see Figure 1 in the appendices). Furthermore, the downward vertical extension type was most common within African-American communities, while Asian families were more likely to take in a parent (vertical up), and the horizontal extension patterns were most pervasive in Hispanic households. On average, the additional family members in these non-nuclear households were found to contribute between 30 and 35 percent of total household income, depending on the subgroup. Lower-income, unmarried, and disabled persons were more likely to live in an extended-family household. The horizontal and vertical-up patterns (but not vertical-down) were more common in areas with high housing costs.

Notice that in Kamo's typology, a multi-generational family comprised of grandparents, children, and grandchildren, could be classified as either an upward or downward extension. The distinction depends on which generation is in the position of providing economic support for the other. Cohen and Casper (2003) classify members of a shared household as being part of either a "guest" or "host" subfamily. Regardless of whether the "host" owns or rents their home, the person moving into an existing household takes on the socially dependent role of "guest."

While this framework of one-way dependency may accurately describe the relationships in many shared households, it may not be applicable to those that meet our definition of an EIH. If we find that the incomes of the "guest" adults in an EIH are comparable to that of the home owning "hosts," this may point to a more complex web of mutual support relations. In a study of low-income families in Chicago, the sociologists G. C. Hemmens and C. J. Hoch (1996) identified four primary drivers of home sharing, which they labelled as subsidy, growth/change, dependency, and emergency. Some of these drivers are clearly associated with one-way support, while others could involve more reciprocal relationships.

The *subsidy* scenario is one in which the pooling of financial resources allows people to live in better quality home or a safer neighborhood; such households are inherently more likely to meet our definition of an EIH, because even if we can identify a higher-earning, primary subfamily within the household, they are relying on contributions from other adults to meet their housing expenses.

The motivating driver of *growth and change* describes the range of practical and social support that householders can provide to each other, including child care, assistance with household management, vehicle sharing, and companionship. Shared households falling into this category include those in which adult children are living with and being supported by their parents. The category also describe relations between other types of family members or friends, so that both one-way support and more reciprocal models may apply in this case.

A one-way support model would seem to apply to shared households motivated by the *dependency* driver, in which an elderly or disabled person is housed and taken care of by others. But it is also possible that a person in need of physical care, who is no longer able to live independently, may still be able to contribute financially to the household, because of income streams from retirement accounts or government benefits.

Finally, the one-way model also applies when the driving factor for home sharing is *emergency situation and need*. This applies when a stable household takes in someone temporarily who would otherwise have no place to live, because of an event such as job loss, marital separation, or natural disaster. Not surprisingly, this particular scenario has been a focus of more recent media and attention and scholarship, because of its applicability to the events of the past several years. The economic dislocations within the US associated with the 2008-09 Great Recession, including high unemployment and record foreclosure rates, triggered an increase in the phenomenon of "doubling-up", as people or families who had previously been independent were forced to move in with relatives or friends.

One Census Bureau study (Elliott, et al, 2011) compared American Community Survey (ACS) data from 2006, 2008 and 2010 to examine how the recession may have affected the formation of extended-family households. In this study, households where the extra member was an adult child were analyzed separately from so-called complex households containing other types of relatives. They found that complex households were more likely than non-complex households to contain at least one unemployed individual (15.6% vs 7.1%) even in 2006,

and they report that the absolute gap in this rate between the two groups had widened by 2010 (24.6% vs 15.6%). Similar results were found for the co-residence patterns of young adults.

Comparing pre and post-recession data from the Annual Social and Economic Supplement of the Current Population Survey (CPS ASEC), Mykyta and Macartney (2011) observed that the proportion of shared households (which they define as those containing adults, not in school, other than the head of household and their spouse or partner) rose from 22.4 to 24.1 percent between 2008 and 2010. By comparing household and personal poverty rates, they found in 2010, there were 19.8 million of these extra adults who would have been in poverty had they been forced to live independently, an increase of 2.5 million from just two years earlier.

About half of these extra adults in shared households were found to be adult children of the householders, and the youngest age group (18 to 24 year olds) had the highest likelihood of residing in a doubled-up household, even when excluding those enrolled in school. Between the 2008 and 2010 results, the likelihood of a younger adult (ages 28 to 34) living in a doubled-up household increased relative to that of the cohort of 35 to 64 year olds.

The impact of the Great Recession on the rate of young adults of the millennial generation co-residing with their parents is documented in a Pew survey (Wang and Moran, 2009) in which one in ten adults, aged 18 to 34, who were interviewed in 2009 reported having moved back in with their parents due to the poor economy. However, as Greg Kaplan notes in his analysis of the National Longitudinal Survey of Youth 1997 (Kaplan, 2009), anecdotal and press accounts of parental co-residence among the so-called “boomerang generation” of 18 to 34 year olds predated the recession.

A more recent long-term analysis by the Federal Reserve Bank of New York, using data from their consumer credit panel over the period from 2000 to 2013 (Bleemer et al 2014), argues that the primary driver of increased parental co-residence, at least at a national level, has been the mounting burden of student debt. Overall, they observe a 63% relative increase in the rate of 25 year olds living with parents and elders over this 14 year period. Co-residence rates were higher in areas with large home price increases after 200, such as California, and in regions with persistent economic distress such as Michigan.

A Pew study of Integrated Public Use Microdata (IPUMS), combining decennial Census data with the 2006 to 2008 ACS (Taylor et al 2010), also points to a resurgence in multi-generational families stemming in part from the recession, but primarily due to “demographic changes that have been gathering steam for decades.” They show that the share of US population living in a multi-generational family household (either one containing both grandparents and grandchildren, or having two or more generations of adults 25 and older) declined from 24.7% in 1940, to a low of 12.1% in 1980, but then rose to 16.1% by 2010. While some of the increase was due to the influx of immigrants from Asian and Latin American countries, who were more likely to live in extended families, this rising trend is also found among native-born Americans.

Part of the trend is associated with a slight increase in the likelihood of adults 65 and over co-residing with younger relatives, from 17% in 1980 to 20% in 2010. But the corresponding share for adults between 25 and 34 rose from 11% to 20% over the same period. The Pew study hypothesizes that co-residence trends among young adults prior to the Great Recession may be associated with increasing age at first marriage (although the direction of causation is not discussed).

An analysis for the National Poverty Center, reviewing Current Population Survey data (Haider and McGarry, 2005), found that as marriage rates declined from 1980 to 2004, more women were living either with (unmarried) partners or with relatives. For single women, the potential for resource sharing in an extended household was associated with lower education levels and with having children. The fraction of household income coming from non-spouses (15%) was almost twice as high for women without a high school diploma compared to the equivalent figure (8%) for other women. Similarly, the proportion of household income coming from relatives was 13% for less-educated single mothers, but just 6% for all less-educated women.

Haider and McGarry also observe that resource sharing *within* an extended household appears to be a more critical factor for people with low-incomes than aid from family members outside that household. However, they caution that existing survey data on the magnitude of actual income transfers within these households is

extremely incomplete, and that little is known about non-cash forms of economic assistance in extended families, such as the provision of child care. A literature survey by Sherry Ahrentzen (2003) also cautions that not enough is known about how members of these households view their living situation, and how shared living arrangements affect members' physical and psychological health (for better or worse). Ahrentzen argues that the physical design of postwar US housing is oriented towards the needs of nuclear families, and is less suited to the management of privacy concerns when a greater number of adults are living together. Home design, along with zoning regulations that make it more difficult to home share, can be seen as part of a web of societal forces that treat nuclear families as the norm and shared households as deviant. And yet, the fact that Hispanics and Asians, for example, are more likely to live in an extended-family household, even when controlling for income level, shows that people do share households out of choice and not just for economic necessity. Ahrentzen concludes that housing policies should be reformed in order to accommodate those who prefer and benefit from shared living arrangements.

Section 3: Shared and Extended-Income Households in the ACS

The American Community Survey (ACS) provides us with a large sample of US households through which we can track recent trends in personal and household incomes for nuclear and shared families, including extended-income households (EIHs). We have used the single-year Public Use Microdata Samples (PUMS) that cover 1% of American households in each year from 2007 through 2013. This period happens to extend from just after the peak of the housing bubble, through the years of the Great Recession and its long aftermath.

Before proceeding to the analysis of extended-income households, we start with a general look at non-nuclear household types that can be observed in the ACS. We define a *shared household* as one in which there are other adults (18 or over) living in the home other than the survey respondent and, if applicable, their spouse. Table A-1 (see appendices) shows the proportion of shared households in the most recent ACS survey year, 2013, including home-owners and renters, using a range of alternate definitions. First, we count just *extended-family* households, in which some adult relative of the head of household or their spouse is co-resident. We then expand our definition of a shared household to also include cohabiting unmarried adults (without other relatives present), and then, most broadly, any household with other adults present, including friends, roommates, or boarders. We also tracked these proportions for a number of demographic subgroups, based on whether the head of household or their spouse or unmarried partner had a reported race of Asian or African American, or identified as Hispanic, or had immigrated to the US.

Note that unlike in some other studies, we include young adults in the analysis regardless of their marital or student status, or whether or not they have children. The ACS counts a student as being part of the household if they are physically present at the time of the interview. We have chosen to include this population, as some adult students may also be working and contributing to the household finances, although this can also result in over counting if the students are only in the household for part of the year. We also exclude from our analysis extended or multi-generational families in which the householders are caring for minor grandchildren, nieces or nephews, but no other adults are present.

We see that 21% of US households in 2013 were of the extended-family type, with an additional 9% being shared with domestic partners or other non-relatives, but no other adult relatives. All of these proportions are higher for immigrant and minority households, with 45% of Hispanic households being in some shared category.

We find that there are significant differences in the prevalence of shared households depending on their tenure category, as shown in Table A-2. When all non-relatives are included, renters are more likely to be in shared households than home-owners. On the other hand, owners are considerably less likely to live with non-relatives. At the same time, the prevalence of cohabitation also drops when people transition from renters to owners. As reported in (Gibson-Davis, 2005) and other studies, more people appear to be delaying marriage until they are financially stable enough to be able to buy a home together. We also see that the rate of household sharing is lower for owners who do not have a mortgage. This could be driven in part by age differences between these households and mortgage-holders, but it may also be affected by economic

hardship, if people who are having trouble paying a mortgage end up receiving support from a co-resident family member.

We now proceed to define and analyze the *extended-income household (EIH),* in which substantial household income is coming from non-borrowers. This analysis will be restricted to the population of home-owners who have outstanding mortgages. For families that own a home, the ACS head of household is by definition always a home-owner. We cannot reliably tell from the survey data whether the spouse of the head of household is necessarily also one of the owners or is on the mortgage. Therefore, for our analysis we always include spouses as a homeowner/borrower, so as not to overstate the extent of non-borrowers in a household. We will thus define the household *core income* as that of the head of household and their spouse, if present. An extended-income household will then be defined as one in which the adults in the household outside of the core (including non-relatives) have, singly or combined, an income that is at least 30% of the core income.

In this study, we primarily are interested in households that are already homeowners and are paying a mortgage. Defining the population of potential EIHs in purchase applications from households that are currently renting, is inherently more speculative. For example, the specification of who is the "head of household" among multiple renters is inherently more arbitrary than for an owner-occupied dwelling. It is reasonable to assume, though, based on the evidence from Table A-2, that as people transition from renting to owning, roommates who are relatives are more likely to move with a new homeowner than non-relatives. We know also, from the Gibson-Davis study, that unmarried couples who are renting may get married at around the same time that they buy their first home.

