

## **Homeowner-Entrepreneurs, Housing Capital Gains, and Self-Employment**

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September 20, 2013

Funding for this project from the Ewing Marion Kauffman Foundation and the Center for Aging and Policy Studies at Syracuse University is gratefully acknowledged. We thank Jing Li, Shimeng Liu, and Nuno Mota for excellent research assistance. Any errors are our own.

## Abstract

Using individual-level data from the 1985-2011 American Housing Survey panel, this paper confirms that housing capital gains encourage transitions into self-employment. Additional findings suggest that this occurs at least in part because homeownership provides an accessible source of *potential* financing that serves as a form of insurance for aspiring homeowner-entrepreneurs. The link between homeownership and self-employment is also stronger for older homeowners who are wealthier and typically have more latitude to take on discretionary mortgage debt to finance an investment. Overall, our results provide support for arguments in previous studies that personal wealth and access to credit are important drivers of self-employment. Our findings also provide a new justification for longstanding government support for homeownership: homeownership encourages self-employment.

JEL Codes: J2, R2, M2

Key Words: Self-employment; homeownership; housing capital gains

## I. Introduction

The creation of new small firms is an essential driver of growth and innovation in the economy. In recent years, the share of firms with fewer than 5 employees was roughly 60 percent while companies with fewer than 20 employees accounted for roughly 89 percent of all firms (SBA Report to the President, 2001). Although these firms accounted for only 5.2 percent and 18.8 percent of employment, respectively, most large firms begin small and are the survivors of an intensive, competitive process in which only the most efficient and/or innovative survive. Thirty percent of new firms that employ at least one worker fail in the first two years, 50 percent fail in the first five years, and just 25 percent survive beyond 15 years.<sup>1</sup> It is from these survivors that select firms grow and ultimately account for the bulk of employment and innovation in the economy. The creation of new small businesses is essential to this process.

Given the central role that small business creation plays in the economy, it is no surprise that a large literature has sought to evaluate the drivers of transitions into and out of self-employment as each new firm requires a self-employed entrepreneur. Previous studies have documented that some individuals have a taste for self-employment, either because they are risk lovers (recall the high failure rate of new businesses) or because a parent was self-employed (see Blanchflower and Oswald (1998) or Dunn and Holtz-Eakin (2000), for example). Others seek self-employment to offset limited wage-employment opportunities and/or to escape discrimination in the workplace, but not in a way that would necessarily enhance growth and innovation.<sup>2</sup> At the heart of this literature has been a series of papers that provide evidence that personal wealth and access to credit have strong positive effects on the propensity for self-employment and entrepreneurship (see Evans and Leighton (1989), Evans and Jovanovic (1989), Holtz-

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<sup>1</sup> For details, see the US Small Business Administration website, “Frequently Asked Questions,” at <http://web.sba.gov/faqs/faqIndexAll.cfm?areaid=24>, and related source data from the US Commerce Department.

<sup>2</sup> It is recognized that not all self-employment is necessarily a catalyst for growth. Faggio and Silva (2012), for example, analyze UK data and find that in rural areas self-employment is more of a source of employment of last resort while this is less true in urban areas. This is consistent with estimates by Lindh and Ohlsson (1996) who also report higher self-employment rates in rural areas of Sweden after conditioning on other factors. Other studies have suggested that self-employment may offer a route out of poverty for minority groups that have been subject to labor market discrimination (e.g. Borjas and Bronars (1989), Black (1995), Fairlie and Meyer (1996)). Still others have emphasized that white customer discrimination might deter minority self-employment in locations where the scale of the local minority population is small (e.g. Black, Holtz-Eakin, and Rosenthal (2001)). Although reliance on self-employment as a strategy to offset limited opportunities for wage-employment is important, that will not be the focus of this study.

Eakin, Joulfaian, and Rosen (1994), Fairlie and Meyer (1996), Lindh and Ohlsson (1996), Blanchflower and Oswald (1998), Bruce (1999), and Dunn and Holtz-Eakin (2000), for example). Much of that evidence is based on the impact of family inheritances and windfall financial gains (e.g. lottery winnings) on self-employment.