In Table A-3, the proportion of EIHs among renters is calculated using two different methods. In the first method, the ACS-designated head of household and their spouse are included in the core, and the non-core members are other adult relatives or unmarried partners of core members. In the second method, unmarried partners of the head of household are also included in the core. Under both methods, incomes of nonrelatives other than partners are not evaluated at all. An extended-income renter household is then defined as one in which non-core income is 30% or more of core income. Depending on the method used to classify households, EIHs are found to comprise 10 to 17% of the renter population, and 17 to 26% of Hispanic renters.

Turning now to homeowners with mortgages, we have also defined EIHs using two methods. Here, the more restrictive definition is equivalent to Method One for renters: it includes relatives and partners of the borrower as non-core (non-borrower) household members. In the second definition, we also consider non-borrower income from adults who are neither relatives nor partners. The latter definition is consistent with the program rules for Fannie Mae's HomeReady.

Table A-4 compares the proportion of EIHs for various populations of homeowners with mortgages, under these two definitions. We also contrast this with the corresponding proportion of shared households (with no income test). We see that just about half of all shared households meet our 30% threshold test to qualify as an EIH, and this proportion is fairly consistent across subgroups and using alternate definitions. Using our inclusive definition, about 15% of households with mortgages are EIHs, and this proportion rises to 20% for African Americans and 24% for Hispanics.

Using our more inclusive definition, we classified extended-income households according to the relationship between the borrower(s) and the non-borrower household member with the highest income. Table A-5 shows the distribution of non-borrower types for various populations of EIHs, taken from the most recent data in 2013. The most common configuration is one in which an adult child of the borrower or their spouse (or a son or daughter in law) is the high-income non-borrower. This would correspond to the "vertical down" extended-family configuration described by Kamo. The "vertical up" household type, in which the income-contributing non-borrower is a parent or step-parent of the borrower or spouse, is relatively less common, although it is more prevalent in Asian families. In the general population of EIHs, the second most common pattern is one with an income-contributing unmarried partner of the borrower. Among minority and immigrant populations, however, we see fewer of these types of EIH and more "horizontal" family structures in which some other type of relative such as a sibling is the contributing non-borrower.

Notice that the type of EIH based on a high-income non-relative other than a partner makes up just 9 to 12 percent of the total, depending on the type of population. This is the main reason why, with this research, we have used the more general term “non-borrower household income”, in place of the more common industry term, “boarder income”, which has connotations of a more arms-length relationship between borrower and non-borrower. (FHA, 2015).

The high proportion of EIHs in which an adult child of the borrower has significant income is quite interesting in light of the well-documented phenomenon of co-residing adult children of the millennial generation (Kaplan, 2009). In Table A-6, we perform the same breakdown of EIH types as in Table A-5, but using data from 2007, just prior to the Great Recession. We see that prior to the recession, there were fewer EIHs where the adult child was the high income non-borrower, compared to 2013, and this pattern is consistent for all subgroups. The growth in vertical-down EIH structures with adult children has mostly come at the expense of horizontal patterns with some relative other than a child or parent being the additional income provider.

These changes over time are consistent with those in the general population of shared households. Table A-7 compares the relative population of household members other than the survey respondent or spouse, in all shared households seen in the 2007 and 2013 ACS. The proportion of adult children rises from 48 to 50% while that of other relatives falls from 18 to 15%. We should note that the level of adult-child driven EIHs is a bit lower than that of the overall number of adult children in shared households. This is not surprising if we consider that many of the stay-at-home millennial adults have been unable to find well-paying jobs (Bleemer, 2014).

Figure 2 shows an age breakdown for adult children of homeowners with mortgages in the 2013 ACS, characterized by the child’s potential contribution to household income. The adult child is classified as “high income” if, by themselves, they could qualify the household as an EIH: that is, if their income is at least 30% of the borrower and spouse’s. Middle income adult children are defined as those with 10-30% of core income, with the remainder marked as low income. The high income category includes the majority of adult children who are 30 or older, but only a small fraction of those 21 or younger.

Along with the millennial “boomerang” phenomenon, much of the recent literature on shared households has focused on after-effects of the Great Recession. The common scenario that has been examined is one where, following the terminology of Cohen and Casper (2002), individuals facing financial or other difficulties (the “guest”) move into a more economically stable household (the “host”). Relatively little work has examined the reverse situation where the “host” is the one facing financial distress. For example, family members of a homeowner facing hardship might move in with him/her and/or increase their work hours to provide that person with economic stability, which would be one of the scenarios leading to the formation of an EIH. Other EIHs may form primarily due to cultural norms of extended family, in which case neither the borrower nor the additional household members would necessarily be in hardship.

Either way, it is likely that EIH and non-EIH shared households, forming under such different circumstances, will on average look quite different from each other in many respects, and from non-shared households. Furthermore, we may see differences over time in the rate of formation of these household types. We know from recent research, including (Mykyta and Macartney, 2012), that the long period of high unemployment following the Great Recession spurred an increase in the overall rate of household sharing. But this did not necessarily affect EIH and non-EIHs in the same way. In Table A-8, we contrast the changes over time in the proportion of all shared households with the corresponding series for shared households that meet our EIH definition and those that did not. Our population includes all households with mortgages as well as the subgroup of those households where the borrower or spouse are either nonwhite or Hispanic.

We see that prior to the recession, as the economy was expanding from 2007 to 2008, the rate of doubling up in all categories was going down. Household sharing rates then went up substantially in 2009 and 2010, but this trend was dominated by increases in non-EIHs – that is, where the new household members had little or no income. This is consistent with the SIPP data analysis of Wiemers (2011) which shows that people who became unemployed were much more likely to change residence to double up with a more financially stable household. Then in 2011 to 2013, as the economy starts to recover, we see that the rate of non-EIH sharing

continued to go up, while the proportion of EIHs actually went down for one year and then began climbing again. While the specific reasons for the reversal in EIH trends in 2011 are difficult to unravel, it is clear that the economic crisis led to greater fluctuations in the non-EIH shared household pattern – in which the existing household is supporting additional displaced members – than in EIH levels.

Although the ACS does not track individual households over time, differences in responses to some of the survey questions between groups can give us some clues as to the triggering conditions that may have led to the formation of an EIH rather than other types of households. Table A-9 shows the relative incidence of different conditions under which we find a core household member (borrower or spouse), or any adult, who is not currently working but had previously worked within the past year, or the past five years. We further divide these groups of non-workers depending on whether they are in the workforce (but laid off, sick, or unemployed), or have left it. Non-workers are considered unemployed if they have actively looked for work in the four weeks prior to the survey. Following Haider and McGarry, we see that all shared households are more likely to have some adult who is unemployed or has left the labor force. Notice that these figures are higher for the non-EIH shared households – particularly in the case of non-borrower ("guest") members who had left the workforce within the past year.

Comparing the figures for core members as opposed to all adults, we see that for homeowners with mortgages, there is relatively little difference between the nuclear and shared households in the rate of non-working core members (borrowers or spouses). There is a slightly higher incidence of core members having left the workforce in the past five years, for EIHs in comparison to non-EIH shared households, which would match a story of non-borrowers supporting a borrower who has permanently, but perhaps unexpectedly, left the labor force.

As shown in Table A-10, there is about a four percentage point difference between EIH and non EIH shared households in the proportion of core members with some kind of disability. Not surprisingly, there is a considerably larger tendency of all shared households to include some non-borrower adult member with a disability.

Using a multivariate logistic regression, we evaluated the relative influence of factors that make a household more likely to be an EIH. (See Table A-11.) Being unmarried is the strongest single factor, but this is partly due to our EIH definition in which a cohabitating unmarried couple where the non-borrower partner has substantial income forms part of the population. Not surprisingly, when the borrower and their spouse have lower levels of education (which will be associated with current income), they have a higher likelihood of living in an EIH. Members of minority groups, and particularly Hispanics and Asians, are also more likely to be in an EIH even when controlling for other factors.

Although the geographic location of some households in the ACS public use files is censored, we can map many of the identified public use microdata areas (PUMAs) to specific metropolitan areas, to see which ones have a higher concentration of EIHs compared to other households with mortgages. Among the largest 50 combined metropolitan statistical areas (as measured by weighted ACS household count), we show in Table A-12 those with a proportion of EIHs being over 15%, as opposed to 14% for the entire country.

The potential market size of households that could benefit from a mortgage lending provisions for non-borrower household income is in the millions. Table A-13 classifies all household meeting the EIH definition within the 2013 ACS, according to their existing tenure (renting vs. owning a home with a mortgage) and the current ratio of rent or mortgage payments to the head of household and spouse's income. We consider a household as being potentially eligible for an EIH lending program if this ratio is between 20 and 50%. When the ratio is low, then even if the potential borrower is trying to move up to a more expensive home, they can still probably qualify without non-borrower income being considered. Alternatively, if the head of household's rent or mortgage payment is more than half their own income, then they are likely to have trouble qualifying for a loan even under an EIH-oriented program.

We also categorize the households as to whether the total household income is above or below the median level for their MSA (calculated directly from the 2013 ACS). This gives us a rough indication of whether the

potential borrower would qualify for a program, such as HomeReady, that is restricted to low and moderate income borrowers, or to those in underserved areas. Even when this restriction is taken into account, we find 700,000 existing homeowner EIHs and 1.2 million renter EIHs that fall into our target DTI range.

Having identified our target population of EIHs, we now turn the question of how these households differ in their characteristics from those in which there are no adults present other than the borrower and spouse, and from those in which the incomes of any additional adults are comparatively low. We expect that the patterns of income distribution between members of our three household types (nuclear, EIH, and non-EIH shared) should be quite different. In Table A-14, we compare these household types using two measures of income that might be available to the homeowner. We define *core income* to be simply the combined income, from all sources, of the home-owner/borrower and, if applicable, their spouse. This is the income level that would normally be visible in a mortgage application (assuming that the spouse is a co-borrower). We then define *extended income* as being the core income, supplemented by a "shadow rent" consisting of 30% of the total income of all non-borrower adults in the household. (See Section 5 for a further discussion of shadow rent.) Note that by our definition of an EIH, the extended income as we have defined it will always be at least 9% higher than the core income – enough to make a meaningful difference in the borrower's ability to sustain a mortgage, if this shadow rent is in fact available to the borrower.[2] Of course, the actual level of financial support made by EIH members to the borrower(s) may be less than this, or it may take alternative forms, such as through child-care or other in-kind services. However, we find it reasonable to assume that in a situation of financial stress, a borrower could call on other household members with whom they have a familial or other close relationship, for support of roughly this magnitude.

By definition, the core and extended incomes in a nuclear household are identical, as there are no additional adults to provide income. Also, in a non-EIH shared household, where the additional adults provide only a small amount of income, the two measures are very close together. We find that in the median case, the extended income measure in an EIH is about a third higher than core income: $54,600 vs $41,900. This means that in the median case, the income of the non-borrowers is actually a bit *higher* than that of the borrowers. This matches the results on income sharing found by Haider and McGarry (2005).