Recently, however, Hurst and Lusardi (2004) using U.S. data, and Disney and Gathergood (2009) using U.K. data, show that both past and *future* inheritances are positively associated with self-employment. The fact that future inheritances can predict current self-employment status suggests that unobserved household attributes may be correlated with past inheritances. For this reason, Hurst and Lusardi (2004) and Disney and Gathergood (2009) question the reliability of previous claims (based on inheritances) that personal wealth and access to credit encourage business startups.

As an alternative measure of wealth shocks, Hurst and Lusardi (2004) and Disney and Gathergood (2009) use house price appreciation to proxy for housing capital gains. This approach is still not without its challenges. Disney and Gathergood (2009), for example, emphasize that housing capital gains could be endogenous because of home maintenance and improvement decisions that may be sensitive to a homeowner's self-employment status (as with construction of a home office). Partly for that reason, Disney and Gathergood (2009) use county-level house price inflation to proxy for individual-level housing capital gains while Hurst and Lusardi (2004) using region-level measures (based on the Federal Housing Finance Agency home price index). Although such measures must be correlated with individual housing capital gains, they suffer from two limitations. First, they do not allow for short-run variation in house price shocks at the sub-county/sub-region level. Second, they do not allow for the fact that an individual's housing capital gain is the product of house price inflation and the initial-period house value, and therefore larger for owners of more valuable homes. Possibly for these reasons, Hurst and Lusardi (2004) fail to find any evidence that housing capital gains affect self-employment. Disney and Gathergood (2009) do find that rising house prices increase self-employment but with caveats.<sup>3</sup>

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<sup>3</sup> Disney and Gathergood (2009) first show a strong positive correlation between county-level house price appreciation and self-employment, but this pattern weakens notably when the use a residual-based measure of

This paper draws on special features of the 1985-2011 American Housing Survey panel that enable us to offer a sharper view of the influence of housing capital gains on transitions into and exits from self-employment. Unusual among panels, the AHS follows roughly 55,000 homes – not households – every two years. Each survey provides detailed information on the house and its current occupants, including self-employment status, income, whether the household owns or rents, mortgage attributes, and a battery of usual socio-demographic descriptors. Importantly, the survey also provides information on expenditures on home maintenance and improvements (see Harding *et al.* (2007), for example).

Using these data, we examine transitions into and out of self-employment as a function of the homeowner's housing capital gains net of recent expenditures on home maintenance and improvements. Conditional on individual-level housing capital gains, MSA-level (and region-level) measures of house price inflation proxy for changes in the strength of the local economy and related opportunities for wage-employment. Possible selection effects associated with a family's decision to remain in the home between surveys is taken into account using Heckman selection methods. Identification is aided by several control measures that affect the cost of moving and/or desire to move but which have little conceptual role in driving self-employment except through the mobility channel.<sup>4</sup> As an example, house size is a strong negative predictor of mobility because moving costs increase with house size. But house size has no natural role in driving self-employment after conditioning on house value in the model.

Our analysis enables us to address two related questions. First, we identify the impact of housing capital gains and losses on transitions into and out of self-employment. Second, we provide indirect evidence of mechanisms that link homeownership and self-employment by examining the influence of self-employment status on the size and type of mortgage contracts secured by homeowners. In addressing

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unanticipated housing capital gains. On the other hand, they do find that upon becoming self-employed, homeowners are more likely to refinance their mortgages which is suggestive that entrepreneurs may be using home equity to help cover business startup costs. In related work, Black *et al.* (1996) report that house price appreciation in the UK increases the tendency for business owners to use their home as collateral against bank loans.