Even with the addition of shadow rents, the median income in an EIH is about 30% lower than that of either nuclear households or non-EIH shared households. Large gaps between EIH and non-EIH median incomes can also be seen among our subgroup populations such as Hispanics and African-Americans. This implies that, even among groups with a stronger social norm for extended-family arrangements, the economic need of the householder is probably a major driver of EIH formation. Either the homeowner is faced with a financial shock prompting another person to move in with them, or families may anticipate a need for co-residence and financial support in advance. However, we have seen from the ACS survey responses that there is a not a large difference in the rates of employment for core household members between EIH and non-EIH shared households, that would account for this income gap. So they may be a longer term selection effect in place where lower income individuals among all ethnic and racial groups are more likely to have chosen to live in EIH configurations for support – despite the fact that the non-borrower income would not have helped them to qualify for a mortgage. Note that, by contrast, median incomes of non-EIH shared households are consistently larger than that of even nuclear households. This could be due in part to a selection effect in which households with greater resources are more likely to be able to take in additional members in distress.

The substantial income differences shown in Table A-14, both across household types and between alternate measures, underscore two key findings about extended income households in the context of mortgage lending: first, EIHs are more likely to be concentrated in the lower-income (but higher risk) populations for which many affordable housing programs have been designed. But we also see that looking just at the traditional income sources of such families, and ignoring potential contributions from non-borrowers, is likely to significantly understate those households' actual resources. For example, when we compare these alternate measures of household income to estimated mortgage payments (including principal, interest, taxes, insurance, and

[2] For example, if a borrower earns $50,000 annually, then a non-borrower living with them needs to make $15,000 for the household to qualify as an EIH. The shadow rent would then be estimated at $4,500 per year, raising the borrower's "extended income" by 9%.

homeowners fees), we find that 34% of EIHs would be found to have a front-end DTI ratio of over 40%, if we only considered the core income. This is a level of mortgage debt service that would be considered extremely high risk. But when we use the extended income definition, then the proportion of EIHs exceeding this high-risk DTI threshold falls to 23%. In comparison, just 13% of nuclear households have a DTI over 40%.

We would intuitively expect that the 23% figure for EIHs using the extended income definition is a more realistic assessment of the proportion of those households at high risk – because it is precisely the condition of high mortgage payments compared to core income that would lead borrowers to call on other household members for support. But the ACS figures cannot tell us what proportion of the borrowers with high DTIs, by either measure, are currently delinquent on their loans or are otherwise at risk of default. To better understand the relative credit risks associated with EIHs, we must turn to other data sources that can track households over time.

Section 4. Tracking Mortgage Performance using the AHS

The American Housing Survey (AHS) is a panel study of about 50,000 housing units that are visited once every two years. Information is gathered about a number of physical characteristics of the home as well as an enumeration of housing related costs including mortgages and home equity lines of credit. Various measures of household income are also collected. Beginning with the 2005 survey, the AHS fully tracked the separate incomes of each household member. Prior to this, income other than wages or salaries was only collected in the aggregate. As a result, we can use data only from the 2005 through 2013 surveys to identify the extent to which household income comes from core members (borrower or spouse) or other adults, so that EIHs can be distinguished from other shared households.

To understand the relative risks to a mortgage lender of considering non-borrower income, we would ideally want to have direct loan performance data comparing nuclear and extended-income households. The transitions we can observe in the AHS panel fall short of this. We can observe whether the family interviewed in one survey year has moved out of their housing unit as of the following survey, two years later, but we don't have any information about the reason for that move. We can observe whether the new residents of the unit are owners are renters: but if they are owners, we don't know if the transfer of ownership was a regular or short sale or was the result of a foreclosure action. If the new residents are renters, we don't know if the prior residents still own the home and are now renting it out, or if there is a new owner.

Nonetheless, we can construct a rough proxy for a mortgage default event by considering just the subset of owners with mortgages in the AHS whose homes were *underwater* – that is, whose outstanding mortgage balance was greater than the value of their home. If a household was observed to be underwater in one survey year, and then moved out, this event is likely to be correlated with actual defaults. Note that this kind of analysis is only relevant when looking at EIHs that already hold mortgages. Although we would like to be able to predict the behavior of renters who form a shared household after purchasing a home, the scenario of a defaulting on an underwater mortgage is not relevant to any renter EIHs that we observe in the AHS, and we have also seen that the renter and homeowner EIH populations are very different.

Negative equity is a well-known driver of mortgage default during the housing crisis years we are examining, while the likelihood of an ordinary loan payoff (rather than a short sale) becomes increasingly remote when the borrower's LTV ratio increases past 100% (Fuster and Willen, 2013). For the purpose of predicting mortgage defaults, we define a borrower as being underwater if their LTV at the time of a survey is 110% or greater. This is because a borrower who has only a small amount of negative equity still has a reasonable chance of being able to pay off their mortgage when moving. We used Fannie Mae loan performance data to confirm that when loans have a 110% or greater LTV ratio, at least 84% of terminations in the following two years are due to defaults. (See Appendix II for details.) We also performed sensitivity tests in which the underwater threshold was varied from 100 to 120%, and the regression outcomes were not appreciably affected.

The AHS began to collect data on current estimated home values as well as initial mortgage balances in 2007, but did not ask borrowers to report their current mortgage balance, or their monthly principal and interest

payments and other loan terms, until 2011. About 25% of interviewed households in the 2011 AHS did not provide their current mortgage balance. For the other 75%, though, we can test whether, for an underwater borrower, being in an extended income household affects the likelihood of that borrower remaining at the same location two years later.

We constructed a logistic regression model where the outcome of interest was a household with a mortgage failing to appear in a following survey (mover status). This outcome is a proxy for a mortgage default event. The model population is all AHS households with mortgages who were interviewed in 2011 (so that the LTV is observable and we can observe the family's presence or absence in the following survey). The parameter of interest is that of an underwater household being an EIH, as compared to two non-EIH control groups. The three household types are defined along the same lines used for the ACS analysis. The first control group, referred to as nuclear households, are ones in which there are no other adults besides the borrower and their spouse. Extended income households (EIH) are defined as before, and 'Non EIH Extended' households, the second control group are those where other adults are present, but the combined income of those adults does not exceed our 30% of borrower/spouse income threshold for an EIH.

The model incorporates a number of control variables that are likely to be associated with differences in a borrower's credit rating, or other factors visible to a mortgage lender. The idea here is that a mortgage lender would be considering the presence of other incomes in the household in the context of other credit risk factors. These credit related controls include:

- Whether the borrower is living in their first owned home,
- The source of down payment they used for their prior mortgage (e.g. own savings vs gifts),
- Whether the borrower's current first mortgage is an ARM,
- Whether the borrower is currently carrying a balance on a home equity line of credit,
- Whether the borrower has self-employment income (which is generally less stable than wage or retirement income)
- Whether the borrower has income from rental properties

In addition, the year in which the borrower's current mortgage was originated is used as an indicator for the general level of underwriting standards that may have been applied to them. We use 2008/09 as the dividing line between relatively loose and tight underwriting criteria, based on bank self-reporting (Rappaport and Willen, 2014). We also include fixed effects for the Census region (northeast, Midwest, south, and West) of the surveyed housing unit. More fine grained geographic indicators suffer from censoring in the AHS public use file.

Other control variables that relate to potentially risky loan features are whether the borrower's mortgage has a balloon payment or an interest-only period, and whether documentation requirements for income, assets or employment were reduced or eliminated. (The latter two controls are only available in the 2011 survey.) These covariates did not have a significant effect on borrower outcomes or on other model coefficients, and so were removed.

An important control variable that aids in predicting mortgage default is the so-called DTI ratio. Here, we compute DTI as the ratio of housing expenses (including mortgage payments and utilities) to the core income of the borrower and spouse – but leaving out any implied contributions from other household members. This gives some indication of the level of payment stress that the borrowers may be experiencing, that might impel them to either pay off their mortgage and downsize (if they have equity), or to possibly default if they are underwater and do not have funds for a full payoff. We do not include the additional household member incomes in this DTI calculation, because we want to see if EIHs appear to be a better or worse risk under traditional lending guidelines in which such incomes are not considered. Note that this DTI ratio is not directly comparable to a back-end DTI (which figures into program rules for HomeReady and for qualified residential mortgages), which excludes utilities but includes other debt obligations.

Finally, we considered an additional set of control variables that are likely to affect the borrower's desire to stay in their home, but which would not be part of a lender's underwriting criteria (although age and education may also be correlated with a FICO score):

- The number of years the borrower has been residing in the home,
- The level of education of the borrower (less than high school, high school graduate, some college, or college degree and beyond),
- The borrower's age (or average age of borrower and spouse),
- Whether there are children under 18 in the household, and
- Whether there are elders (persons 65 or over) in the household.

Two regression models were run, with model 'B' using all of the controls discussed here and model 'A' using all but the final set of controls. All of the covariates were interacted with the flag for a borrower's current mortgage being underwater, and run against the pooled set of observations of households with mortgages in 2011 (both underwater and otherwise) for which the current LTV was known. Summary statistics showing the differences between the three populations – nuclear households, non-EIH shared, and EIHs – are shown in Tables B-1 and B-2.

The sample is restricted to those where the outcome status (that the family has moved out in 2013 or not) is clearly observable. In particular, observations are removed if there is no corresponding record for the housing unit in 2013, or if there is a record but it is a Type A Non-Interview. The Type A non-interview occurs when there is someone is known to be living in the home but an interview was not obtained. Other 2013 outcomes that we would classify as an adverse outcome would be: a completely different family having moved in; or the home being vacant or torn down.

Table B-3 shows the regression results for our two variant models, with coefficients shown for both underwater and non-underwater borrowers, for our parameter of interest (whether the household is an EIH vs the two control groups) and for selected covariates. In particular, we see that borrowers with a high housing expense to income ratio (DTI) are more likely to move out, and that this effect is intensified for underwater borrowers.

In both model variants, being in an extended income household has a strong and significant ($p < 0.0001$) effect of reducing the likelihood of a move-out two years after being underwater (compared to nuclear households). On average, the associated marginal effect is a reduction in move-out probability from 11% to 6%. Notice also that shared households that are underwater but are *not* EIHs (i.e. in which the non-borrowers have relatively little income) are also less likely to move out than nuclear households. The magnitude of the effect for non-EIH shared households is less than half that of EIHs, but it is still statistically significant.

These results suggest that being in an EIH may positively improve mortgage loan performance through two distinct mechanisms. First, the mere presence of additional adults or sub-families in the household, regardless of their income status, could make the borrower more reluctant to move, and more willing to find ways to stay in the home even under adverse circumstances such as a loss of equity and/or an income shock. In addition, having multiple adults with significant income could make the household more resilient to a negative income shock experienced by one individual.

Prior research has shown that lower-income and minority households have relatively lower mortgage prepayment speeds (Deng and Gabriel, 2006). This could be driven by a lower incidence of refinancing and/or less frequent moves. However, Model B in our analysis controls for minority status and for income related variables. Furthermore, we see fewer move-outs for borrowers with equity when they are in *non*-EIH shared households, which have similar incomes to nuclear families. This suggests that turnovers are less frequent in shared households of all types, even when controlling for income and minority status.

The regression results on the likelihood of staying in place (whether underwater or not) are also reflected in differences between the groups in the average number of years that a household has lived at their current residence as of the survey year. This statistic is 9.7 for nuclear households, but 11.7 for EIHs and 12.2 for non-

EIH shared households. EIHs are more likely than both other groups to be first time home buyers, and to have someone 65 or older at home, but are less likely to be married or to have children. Even when we exclude the subset of EIHs consisting of a cohabitating, unmarried couple (which by definition will not be married), just 40% of the borrowers in the remaining EIHs are married, as compared to 70% for those in other groups. Thus, in a majority of EIHs, a non-borrower adult may be providing income stability and other practical support to a single householder who does not have a spouse to fall back on.

We would like to know if the same effects shown in the prior regressions can be observed not only during a time period of economic recovery, but in a crisis period, such as 2007 through 2011, when mortgage defaults were at their peak. To extend the analysis to those years, however, we needed to use more indirect means to judge whether the household had an underwater mortgage, because the AHS did not ask respondents to estimate their current loan balances prior to 2011. We therefore calculated an approximate LTV ratio based on the mortgage origination date, initial loan balance, original interest rate, and original term. From these fields, we estimated a mortgage payment for a fixed rate loan with the specified term, and then computed what the remaining loan balance, and LTV, would be as of the survey interview date.

Table B-4 repeats the prior regressions with the underwater status being derived from an estimated LTV, and with additional interactions on the survey year. By isolating the results for 2011, these can be compared to the equivalent models that use the more accurate LTV measure. Because the population of underwater borrowers in 2007 and 2009 is fairly thin, we then pool the results for these two survey years, so that they represent a mix of outcomes where the time frame over which a move-out event is observed is either 2007 to 2009, or 2009 to 2011.

Looking at the 2011 results, the coefficient on EIH and underwater is still strong and significant, but it is closer in magnitude to its non-underwater counterpart, which is consistent with an attenuation bias effect from measurement error in the parameter. However, this measurement error alone probably does not account for the differences seen in the 2007/2009 coefficients. The measured effect on move-outs for EIHs that are not underwater is slightly weaker than it is in 2011, but the corresponding effect for underwater EIHs in 2007/09 is only about half as strong under Model B, and in Model A it is not significantly different from zero.

Some of the difference in results from Table B-3 could be due to noise in the LTV measure used to generate the underwater flag. By comparing the inferred LTV used in this regression to the actual LTV within the subset of the 2011 surveys where both are available, we can see how noisy an approximation our inferred LTV is to the real thing. The comparison in shown in Table B-5 .Based on our 110% threshold, the rate of underwater false negatives is quite small (3%) but the rate of false positives is 23%. This means that any results based on the pool of borrowers presumed to be underwater using the inferred LTV will suffer from a kind of attenuation bias – being a mixture of effects for underwater and non-underwater borrowers.

A possible economic explanation for these differences in results is that the “home attachment” channel, by which an EIH may be less likely to default because the larger household has greater incentives to stay in place, is operative regardless of external economic conditions. But the “income hedging” channel, by which multiple income earners provides a buffer against shocks, may only be effective, or is at the very least more effective, when the shocks to the borrower’s income are idiosyncratic rather than cyclical. That is, during normal economic conditions, changes to incomes of different household members are less correlated, so that if one person loses a job, the other is likely to still be employed. But during the Great Recession, income or job losses of family members were more likely to be correlated, and it would also have been more difficult for other family members to quickly find a new job or increase their hours.

When robustness checks are applied, we do not see appreciable changes to the 2011 findings. Results did not change appreciably when we varied the threshold for considering a household as being underwater on their mortgage, from 100% to 120% MTMLTV. We also re-ran tests using an alternate income calculation in which negative personal incomes were replaced with zeros, with no significant change in outcomes. However, as shown in Table B-6, the magnitude and significance of the 2007/09 EIH effects for underwater borrowers turn out to be sensitive to certain conditions, particularly under Model A in which demographic controls are not included. In particular, we do see a statistically significant reduction in underwater move-out rates even in

2007/09, when non-relatives other than partners of the borrower are excluded from EIH qualification. This is also the case when the borrower population is restricted to those where core income is at or below 100% of the HUD assigned area median family income (AMI).

These results suggest that the design features of a lending program that targets extended income households can have an appreciable effect on the potential credit risks associated with considering the non-borrower income. From the Model B results, which include demographic controls, it appears that even in periods of high unemployment, the non-borrower incomes do improve loan performance, all other factors being equal. However, forming an EIH is also associated with selection factors that may be related to a borrower's financial need, making those households riskier as a group. These selection-related risks appear to be stronger when the non-borrower is not a relative, and when the borrower's income is greater than the local HUD AMI.

Because our models do not include credit scores or similar information that would be present in a mortgage application, it is unclear whether the Model A or Model B results are more indicative of the net performance effects of non-borrower income that would be experienced by a lender. We can reasonably infer, however, that extended income households should entail less risk in the context of an affordable lending program targeted to low and moderate income buyers, or to underserved geographic areas (such as those with higher minority populations). Under such a program, the self-selection factors associated with EIHs would be diminished.

It is also possible that these regression models understate the implied loan performance benefits of being in an EIH, because we have not been able to fully control for geographical differences (which would be associated with unemployment and home price changes over the two year period), or for loan features associated with risky practices of the subprime era (particularly in 2007/09). If borrowers in EIHs were more likely to have lived in areas with large home price declines, or to have taken out loans with higher risk features, then this could have increased their move-out rates relative to nuclear households in ways that would not necessarily be relevant to a lender's risk in the current era.

Because mortgage lending programs have not counted non-borrower income in the past, we cannot directly measure the effects that new programs might have in allowing borrowers in EIHs to take out bigger loans. However, as an additional indirect measure, we performed an additional sensitivity test on the underwater borrower analysis, by replacing the front-end DTI ratio control variable with one that uses the borrower's extended income (including shadow rent) in the DTI calculation, as might occur in a hypothetical EIH lending program. If, in this context, we saw a negative coefficient for underwater EIHs, this would suggest that counting the shadow rent in borrower's income would increase lender risk. Instead, we observed no substantial difference in regression outcomes when using the alternate DTI, and even in the worst performing model, no statistically significant negative coefficient was observed for EIHs with underwater loans.

Section 5. AHS Income Stability Analysis

So far, we have not addressed the mechanism by which non-borrower income might be taken into account in the underwriting process. A simple approach would be to give some positive weight to any borrower in an EIH, treating this condition as a binary compensating factor. Alternatively, the influence of EIH status on underwriting outcomes could be variable, based on the amount of non-borrower income. However, our sample of underwater EIHs is too small to allow more than a binary effect to be detected.

One approach that is sometimes used in loan underwriting to factor in a potentially variable income stream is to apply a haircut or weight factor. For example, documented rental income may be reduced by 25% in order to compensate for possible vacancy periods and maintenance costs (Fannie Mae, 2015). In the same spirit, we will define the *extended income* of a borrower in an EIH as consisting of the borrower(s) regular income sources, supplemented by just 30% of the income of all non-borrower adults in the household. We use the 30% level as an imputed potential rent contribution or *shadow rent* payment. This level is based on FHA standards for low-income rental housing programs such as Section 8 vouchers, in which household members are assumed to be able to sustain rental payments at this level. This should not be confused with the use of a 30% ratio of non-borrower to borrower income that we have used to define an EIH. Using the shadow rent

concept, we can assume that in any EIH, the shadow rent will raise a borrower's extended income by at least 9% (30% of 30%).

We would like to know if a borrower's extended income, by this definition, has the same "quality" as that of borrowers who do not live in an EIH. One avenue by which income "quality" can be assessed is to observe whether the income is stable over time – in particular, whether it is vulnerable to losses of various magnitudes. That is, can we rely upon shadow rent contributions from non-borrower household members in the future? If the inclusion of shadow rent does not degrade the stability of the borrower's income, this gives us more assurance that such an inclusion should not increase the risk of default.

The income stability issue is particularly important in the context of lending to lower-income households, who may be subject to a greater risk of both idiosyncratic and cyclical shocks to their income. The preceding analysis of underwater households suggests that the EIH structure provides a good measure of insurance against idiosyncratic shocks, but possibly not against cyclical shocks.

Because the data in the American Housing Survey is organized as a panel, we can track the overall income of a household, and of individual members, over time, as long as they are residing at the same location. The tracking is relatively coarse-grained because each household is interviewed only once every two years, and we can only identify individual incomes starting with the 2005 survey. This means that, at best, we can observe five income snapshots for the same household.

Furthermore, as the length of time between two snapshots increases, the observable sample of families who remain at the same address over that period becomes progressively smaller and more censored. To the extent that families who have gained or lost significant income are more likely to move away from the sampled housing unit, the censoring may cause us to under-estimate income instability. To minimize this censoring effect, we have only used short-term income comparisons between two successive interviews as our metric of income stability.

The income being compared across time periods is the CPI-U adjusted *extended borrower income* as defined previously. We expect that such an income measure (using a 30% weight on non-borrower income) should be more relevant to the ability of a home-owner in an extended household to pay their housing expenses, than either a measure of the borrower's income alone (with a zero weight on the non-borrower amount) or total household income (with a 100% weight).

From one snapshot to the next, this extended borrower income can fluctuate for several reasons: the personal income of a given household member may go up or down; and the household composition can change as both borrowers and non-borrowers could move in or out. Table B-7 shows the relative occurrence of various changes in EIH households observed between surveys.

In particular, we track whether the identity of the highest income non-borrower remains the same, which is only true about half the time (although in some cases the household is reclassified as 'nuclear' simply because the borrower marries their cohabitating partner). In a number of cases, a non-borrower who moves out or loses income is replaced by another household member. However, in 27% of EIHs, we see two years later that the high-income non-borrower either loses all of his or her income, or moves out, and is not replaced. This scenario clearly poses a risk to the overall stability of our extended income measure: as we will show, however, the loss of non-borrower income is partially mitigated due to the fact that only 30% of non-borrower income is counted, and because borrower income in an EIH is itself likely to increase.

For this analysis, we have constructed two alternative measures for income instability as measured over two consecutive surveys (two years apart). They are defined as the proportion of households whose CPI-adjusted extended borrower income dropped by at least 25% or 50% in between surveys. We exclude from each sample any household in which real total household income in the earlier survey is less than $1,000 per year, or which reports that the household is receiving help with their mortgage payments from an outside party, as relative income losses in such households may not be meaningful.

Within the population of homeowners with mortgages, we then compared the rate of moderate and severe income losses among extended-income households (EIHs) with nuclear families and with shared households not meeting the EIH income threshold. This is shown in Table B-8. The stability of income for extended-income households, as a group, turns out to be roughly similar to that of other households, with stability in comparison to other groups improving as the magnitude of the income loss threshold increases. This pattern can be better understood by comparing average changes in both borrower and non-borrower income, as shown in Table B-9.

Notice that average real total household income went down among all household types, reflecting the influence of the severe and persistent drops in employment rates that came about with the Great Recession. For nuclear (non-shared) households, non-borrower adult income at the initial survey is zero by definition, and cannot go down, so the mean increase of $1,986 in this income category reflects a subset in which additional adults with income either moved into the household, or aged in (turned 18) between the initial survey and two years later.

Because we have separated shared households into EIH and non-EIH subgroups on the basis of the ratio of borrower and non-borrower income, then by the nature of this selection process, we are more likely to see borrower income increase, and non-borrower income decrease, in an EIH, with the reverse being true for non-EIHs. However, we also see that non-borrower income changes are biased downward in shared households, as non-borrowers whose income goes up are more likely to move out. For EIHs, in fact, the average drop in non-borrower income over two years is twice the magnitude of the average gain in borrower income, so that mean total household income in EIHs drops by $8,500.