<sup>4</sup> Blanchflower (2000) concludes that self-employed workers are less geographically mobile than other workers. In part this motivates our efforts to control for selection effects associated with the decision to remain in the home. In practice, estimates from the selection models are very close to those when selection is ignored. These considerations are indirectly related to recent work by Ferreira *et al.* (2010) who show that underwater homeowners are less mobile (using AHS data). Valetta (2012) also evaluates whether reduced geographic mobility among underwater U.S. workers following the recent financial crash has contributed to adverse labor market outcomes.

these questions, we draw lessons from three distinct literatures. The first is the traditional labor literature on self-employment which motivates many of the controls in our regression models (e.g. Fairlie and Bruce (1996), Lindh and Ohlsson (1996)). The second is literature on small business financing which emphasizes that small business owners face higher costs and related constraints when seeking credit given their higher risk profile (e.g. Berger and Udell (1993)). The third is literature which confirms that the majority of US homeowners hold more mortgage debt than is necessary to finance their homes (e.g. Canner *et al.* (2002)), and use that extra mortgage debt to finance consumption and investments.

Together, these literatures suggest that homeowner-entrepreneurs have two advantages over renters when seeking to open and operate a business. Housing capital gains may provide a windfall source of wealth that can be used to help finance a family's business efforts. In addition, the home may serve as a sort of rainy-day insurance policy that ensures the homeowner-entrepreneur access to future credit (e.g. Adelino *et al.* (2013), Chen *et al.* (2012)).

Links between house price volatility, homeownership, and self-employment have taken on special importance in light of the boom and bust in housing and mortgage markets that was a defining feature of the decade from 2000 to 2010. Figure 1a displays plots of U.S. house price inflation over the 1991-2011 period based on the Federal Housing Finance Agency (FHFA) repeat sales purchase-only price index. The sharp increase in house price inflation that began in the late 1990s is readily apparent, along with the subsequent crash that began in 2007. Such patterns, however, differed widely across metropolitan areas. In Figure 1b, observe that over most of the 1991-2011 period, house prices in Houston rose in a smooth, modest fashion. Denver prices rose sharply in the 1990s but then moderated. Los Angeles experienced a dramatic boom and bust between 2000 and 2009, while Detroit prices rose at a moderate pace throughout most of 1991-2005 but then crashed. The question is whether this considerable variation in house price volatility over time and across metropolitan areas contributed to variation in self-employment rates?

To address this and related questions we first rely on MSA and region-level indicators of house price inflation to proxy for housing capital gains. This mimics measures used by Hurst and Lusardi (2004) and Disney and Gathergood (2009), and consistent with those studies, yields only tentative support

for the idea that housing price shocks affect self-employment. However, when we add individual-level housing capital gains net of home maintenance and improvement expenditures to our model a more compelling picture emerges. The coefficient on this variable confirms that housing capital gains increase the likelihood that a homeowner transitions into self-employment while housing capital losses have only a modest effect on exits from self-employment. Other patterns indicate that homeowner-entrepreneurs are more likely to hold a primary mortgage than comparable individuals who are not self-employed. This is especially apparent for homeowners over age 50 who are wealthier and would be expected to display a greater tendency to hold “excess” mortgage debt as part of an investment strategy. Among families with a mortgage, self-employed household heads of all ages are more likely to hold a home equity line of credit (HELOC) which provides easy access to home equity. Self-employed homeowners over age 50 hold more mortgage debt relative to house value while little evidence of such an effect is found for younger homeowners.

Our findings lend fresh support for the idea that there is an important link between personal wealth, homeownership and entrepreneurship. This arises because homeowner-entrepreneurs sometimes draw on housing capital gains to finance business activity, and especially because the home provides collateral and a sort of rainy day insurance fund for aspiring homeowner-entrepreneurs. Our results also highlight previously overlooked differences in the relationship between homeownership and self-employment between young versus older households. That differences would exist is not surprising. Older individuals are higher wealth and should be more able to take on additional mortgage debt as part of an investment strategy. In contrast, younger households are often wealth-constrained relative to their housing needs and must often lever up to the limit allowed by lenders to obtain a home that meets their demand for space and other housing attributes (e.g. bathrooms, local schools, etc.).

To put these findings in context, the following section further reviews the three literatures noted earlier that are especially relevant to links between homeownership and self-employment. Section III describes the AHS data and discusses summary measures. Importantly, the broad summary attributes on self-employment in the AHS are similar to more commonly used surveys such as the Census or the ACS.