It should be clear from these results that it would be imprudent to expand credit to EIHs (or to shared households in general) on the basis of *total* household income. However, when we track changes in borrower's extended income (using the 30% weight), EIHs look much more stable along this measure. The mean real extended income in an EIH actually goes up by over $5500 over two years (in contrast to a $3000 average decline for non-EIHs), in part because we have limited the impact of the non-borrower losses by including only the 30% shadow rent component in the "extended income". That is, each dollar of income loss for a non-borrower is assumed to have less of an impact on the borrower's ability to pay a mortgage than an equivalent reduction in that borrower's own income.

Another factor contributing to the relative stability of the borrower's extended income is a hedging effect where increased contributions from non-borrowers help absorb the borrower's negative income shocks. We can see this pattern in Table B-10, which shows the percentage of EIHs in which non-borrower real income goes up. In the most recent time span (2011 to 2033), non-borrower income is much more likely to increase (34% vs 25%) when the borrower's income has fallen. However, this hedging effect is weaker in other periods, and is no longer statistically significant at the Great Recession interval of 2007-09.

We conducted simple logistic regressions to test for the statistical significance of the income stability results found in Table B-10, with the outcome being a reduction in extended income over some threshold (either 25% or 50%), and the variables of interest being EIH status in comparison to flags indicating the existence of rental or self-employment income. In one model specification (Model A), only controls for time (survey year) and geographic (census region) fixed effects were included. In Model B, demographic controls were added on borrower age, race/ethnicity, sex, and marital status. The regression results are shown in Table B-11.

Overall, we find that EIHs are less likely than non-EIHs to show very large income losses (50% or more), but when smaller loss thresholds are used, the advantage tilts towards non-EIHs. At the 25% threshold, there is no statistically significant difference between EIHs and non-EIHs using Model B; with fewer controls, there is a slight disadvantage for EIHs. That is, the hedging properties of non-borrower income help insulate EIHs against very large income losses, but when non-borrower income drops, the removal of shadow rent payments makes the borrower more vulnerable to more moderate income shocks.

These stability results can be contrasted with those for borrowers with other income types, the effects of which were measured by Model B. In particular, borrowers with rental income or self-employment income experience

a greater risk of income loss than other borrowers, and this risk is fairly uniform across different loss thresholds.

When these effects are broken out by survey year, this general pattern persists (see Table B-12), but there are variations from year to year in the level of income loss that must occur for us to observe that EIH's are able to hedge from that loss. In particular, EIH's seem to be more unstable when measuring changes between the 2009 and 2011 surveys, than for other periods, while they are relatively more stable in the 2011-13 interval. This dovetails with the theory that EIH's can hedge against idiosyncratic income losses but not against cyclical ones, as unemployment rates, particularly for lower-income workers, remained high between 2009 and 2011.

The relatively weaker results for the 2009 to 2011 are also consistent with our prior findings that an incremental improvement in loan performance due to an underwater extended household also being an EIH was observed in 2011 to 2013, but not in the pool of 2007-09 and 2009-11 interviews. This is because there were relatively few underwater mortgages in 2007 compared to 2009 – so results for this cohort are dominated by the 2009-11 group, for which we see that EIH income hedging was not effective.

As a robustness check, all of the data analysis and regressions described in this section were repeated using an alternate income calculation in which negative personal incomes were replaced with a zero; this had minimal effects on the results. We also re-ran the tests using two alternate definitions for an EIH: one in which only non-borrower income from relatives of the borrower or spouse was taken into consideration, and another in which unmarried partners of the borrower could be considered, but not other non-relatives. The results are shown in Table B-13. Removing non-partner non-relatives from EIH qualification does not significantly change stability results. However, there is a significant degradation in income stability when the income of *all* non-relatives, including unmarried partners, is disqualified. These results imply that restricting non-borrower, unmarried partners of the borrower from being included in an EIH lending program might actually increase overall risk.

One approach to reducing a lender's exposure to risks associated with a non-borrower losing income or moving out is to place a cap on the proportion of non-borrower income, in relation to the borrower(s) own income, that is taken into consideration. To explore the effect of such a cap, we ran a sensitivity test for the regression that measures EIH effects on the risk of a 25% income loss. We used only time and geographic fixed effect controls (Model A). Here, we continue to assume that the extended income including shadow rent fairly represents the resources available to the borrower. But now, we only mark an EIH as having experienced an income drop if its future extended income, two years later, falls below some percentage of the initial *program countable* income. The program countable income is the minimum of the actual extended income with the cap limit. At one extreme, if the cap on shadow rent is zero, then EIHs are guaranteed to look more stable than non-EIHs, but there is also no additional credit extended under the program to those families. As we gradually lift the cap, we increase the extent to which additional mortgage credit is extended to EIHs, with the trade-off that the risk increases that actual resources in the future will fall below what we have considered for the program.

As shown in Table B-14, it only takes a very mild cap to eliminate the relative risk of smaller income losses in EIHs as compared to non-EIHs. The threshold at which the "quality" of the program countable income meets or exceeds that of non-EIH income occurs when the cap on shadow rent is 50%, so that non-borrower income can be as high as 167% of borrower/spouse income. If we wanted to be even more cautious in implementing an EIH lending program, we might decide to tailor the cap so that, even in the worst-performing time period for EIHs, the risk of moderate income loss is as good as or better than in non-EIHs. This occurs when a 20% cap is used, so that only non-borrower income of up to 67% of the borrower income is considered.

Section 6. Conclusions

A substantial and growing number of Americans live in households that are shared with adults other than a spouse. Especially for homeowners, these shared living arrangements are usually with relatives or unmarried partners rather than roommates or boarders. People in these households may provide support for each other

through a variety of financial and non-financial means that are not expressed as formal rent payments. In the context of mortgage lending, this suggests that the income of the loan applicants may not fully capture those borrowers' ability to sustain a mortgage payment, given the income levels of non-borrowers with whom they would be sharing a home.

If non-borrower income were to be taken into account in mortgage underwriting, this could help qualify more borrowers who are credit constrained because of high debt to income ratios (DTI). This could be particularly beneficial for members of minority groups, for whom these shared or extended-family household types are more prevalent.

Looking at American Community Survey data, we find that 15% of existing homeowners live with adults other than a spouse whose incomes would meet this threshold. The proportion of these extended income households or EIHs rises to 20% for African-Americans and 24% for Hispanics. We can indirectly assess whether income from non-borrowers affects loan performance by tracking the behavior of households whose mortgages were underwater after the housing bubble collapsed, using data from the American Housing Survey. Underwater borrowers in EIHs were significantly more likely to stay in their home than those in comparable non-EIH households. There appear to be two factors contributing to this performance difference: the financial benefit from the non-borrower income itself, and the fact that households with additional adults show more attachment to staying in place.

We have defined a borrower's extended income in an EIH as including a shadow rent of 30% of adult non-borrower income. Under this definition, our results indicate that the borrower's income in an EIH is generally as stable as in comparable non-EIHs. Potential declines in the shadow rent, including those resulting from a non-borrower moving out of the house, are offset by a tendency of the borrower's own income in an EIH to go up due to mean reversion.

The EIH performance benefits and income stability measures show significant variation over time, with the worst relative outcomes occurring in the 2009-11 post-crisis period, giving us an empirical "stress test". We see that EIHs are less able to hedge against borrower income losses at those times. Also, some EIH performance measures weakened when demographic and socio-economic controls were removed. Removing unmarried partners from the population of EIHs actually degrades income stability.

We find that extended income households tend to be concentrated at the lower income levels among home owners, and they also are more likely to have characteristics associated with lower credit scores, such as utilization of home equity lines of credit. The implied performance of EIHs in relation to non-EIHs was found to be more consistent over time when we controlled for a wide range of credit-related and demographic characteristics. We therefore see two competing risk factors at work: the positive treatment effect of a borrower's being in an EIH, but a negative selection effect. The negative selection effect would come into play if considering non-borrower income lowers the mean borrower income in a lender's portfolio, and if lower income is correlated with risk factors that are not captured in the mortgage application or credit report. This implies that counting non-borrower income would entail less credit risk in the context of a loan program that is targeted at lower-income homeowners, because this could reduce the selection effects.

We hope that these research findings will encourage mortgage lenders to review their treatment of non-borrower and boarder income. In addition, we see value in a broader engagement by researchers and industry participants in gaining a better understanding of the changing structures of American households. In particular, more work can be done to investigate what motivates people to form extended households, how they share financial and non-financial resources within those households, and whether they view these arrangements as temporary or more long-lasting.

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Appendix I: Data Sources and Transformations

American Community Survey

Most of the ACS results were derived from the US Census public use microdata 1% single-year sample for the 2013 survey year, with the exception of Tables 4b, 5 and 6, which also draw on the 2007 through 2012 samples. Surveys corresponding to group quarters and dwellings other than fixed structures (RVs, houseboats) were excluded. Mobile homes were also removed from the sample, due to the complexities of classifying such a household as an owner or renter.

Households were classified as African-American or Asian if the head of household, spouse or unmarried partner identified as such, possibly in combination with another race. A similar rule was followed for Hispanic and immigrant households.

Household relationships were defined using both the codes for a person's relationship with the head of household (REL) and their subfamily relationships (SFN and SFR). An "adult child" is broadly defined as anyone 18 or older who is designated as a child, stepchild, or son or daughter-in-law of the head of household, or who has a subfamily relationship indicating that they are the child of the spouse or partner of the head of household, or the spouse of any other adult child. The same strategy is used to identify parents, step-parents, or mother or fathers-in-law of the respondent, their spouse or partner, who are all classified as "parents". People related to the spouse or partner of the head of household in any other way are then classified as "other relatives". Unfortunately, we do not have a way to exclude from the non-relative group, anyone who is making explicit rent payments, or is a household employee, as we do with household members in the American Housing Survey.

American Housing Survey

AHS analysis is based on the public use microdata for the national biannual surveys from 2005 through 2013. The starting point of 2005 was chosen because this is the first year in which the incomes of each household member are fully separable. Prior to this, income other than wages and salaries was pooled at a household level. As all regressions were based on comparing two consecutive surveys, the base years then ranged from 2005 through 2011. For the underwater borrower regressions, the 2005 base year could not be used because there was no survey question on the current home value at that time.

The most complex data cleaning step for the AHS is the proper identification of unique individuals across survey years, and the assessment of whether an existing family is still residing at a housing unit or if there are new occupants. The AHS codes for new/existing families (SAMEHH and SAMEHH2) are known to be inaccurate in some cases. Furthermore, PLINE codes, which are supposed to uniquely identify household members, may be reassigned in an inconsistent fashion. For this reason, a multi-step algorithm is used to resolve these issues, based on the consistency of MOVE, AGE and SEX attributes of each person from year to year. Each combination of household and survey year is assigned a generation number (GEN); when a generation number changes between surveys, the prior household is assumed to have moved out. Alternate PLINE values are assigned, as needed, so that at a given address, each combination of PLINE and GEN represents a unique person.

Starting with the second survey year (i.e. 2007 or later) in which a household (CONTROL) is observed, PLINE person records are compared to the most recent prior survey within the current generation (GEN).