Section IV presents regression results pertaining to transitions into and out of self-employment in response to housing capital gains and losses. Additional details of our identification strategy are discussed at that time. Section V provides evidence of the impact of self-employment on the size and type of loans held by homeowners, and Section VI concludes.

## II. Previous literature

Early work by Evans and Leighton (1989) and Evans and Jovanovic (1989) based on the National Longitudinal Survey of Youth (NLSY) and the Current Population Survey (CPS) provides evidence that the likelihood that an individual transitions from wage- to self-employment is roughly independent of age but increases with wealth. Given the high failure rate of new businesses this contrasts with earlier studies on occupational choice which report that younger workers are more willing to expose themselves to higher risk. As a possible explanation for this seeming discrepancy, Evans and his coauthors suggest that younger workers lack the personal wealth and access to credit necessary to cover the high start-up costs of opening a new business. Subsequent work by Holtz-Eakin *et al.* (1994) and Blanchflower and Oswald (1998) on the influence of inheritance reinforce this view.<sup>5</sup> Dunn and Holtz-Eakin (2000) show that having a parent that was self-employed increases the likelihood that the individual in question is self-employed. However, while taking this into account reduces the estimated effect of personal wealth a notable influence of personal wealth on self-employment remains.<sup>6</sup> Broadly, these studies are consistent with evidence from Lindh and Ohlsson (1996) that windfall capital gains enjoyed by lottery winners in Sweden increase the likelihood of self-employment.<sup>7</sup>

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<sup>5</sup> Holtz-Eakin *et al.* (1994) and Blanchflower and Oswald (1998) find that the receipt of an inheritance is positively correlated with the probability of being self-employed, and Holtz-Eakin *et al.* also find that the size of the inheritance positively impacts the amount of capital invested in new enterprises. These findings lend credibility to the idea that personal wealth and liquidity constraints are drivers of self-employment and business creation.

<sup>6</sup> Dunn and Holtz-Eakin (2000) use matched parents-sons data from the National Longitudinal Survey of Labor Market Experience for their analysis. They find that the impact of a parent being self-employed – and especially the father – on an individual’s self-employment is more important than that of personal wealth.

<sup>7</sup> A related literature on cross-country differences in self-employment rates has also provided evidence that restricted access to credit deters entrepreneurship. Examples include Loutfi (1991) on Europe; Cowling and Mitchell (1997), Robson (1997) and Taylor (1996) on the United Kingdom; Carrasco (1999) on Spain; Johansson (1998) on Finland; Blanchflower (2000) on the OECD as a whole; Pfeiffer and Pohlmeier (1992) on Germany. Widespread



Nevertheless, as discussed earlier, Hurst and Lusardi (2004) and Disney and Gathergood (2009) cast doubt on the reliability of using inheritances as an exogenous shock to personal wealth. In addition, Hurst and Lusardi (2004) show that (i) personal wealth only affects self-employment for the top 5<sup>th</sup> percentile of the wealth distribution and (ii) low-wealth self-employed individuals are not disproportionately likely to concentrate in industries with low startup costs. These results cause Hurst and Lusardi (2004) to question whether personal wealth has been a significant impediment to self-employment.

Although the findings from Hurst and Lusardi (2004) are convincing, they are at odds with compelling conceptual arguments and stylized facts about credit markets. Previous studies on the nature of small business lending suggest that credit is comparatively difficult to obtain and expensive for the typical prospective (or current) entrepreneur. Many small businesses depend on “relationship lending” as a source of funds, in which the entrepreneur develops a close working relationship with a local bank that holds the originated loans in portfolio. This differs from financing for larger corporations many of which have direct access to the capital markets and whose bank loans are often sold in a secondary market. In part this is because risks associated with a given small business loan application are difficult to assess unless the lender has close knowledge of the entrepreneur. This situation is compounded by the high failure rate of new small businesses noted earlier. See, for example, Berger and Udell (1993), Berger, Klapper, Udell (2001), Brevoort and Hannan (2004), Carlstrom and Samolyk (1995), Demsetz (2000), and Drucker and Puri (2008). Given these circumstances, it would be natural for prospective homeowner entrepreneurs to use comparatively inexpensive and accessible collateralized home mortgage debt to finance portions of their business ventures.<sup>8</sup> As suggested earlier, additional literature provides indirect support for this idea by documenting that many homeowners hold more mortgage debt than is needed to

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development since the 1990s of secondary credit markets for commercial loans should have reduced the influence of cross-country and cross-regional differences in credit supply on self-employment rates. Nevertheless, as will be discussed shortly, small business lending remains sensitive to relationships with local lenders in ways that could allow geographic differences in access to credit to continue to affect small business creation and self-employment.