A PLINE record is considered *move consistent* with its predecessor if the person's move-in year (MOVE) is either unchanged, or at least remains earlier than the prior survey year. A record is *age consistent* with its predecessor if the difference between the person's reported age and the survey year has not changed by more than two years. Any person's record that is move, age and sex consistent with its prior value is then assumed to represent an existing household member. A record that is move-inconsistent, and either age or sex-inconsistent, with its prior value, or that has no predecessor, is assumed to represent a new individual. Other records are marked as ambiguous.

If there are two or more people in the same survey whose status is ambiguous due to a sex or age inconsistency, we check to see if there is some unique permutation of those PLINES that would resolve the anomaly. If so, we reassign the PLINES and mark the records as representing existing household members. This takes care of situations where PLINES were inappropriately re-ordered in a follow up survey of the same household.

After checking for transpositions, we examine each survey year in which one or more persons still have an ambiguous status. If there is no one in the household who has been clearly marked as an existing person, then we resolve the ambiguity by assuming that this is an entirely new household (generation), and all members are then considered to be new. Otherwise, then we assume that persons who were marked as ambiguous due to an age or sex discrepancy are new (and are given new PLINEs), while those with a move inconsistency (only) are assumed to be existing.

Once these ambiguities have been resolved, family relationships are derived in a similar fashion to those used for the ACS. The core household members are defined as the head of household, their spouse, and anyone explicitly marked as an owner/renter (TEN). Because TEN is not applied consistently we do not have an accurate indicator for whether spouses are actually co-borrowers or not. The REL, PAR, SPOS, FAMREL and FAMNUM fields are used in the same manner as REL, SFN and SFR in the ACS, to broadly include stepfamilies, in-laws, and relatives of unmarried partners or other resident homeowners, when classifying someone as an adult child, parent, or other relative. Any household member reported to be paying lodger rent to the head of household is excluded from the household income calculations and EIH designations.

To compare incomes across survey years, all dollar amounts are converted from their nominal values to year-2013 equivalents, using the CPI_U from January of the survey year. This reflects the fact that incomes are taken over the 12 months prior to an interview, and interviews can take place at any time in the calendar year, so that, for example, a July 2011 interview used for the 2011 AHS will take income from July 2010 through June 2011, which will be adjusted based on the January 2011 CPI.

Appendix II. Underwater Termination Analysis

In our analysis of move-out rates among underwater homeowners in the American Housing Survey, we make the assumption that when a borrower has negative equity, any observed move-out is likely to be associated with a default event (foreclosure or short sale). As an empirical test of this assumption, we examined terminations of underwater mortgages that were either owned or guaranteed by Fannie Mae, using the company's internal loan performance data. Two snapshots were taken of all Fannie Mae loans, as of June 2009 and June 2011, which had an estimated mark-to-market LTV ratio of 110% or more. Then, to match the AHS survey interval, we observed whether the loans had terminated within 24 months of the snapshot date.

For a loan in Fannie Mae's book of business, a termination can occur either due to a default-related liquidation (foreclosure or short sale), a servicer's repurchase of the loan, or a payoff. Most mortgage payoffs are prepayments, either due to refinancing or turnover (borrower sells the subject property). We can detect payoffs due to refinancing when the new loan is also owned or guaranteed by Fannie Mae. After excluding repurchases and known refinances, this leaves us with liquidations (which involve a move-out) and payoffs (which may or may not involve a move-out). The ratio between the numbers of loans in these two groups gives us a lower bound on the proportion of underwater loan terminations within 24 months that resulted from defaults. For the June 2009 cohort, this proportion was 89%, and for the June 2011 group, it was 84%. The lower default rate in 2011 is probably due to rising home prices in the 2011-13 period that could have allowed some borrowers with slightly negative equity to pay off their mortgage in full within two years.

It is possible that an underwater borrower can move to a new residence and convert their previous home to a rental property, in order to continue paying a mortgage. Our loan performance data does not allows us to track such conversions, and so the actual default rate among underwater borrowers will be lower than the observed rate of move-outs. Nevertheless, the relatively high ratio of default to prepayment rates seen in our data does give support to the use of underwater move-outs as an indirect performance metric

Appendix III. Treatment of Non-Borrower Income in Existing Mortgage Programs

In most mortgage lending programs, payments from other household members to the home-owner are evaluated under so-called "boarder income" rules. The frameworks for boarder income tend to be similar to those for rental income from investment properties, or from additional units in a 2- to 4-unit property that the borrower is living in. For example, when underwriting an FHA loan, rent payments from boarders can only be counted towards the borrower's income in the context of a net rental income that has been declared on the borrower's tax returns for the past two years, and where there is a formal lease (FHA, 2015). This situation is unlikely to occur when the "boarder" is a family member, friend, or unmarried partner of the boarder.

Under the standard underwriting rules for conventional mortgages defined by Fannie Mae and Freddie Mac, boarder income is usually not considered. Until 2015, the only exception to this has been the MyCommunityMortgage® (MCM®) program, which was Fannie Mae's program for low and moderate income borrowers. Under MCM, gross boarder income receipts could be included with the borrower's income if they could be documented with 12 consecutive months of rent checks (Freddie Mac, 2015; Fannie Mae; 2015).

Payments from non-borrower household members may also be counted towards a borrower's income if they are applying for a loan modification under the U.S. Treasury's Home Affordable Modification Program (HAMP). Under the HAMP rules, the non-borrower must present proof of income, and the stated payment to the borrower may not exceed 100% of that income. However, the payment itself does not have to be documented (U.S. Treasury, 2015).

In December 2015, Fannie Mae's MCM was retired and replaced with the HomeReady™ program. HomeReady expands the mechanisms by which shared household contributions can be considered for underwriting in several ways. The documentation requirements for boarder income were reduced to 9 months from 12 months. Rent payments from accessory units are allowed under the same rules as for 2 to 4 unit properties. But in situations where formal rent checks cannot be documented, the income of non-borrower household members can be evaluated directly.

To qualify for the non-borrower household income provision in HomeReady, the non-borrower income must be documented and verified by the lender, and it must be at least 30% of the borrower(s) own income. This qualifies the borrower as being part of an Extended Income Household, and the analysis in this paper has employed the same definition for an EIH.

Normally, to qualify for a HomeReady mortgage, the borrower's back-end DTI ratio may not exceed 45%. But if they are in an EIH, this threshold is raised to 50%. However, to qualify for a loan, the borrower's application must still be approved through Fannie Mae's automated underwriting engine, Desktop Underwriter® (DU®). In this context, DU's multi-factor risk assessment takes the borrower's income as one of its inputs, and does *not* take any non-borrower income into account. As a result, borrowers in an EIH may also need to present some kind of compensating factor such as a higher credit score or larger down payment, in order to be able to take advantage of this higher DTI threshold.

For those borrowers who then pass the DU risk assessment, raising the maximum DTI threshold from 45% to 50% is equivalent to raising the borrower's estimated income by 11% when calculating the DTI ratio. Using our shadow rent concept, this is similar in principle to capping the amount of non-borrower income that is taken into account to just 37% of the borrower's income.

The rules for HAMP only allow payments from non-borrower household members to be considered when they are related to the borrower by blood or marriage, or if they are an unmarried partner. HomeReady is less restrictive, allowing the incomes of non-relatives other than partners to be considered. Neither program allows payments or income of a non-borrower spouse to be counted. If spouses were allowed to count some part of their income towards a mortgage application without becoming co-borrowers, this would be likely to exacerbate the existing adverse selection problems that are raised when a married couple applies for a mortgage. If one of the spouses has a poor credit rating and/or a large amount of non-mortgage debt, and relatively low income, then an applicant couple may choose to have only one spouse apply for the mortgage. This causes the observed credit scores of co-borrowers to be skewed higher due to censoring. We can assume then, that if a

spouse chose to declare their income to be considered as a non-borrower household member, but not to be a co-applicant, then their unobserved credit characteristics would probably be poor.

Appendix IV. Tables and Figures

Figure 1. Types of extended-family households, as percentage of all households in category, 1990 Census (Kamo, 2000).

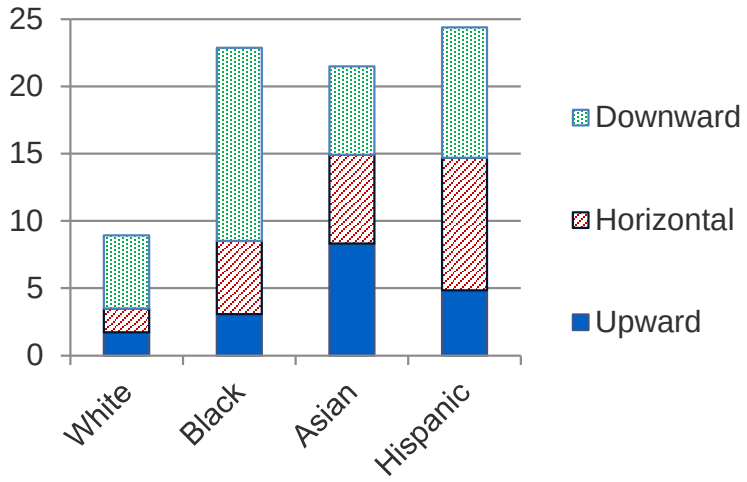
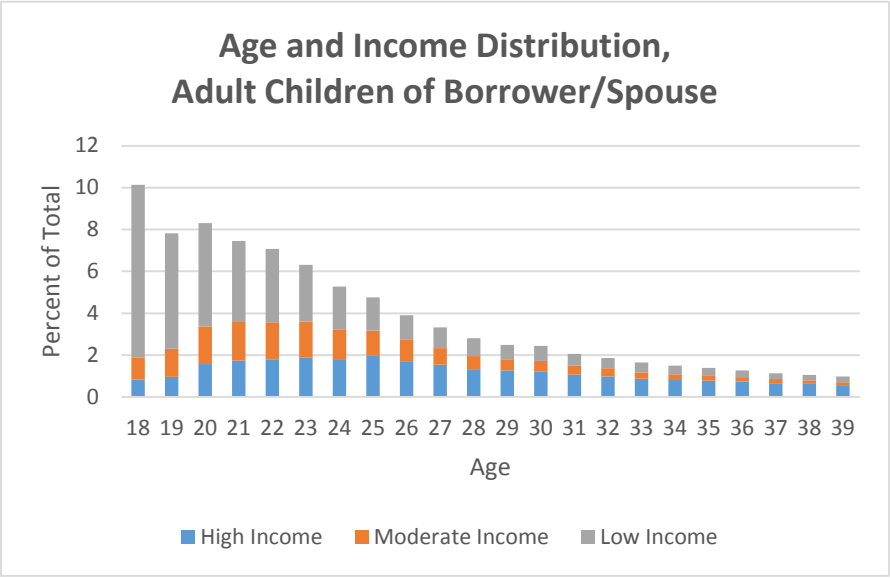


Figure 2. Adult children of borrower/spouse, ages 18–39, by income category (percent of total), 2013 ACS



[A] American Community Survey

Table A-1. Percentage of all households that are shared, 2013 ACS. Includes all tenure categories (renters and homeowners with or without a mortgage).

	Relatives Only	Relatives & Partners	Relatives & Non Relatives
All households	21.4	26.4	29.9
Asian	27.5	31.8	36.1
African American	27.3	32.8	35.7
Hispanic	33.1	40.8	44.8
Immigrant	32.7	36.3	38.6
Non-Hispanic White	17.3	21.7	25.2

Note: shared households contain at least one adult other than the ACS head of household (owner / renter) or their spouse.

Table A-2. Percentage of all households that are shared, by type of additional adult member, and by tenure category, 2013 ACS.

	Shared with relatives only	Shared with relatives & partners only	All shared households (relatives & non-relatives)
All households	21.4	26.4	29.9
Renters	18.0	26.1	32.8
Owners w mortgage	25.0	28.8	30.8
Owners, no mortgage	20.0	22.0	23.5

Table A-3. Percentages of renter households with extended-income pattern, using two alternate definitions, 2013 ACS

	Definition 1	Definition 2
All renters	16.5	9.7
Asian	15.5	10.0
African-American	17.5	11.4
Hispanic	25.5	16.7
Immigrant	18.7	13.7
Non-Hispanic White	12.9	6.3

Household is defined as an EIH if "core" income is at least 30% of non-core income.
Definition 1: core is head of household and spouse; unmarried partners and all other adults are non-core.
Definition 2: core also includes unmarried partner; all other adults are non-core.

Table A-4. Percentages of Shared and Extended-Income Households, using alternate definitions, homeowners with mortgages, 2013 ACS

	EIH (relatives & partners)	EIH (relatives & non-relatives)	Shared (relatives & partners)	Shared (relatives & non-relatives)
All households w/ mtg	13.1	14.7	28.8	30.8
Asian	15.4	17.1	35.7	37.6
African American	18.1	19.8	37.6	39.6
Hispanic	22.4	24.3	43.4	45.5
Immigrant	18.0	19.6	40.4	42.1
Non-Hispanic White	10.7	10.1	24.7	26.8

Table A-5. Extended-income households, classified by relationship of the highest income non-borrower (percent of total), homeowners with mortgages, 2013 ACS

	All EIH	Asian	African-American	Hispanic	Immigrant
Adult Child	43.3	42.3	47.5	47.1	52.8
Parent	7.8	11.7	7.4	8.2	8.7
Other Relative	13.5	18.6	19.5	17.0	15.9
Domestic Partner	23.1	16.4	16.1	18.5	13.7
Other Non-relative	12.3	11.1	9.6	9.2	8.9

Table A-6. Extended-income households, classified by relationship of the highest income non-borrower (percent of total), homeowners with mortgages, 2007 ACS (i.e. pre-recession)

	All EIH	Asian	African-American	Hispanic	Immigrant
Adult Child	40.4	39.3	45.2	42.6	49.2
Parent	6.7	9.3	7.5	6.3	6.4
Other Relative	15.7	23.3	20.4	22.8	20.5
Domestic Partner	24.8	17.8	18.5	18.8	15.1
Other Non-relative	12.3	10.2	8.4	9.5	8.8

Table A-7. Relationship to core of non-core adult members of shared households (percent of total), including EIH and non-EIH, comparing homeowners with mortgages in the 2007 and 2013 ACS

	Adult Children	Parents	Other Relatives	Domestic Partner	Non Relatives
All Shared HH, 2013	50%	8%	15%	11%	15%
All Shared HH, 2007	48%	7%	18%	12%	15%

Table A-8. Percentages of all households and all minority households that are shared (EIH and non-EIH), owners w/ mortgages, 2007–2013 ACS

	2007	2008	2009	2010	2011	2012	2013	*Change, 2008-2013*
All shared households	28.7	28.2	29.2	30.2	30.0	30.5	30.8	
Extended Income	14.2	14.0	14.1	14.5	14.1	14.4	14.7	0.8
Non Extended Income	14.5	14.3	15.0	15.7	15.9	16.1	16.1	1.8
Minority households	38.3	37.7	39.4	41.0	40.5	40.9	41.3	
Extended Income	20.8	20.1	20.8	21.3	20.4	20.5	20.9	0.8
Non Extended Income	17.5	17.6	18.7	19.7	20.0	20.4	20.4	2.8

Note: Changes in percentages from 2008-13 are all statistically significant at pr < 0.01.

Table A-9. Percentages of households with mortgages having non-working adults, 2013 ACS

	Ext Income	Non-EIH Shared	Nuclear
Any adult, unemployed < 1 year	12.5 [a]	13.0 [a]	4.7
Any adult, unemployed 1-5 years	4.4	6.2	1.4
Any adult, left workforce past year	7.9	12.4	5.6
Any adult, left workforce w/in 1-5 yrs	14.6	15.6	10.7
Core member, unemployed < 1 year	4.7 [b]	5.2	4.5 [b]
Core member, unemployed 1-5 yrs	1.9	1.4 [c]	1.4 [c]
Core member, left workforce past year	3.2	1.4	4.8
Core member, left workforce 1-5 yrs	9.2	1.4	10.6

Note: All column differences are significant at pr < 0.01, except: [a] pr < 0.05, [b] pr < 0.10, [c] no significant difference.

Table A-10. Percentage of households with given characteristic, shared and non-shared households, homeowners with mortgages, 2013 ACS

	Ext Income	Non-EIH Shared	Nuclear
Household w/ children under 18	35.3	43.2	39.6
Household w/ children under 6	15.1	11.4	16.6
Any adult has disability	31.5	27.3	16.3
Core member has disability	18.2	14.2	14.6
Has low income adult child under 35	17.3	69.1	0.0

Note: All column differences are significant at p < 0.01.

Table A-11. Multivariate analysis, borrowers likelihood of being in an EIH, homeowners with mortgages, 2013 ACS

Parameter	Estimate
Intercept	-3.338**** (0.002)
Borrower/spouse has disability	0.231**** (0.001)
Children under 6 in household	0.441**** (0.002)
Children 7-17 (only) in household	0.142**** (0.001)
Borrower/spouse age < 35	0.148**** (0.002)
Borrower/spouse age 35 to 49	-0.151**** (0.002)
Borrower/spouse age 40 to 64	0.290**** (0.001)
Borrower/spouse age 65+	-
Borrower is unmarried male	1.465**** (0.001)
Borrower is unmarried female	1.574**** (0.001)
Borrower/spouse not a HS graduate	1.202**** (0.002)
Borrower/spouse is HS graduate	0.882**** (0.001)
Borrower/spouse has some college	0.564**** (0.001)
Borrower/spouse is college graduate	-
Borrower/spouse Asian	0.707**** (0.002)
Borrower/spouse Hispanic	0.751**** (0.001)
Borrower/spouse African-American	0.200**** (0.001)

** pr < 0.10, ** pr < 0.05, *** pr < 0.01, **** pr < 0.0001.*
Coefficient estimates are logit scores (log of change in odds ratio).

Table A-12. Metropolitan Areas with high proportions of EIHs among households with mortgages, 2013 ACS

	Combined Statistical Area	HH w/ mtg	% EIH
1	Los Angeles-Long Beach, CA	2,189,369	21.8
2	Miami-Fort Lauderdale-Port St. Lucie, FL	844,361	19.6
3	Las Vegas-Henderson, NV-AZ	289,626	18.2
4	New York-Newark, NY-NJ-CT-PA	2,987,120	17.6
5	Buffalo-Cheektowaga, NY	198,989	16.9
6	San Jose-San Francisco-Oakland, CA	1,182,711	16.6
7	Philadelphia-Reading-Camden, PA-NJ-DE-MD	1,193,797	16.2
8	Chicago-Naperville, IL-IN-WI	1,588,859	15.9
9	Boston-Worcester-Providence, MA-RI-NH-CT	1,326,526	15.7
10	Albuquerque-Santa Fe-Las Vegas, NM	170,132	15.5
11	Houston-The Woodlands, TX	817,654	15.4
12	Washington-Baltimore-Arlington, DC-MD-VA-WV-PA	1,660,331	15.4
13	Salt Lake City-Provo-Orem, UT	366,084	15.4
14	Pittsburgh-New Castle-Weirton, PA-OH-WV	432,061	15.2
15	Hartford-West Hartford, CT	262,105	15.1
16	Orlando-Deltona-Daytona Beach, FL	417,692	15.1

Table A-13. Count of EIHs by tenure, borrower DTI and household income level, 2013 ACS

Low/Mod	DTI	Owners w/ mortgage	Renters
Yes	**< 20%**	147,647	148,346
Yes	**20 - 50%**	700,797	1,239,998
Yes	**> 50%**	1,083,926	2,624,831
No	**< 20%**	1,908,186	588,627
No	**20 - 50%**	2,647,374	1,428,579
No	**> 50%**	838,969	634,441

Income of adult non-core members in an EIH must be at least 30% of core income (head of household and spouse). Income of non-relatives other than partners is included for homeowners but excluded for renters.

Table A-14. Median core and extended income, EIH and non-EIH households, 2013 ACS

	Extended Income HH		*Non-EIH Shared*		*Non-shared*
	Core Income	**Extended Income**	**Core Income**	**Extended Income**	**Core Income**
All HH w/mtg	$41,900	$54,600	$85,000	$87,350	$77,000
Asian	$59,299	$68,100	$100,000	$103,000	$105,000
African-American	$36,000	$48,000	$67,000	$69,080	$60,100
Hispanic	$37,000	$49,000	$68,880	$70,420	$69,130
Immigrant	$43,000	$57,100	$86,100	$88,840	$85,000

Core income is that of borrower/spouse only. Extended income includes shadow rent (30% of non-core adult incomes). In a nuclear (non-shared) household, core and extended income are identical.

[B] American Housing Survey results

Table B-1. Summary Statistics, households with mortgages, pooled observations from 2007 – 2013 AHS. See text for category definitions.

	Nuclear	Non EIH Shared	Extended Income HH
Borrower/spouse income	$ 89,690	$ 94,788	$ 44,642
Income w/ shadow rent	$ 89,690	$ 96,419	$ 56,469
Total household income	$ 89,690	$ 100,225	$ 84,064
Gets outside help w/ mortgage	2.4%	2.3%	3.0%
Monthly housing cost	$ 1,728	$ 1,875	$ 1,624
Estimated mortgage UPB	$ 150,507	$ 148,412	$ 126,730
Estimated MTMLTV	67.3	62.4	63.8
Underwater (LTV > 110%)	6.7%	6.7%	6.8%
# of years in home	9.7	12.2	11.7
First time home buyer	41.5%	39.4%	51.8%
Has rental income	6.8%	7.3%	5.7%
Has self-employment income	15.0%	15.7%	10.4%
Has social security	15.3%	10.7%	16.9%
Has retirement income	11.3%	9.2%	9.4%
Has boarder	0.8%	0.7%	1.2%
Someone aged 65+ in HH	13.3%	16.5%	22.5%
Number of adults	1.7	3.0	2.9
Borrower/spouse age	46.8	50.0	48.9
Borrower is married	70.1%	70.1%	31.4%
Has children in HH	43.4%	45.7%	35.1%
Borrower/spouse is minority	23.6%	34.8%	37.1%
Borrower/spouse is African-American	8.5%	12.8%	12.6%
Borrower/spouse is Asian	4.4%	6.8%	6.0%
Borrower/spouse is Hispanic	10.1%	15.1%	17.9%
Sample size (2007-2013)	52,580	14,428	7,532

"Has income" percentages refer to whether the borrower and/or spouse has the specified income type. Borrower and spouse ages are averaged.