<sup>8</sup> Because home mortgages are collateralized by the home they are less expensive than unsecured loans. In addition, most “conforming” size home mortgages are also sold on the secondary market as are the majority of “non-conforming” size loans (e.g. Gabriel and Rosenthal (2010)). This further reduces the cost of home mortgage debt relative to the typical small business loan.

purchase their home given the family's level of wealth relative to home value (e.g. Jones (1994) and Canner *et al.* (2002)).

It is worth emphasizing that for a family to utilize home mortgage debt as a source of business finance it must be a homeowner and it must have "discretionary" stores of home equity and net wealth. Homeownership rates are dramatically higher for older individuals: roughly 40 percent for individuals age thirty, 75 percent for individuals age fifty, and 80 percent for individuals age sixty and over (Haurin *et al.* (2007), Gabriel and Rosenthal (2011)). Older households are also wealthier. For both reasons, older households should be more likely to avail themselves of home mortgage debt as a source of business financing, a pattern that has been largely overlooked in previous studies of self-employment (e.g. Hurst and Lusardi (2004), Disney and Gathergood (2009), and Bracke *et al.* (2012)).<sup>9</sup>

### **III. Data and Summary Statistics**

#### *3.1 Data*

The primary data for the study are taken from the 1985-2011 panel of the American Housing Survey (AHS). To our knowledge, this is the first time that the AHS panel has been used to examine questions related to the influence of house price appreciation and access to credit on self-employment. As described earlier, the special features of the AHS panel enable us to offer a fresh assessment of the relationship between homeownership and self-employment.

The AHS is a national panel that follows housing units (not households) every two years and includes roughly 55,000 housing units. It provides detailed information on the attributes of the house occupants and the home in each survey year and allows one to observe when a home turns over. The data

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<sup>9</sup>Bracke et al (2012), for example, use individual panel data on UK households to examine the influence of the decision to become a homeowner on self-employment. Controlling for household fixed effects, they find that the propensity for self-employment is reduced by up to 25 percent in the first few years after becoming a homeowner although this effect dissipates over time. They appeal to portfolio considerations to explain this result, arguing that homeownership and self-employment are both risky and that a new homeowner may therefore seek more secure employment (see Davidoff (2006) for related discussion). While these arguments are cogent, Bracke et al (2013) do not allow for differences between young versus older households and the tendency of younger, first-time homebuyers to lever their housing purchases to the maximum allowed by lenders in order to obtain housing sufficient to meet their family's consumption demand for shelter and community attributes (e.g. Ioannides and Rosenthal (1994)).

also provide extensive information on the mortgages held by homeowners, including whether a homeowner holds a second mortgage such as a home equity line of credit (HELOC). Owner assessed value of the home is reported every two years in addition to purchase price. This enables us to measure the owner's *perceived* change in house value. It is those perceptions that may affect whether the owner-occupier chooses to become self-employed for reasons that will be discussed later. As noted earlier, a challenge for previous studies (e.g. Hurst and Lusardi (2004), Disney and Gathergood (2009)) is that an increase in house value could reflect recent expenditures on home improvements and routine maintenance. The AHS enables us to observe such expenditures (see Harding, Rosenthal, and Sirmans (2007), for example) so that house price appreciation can be measured net of home maintenance. In addition, the AHS identifies the 145 largest metropolitan areas in the United States. Using those geographic identifiers, we merge in Federal Housing Finance Agency (FHFA) repeat sales house price indexes that can be used to measure house price inflation at the metropolitan level. For homes in the AHS outside of these largest MSAs, we merge in region-level FHFA indexes.