Table B-2. Additional categorical attributes, households with mortgages, 2007 – 2013 AHS.

Census Region	Nuclear	Non EIH Shared	Extended Income HH
Northeast	16.4%	19.2%	19.4%
Midwest	25.1%	22.0%	21.8%
South	36.9%	35.6%	33.1%
West	21.7%	23.3%	25.7%
Max education of borrower/spouse	**Nuclear**	**Non EIH Shared**	**Extended Income HH**
a) Less than HS	6.2%	8.7%	14.4%
b) HS Grad	20.5%	24.7%	30.1%
c) Some College	30.3%	31.3%	31.3%
d) BA or Beyond	43.1%	35.3%	24.2%
Mean age of borrower/spouse	**Nuclear**	**Non EIH Shared**	**Extended Income HH**
a) Under 35	21.1%	5.8%	19.1%
b) 35 - 49	39.2%	44.2%	30.4%
c) 50 - 64	28.9%	43.5%	37.6%
d) 65 +	10.9%	6.5%	12.9%

Table B-3. Logistic regression comparing effects of being in an EIH, shared non-EIH, or nuclear household, conditional on a borrower's mortgage being underwater (MTMLTV > 110%), on the probability of the family remaining in the home and continuing to own their home, two years later. Population = households with mortgages, 2011 AHS (with outcome observed in 2013).

Parameter	Model A	Model B
Intercept	0.472 (0.833)	-1.049 (0.940)
Not underwater (LTV < 110%)	2.360** (1.153)	2.743** (1.243)
Shared non-EIH, not underwater	0.323**** (0.061)	0.225*** (0.063)
Shared non-EIH, is underwater	0.308*** (0.119)	0.255** (0.124)
Extended Income HH, not underwater	0.513**** (0.085)	0.688**** (0.087)
Extended Income HH, is underwater	*0.672***** *(0.151)*	*0.765***** *(0.159)*
Core DTI Ratio (not underwater)	-0.751**** (0.091)	-0.569**** (0.100)
Core DTI Ratio (underwater)	-1.267**** (0.171)	-1.287**** (0.186)
Has Rental Income (underwater)	0.118 (0.177)	0.181 (0.180)
Self-Employed (underwater)	0.325** (0.136)	0.283** (0.138)
Credit-related controls	Yes	Yes
Additional controls	No	Yes
Sample size	11,782	11,782
McFadden Pseudo R^2	0.03	0.04

** pr < 0.10, ** pr < 0.05, *** pr < 0.01, **** pr < 0.0001.*
Coefficient estimates are logit scores (log of change in odds ratio).

Table B-4. Logistic regression showing three-way comparison of EIH, non-EIH shared, and non-shared household effects on the probability of the family remaining in the home as owners, two years after initial survey. Expanded population (households with mortgages, initial survey 2007-2011 AHS) using an estimated MTMLTV based on loan origination terms.

	Model A	Model B
Intercept	1.695*** (0.624)	1.072 (0.658)
Not underwater	-0.638 (0.633)	-1.311** (0.669)
First survey = 2011	0.096 (0.068)	0.104 (0.070)
Not underwater & 2011	0.003 (0.073)	-0.008 (0.074)
Shared Non-EIH, not underwater & 2011	0.342**** (0.050)	0.245**** (0.050)
Shared Non-EIH, not underwater & 2007/09	0.389**** (0.031)	0.278**** (0.032)
Shared Non-EIH, is underwater & 2011	0.326*** (0.120)	0.268** (0.122)
Shared Non-EIH, is underwater & 2007/09	0.587**** (0.109)	0.578**** (0.113)
Extended Income HH (EIH), not underwater & 2011	0.371**** (0.062)	0.533**** (0.063)
Extended Income HH (EIH), not underwater & 2007/09	0.274**** (0.036)	0.427**** (0.038)
Extended Income HH (EIH), is underwater & 2011	*0.446**** *(0.139)*	*0.608**** *(0.143)*
Extended Income HH (EIH), is underwater & 2007/09	*0.141* *(0.112)*	*0.339**** *(0.116)*
Core DTI Ratio (not underwater)	-0.676**** (0.035)	-0.371**** (0.038)
Core DTI Ratio (underwater)	-0.980**** (0.104)	-0.852**** (0.112)
Sample Size	43,231	43,231
McFadden Pseudo R^2	0.03	0.05
Credit-related controls	Yes	Yes
Additional controls	No	Yes

** pr < 0.10, ** pr < 0.05, *** pr < 0.01, **** pr < 0.0001.*
Coefficient estimates are logit scores (log of change in odds ratio).

Table B-5. Comparison of inferred and actual LTV in 2011 AHS borrower population

	Actual MTMLTV			
	< 90%	90-100%	100-110%	> 110%
Inferred MTMLTV > 110%	15%	3%	5%	77%
Inferred MTMLTV < 110%	84%	9%	4%	3%

Table B-6. Sensitivity Tests: Coefficient estimates of interest (Household is EIH when underwater in 2007/09), comparing baseline with alternate regression models.

	Qualifying Non-Borrowers	Underwater LTV threshold	100% AMI filter applied	Model A	Model B
Base regressions	Any adults	110%	No	0.141 (0.112)	0.339*** (0.116)
Alt 1	Any adults	110%	Yes	0.439** (0.134)	0.590**** (0.139)
Alt 2	Any adults	100%	No	0.136 (0.092)	0.328*** (0.096)
Alt 3	Any adults	105%	No	0.021 (0.102)	0.223** (0.106)
Alt 4	Any adults	115%	No	0.216* (0.121)	0.365*** (0.126)
Alt 5	Any adults	120%	No	0.148 (0.131)	0.321** (0.136)
Alt 6	Relatives & partners	110%	No	0.326*** (0.119)	0.516**** (0.123)
Alt 7	Relatives only	110%	No	0.560*** (0.149)	0.601**** (0.153)

** pr < 0.10, ** pr < 0.05, *** pr < 0.01, **** pr < 0.0001.*
Coefficient estimates are logit scores (log of change in odds ratio).

Table B-7. Changes over two years in the composition of extended income households, 2005–13 AHS

Action of highest income non-borrower	% of total
Remains in home as HINB	44.0
Remains in home, replaced as HINB	9.1
Remains in home, becomes a borrower	10.4
Moves out, replaced as HINB	9.4
Remains in home, no income, not replaced	7.5
Moves out, not replaced	19.7

Table B-8. Rates of 2-year drops in extended income, households w/ mortgages, 2005–13 AHS

	25% Drop	50% Drop
Non-EIHs	25.7%	13.0%
Nuclear Households	25.0%	12.6%
Non-EIH Shared	28.3%	14.5%
EIHs	26.0%	11.5%

Extended income includes shadow rent (30% of non-borrower/spouse adult income)

Table B-9. Mean 2-year change in alternate income measures, households w/ mortgages, 2005–13 AHS

	Borrower/spouse income	Non-borrower adult income	Total household income	Borrower/spouse extended income
Non-EIHs	-$3,862	$1,986	-$1,877	-$3,267
Nuclear Households	-$2,860	$1,336	-$1,524	-$2,459
Non-EIH Shared	-$7,665	$4,450	-$3,215	-$6,330
EIHs	$11,590	-$20,110	-$8,521	$5,557

Note: Borrower/spouse extended income includes shadow rent (30% of non-borrower/spouse adult income).

Table B-10. Percent of EIHs in which real non-borrower/spouse income increases over 2 years, AHS.

	2005-07	2007-09	2009-11	2011-13
When borrower/spouse income rises	24.4	26.8	22.5	24.8
When borrower/spouse income falls	28.0	27.8	27.4	34.1
Difference in proportions (std err)	3.6* (2.6)	1.0 (2.7)	4.9** (2.8)	9.3*** (2.8)

** pr < 0.10, *** pr < 0.05, *** pr < 0.01, **** pr < 0.0001.*

Table B-11. Logistic regression coefficient for EIH, effect on drops in borrower extended income, AHS 2005-13.

	25% drop Model A	25% drop Model B	50% drop Model A	50% drop Model B
Has rental income	0.281**** (0.028)	0.272**** (0.028)	0.233**** (0.035)	0.215**** (0.035)
Has self employment income	0.350**** (0.017)	0.408**** (0.017)	0.363**** (0.021)	0.447**** (0.022)
EIH, all years	0.036* (0.021)	-0.023 (0.022)	-0.119**** (0.029)	-0.260**** (0.030)

Extended income includes borrower/spouse income plus shadow rent (30% of other adult incomes).

** pr < 0.10, ** pr < 0.05, *** pr < 0.01, **** pr < 0.0001.*
Coefficient estimates are logit scores (log of change in odds ratio).

Table B-12. Logistic regression model coefficients, household is EIH, with outcome variable being a drop in extended borrower income of at least 25% or 50%.

	25% drop Model A	25% drop Model B	50% drop Model A	50% drop Model B
EIH, 2005-07	0.016 (0.045)	-0.058 (0.045)	-0.231*** (0.064)	-0.378**** (0.065)
EIH, 2007-09	0.006 (0.040)	-0.059 (0.040)	-0.182*** (0.055)	-0.333**** (0.056)
EIH, 2009-11	0.246**** (0.040)	0.190**** (0.040)	0.123** (0.052)	-0.017 (0.053)
EIH, 2011-13	-0.157*** (0.045)	-0.202**** (0.045)	-0.235**** (0.060)	-0.361**** (0.061)

Extended income includes borrower/spouse income plus shadow rent (30% of other adult incomes).

** pr < 0.10, ** pr < 0.05, *** pr < 0.01, **** pr < 0.0001.*
Coefficient estimates are logit scores (log of change in odds ratio).

Table B-13. Logistic regression coefficient for EIH, effect on drops in borrower extended income under alternate qualification rules, AHS 2005-13.

	Drop 25 Model A	Drop 25 Model B	Drop 50 Model A	Drop 50 Model B
Baseline EIH definition	0.036* (0.021)	-0.023 (0.022)	-0.119**** (0.029)	-0.260**** (0.030)
Relatives & partners	0.032 (0.021)	-0.029 (0.022)	-0.145**** (0.029)	-0.289**** (0.030)
Relatives only	0.158**** (0.024)	0.046* (0.025)	-0.041 (0.033)	-0.212**** (0.034)

Extended income includes borrower/spouse income plus shadow rent (30% of other adult incomes).

** pr < 0.10, ** pr < 0.05, *** pr < 0.01, **** pr < 0.0001.*
Coefficient estimates are logit scores (log of change in odds ratio).

Table B-14. Logistic regression, coefficient of EIH effect on the probability of extended income falling to 75% or less of the program-counted income, after two years, for the 2005-2011 EIH and for the 2009 cohort alone.

	All years	2009-11
10% cap	-0.362**** (0.023)	-0.096** (0.042)
20% cap	-0.213**** (0.022)	0.009 (0.041)
30% cap	-0.139**** (0.022)	0.073* (0.041)
40% cap	-0.096**** (0.021)	0.120*** (0.040)
50% cap	-0.065*** (0.021)	0.152*** (0.040)
No cap	0.036* (0.021)	0.246**** (0.040)

Extended income includes borrower/spouse income plus shadow rent (30% of other adult incomes).

** pr < 0.10, ** pr < 0.05, *** pr < 0.01, **** pr < 0.0001.*
Coefficient estimates are logit scores (log of change in odds ratio).