A limitation of the AHS is that it provides no information on the particulars of an individual's business, industry or occupation. In addition, household debt information is available only for the family's mortgage(s): no information on other types of loans, including personal and business loans, is available in the data. Despite these limitations, the AHS panel provides a valuable opportunity to assess the relationship between housing capital gains and transitions into and out of self-employment.

### *3.2 Summary Statistics*

Table 1a presents summary measures of self-employment rates for employed household heads in the AHS stratified by survey year. Self-employment is measured here and elsewhere in the paper based on whether the household head reports having received any self-employment income.

In columns (1) and (2), notice that self-employment rates are always higher for homeowners as compared to renters (in 2009, for example, 20.6 versus 10.7 percent, respectively). This underscores the potential link between homeownership and self-employment. In columns 4-8, which stratify the sample

by age, self-employment rates are also sharply higher for older individuals (in 2009, 9.9 percent for age 20-30 and 19.9 percent for age 50-60). These patterns are also present in Census/ACS (American Community Survey) data from 2000 through 2011 as shown in Table 1b.<sup>10</sup> The primary difference between the two tables is that self-employment rates are lower in the ACS relative to comparable values in the AHS. As an example, in 2009, the overall self-employment rate in the ACS is 15.2 percent compared to 17.4 percent for the AHS. This difference likely reflects differences in sample composition but seems unlikely to have any bearing on the regression results to follow given our model designs.

Tables 2a-2c report summary measures from the AHS for the mortgage attributes of not self-employed and self-employed homeowners. As above, measures are provided for each survey year from 1985 through 2011. In each table, the first pair of columns indicates the percentage of individuals that have a primary mortgage as of the survey date. This is followed by the percentage of individuals with a primary mortgage who also have a second mortgage. The last two columns report the average current loan to value ratio. The current loan to value ratio includes the homeowner's first and second mortgage debt in the numerator and the homeowner's estimated home value in the denominator. Table 2a provides summary statistics for all household that own their home. Tables 2b and 2c provide analogous summary measures for household heads under and over age 50, respectively.

In the first two columns of Table 2a, it is evident that the share of homeowners holding a mortgage has increased sharply over the 25 years of the panel horizon. For not self-employed household heads, 52.6 percent held a mortgage in 1985 (see Table 2a) while 77.7 percent held a mortgage in 2011. Among self-employed individuals the analogous numbers are 54.8 percent and 85.4 percent, respectively. Close review of Tables 2b and 2c reveals that the increase in tendency to hold a mortgage over 1985-2011 has been most pronounced among individuals over age 50 (see Table 2c). Individuals under age 50 (Table 2b) have consistently been more likely to have a mortgage but the evidence of an increase in the tendency to hold a mortgage is much weaker.

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<sup>10</sup> Individuals in the ACS are classified as self-employed if they report having received any self-employment income or are coded as self-employed as their primary employment status.

For older households, the sharp increase in tendency to hold a mortgage is consistent with the dramatic decline in mortgage interest rates from the early 1980s to 2011, from over 12 percent in 1985 (for 30-year fixed rate loans) to loan rates below 5 percent in 2011. The modest change in tendency to hold a mortgage among individuals under age 50 is consistent with broadly held views that younger homeowners are more likely to be wealth constrained and must, therefore, secure a mortgage in order to purchase a home that meets their demand for real estate as a source of shelter as opposed to as an investment (see Ioannides and Rosenthal (1994), for example). These patterns are also in line with earlier discussion that housing capital gains and homeownership likely have a more notable positive effect on transitions into self-employment for older families. Consistent with that view, notice that for homeowners over age 50 (Table 2c), self-employed individuals are much more likely to hold a primary mortgage compared to not self-employed individuals. In 2007, for example, among individuals over age 50, the shares of self-employed and not self-employed individuals that held a primary mortgage are 73.9 percent and 60.3 percent, respectively. Also in Table 2c, notice that conditional on holding a primary mortgage, a similar but more muted pattern is present with respect to the share of not self-employed and self-employed household heads that hold a second mortgage.

For individuals age 50 and under, the correlation between self-employment status and a homeowner's mortgage attributes is muted further: there is little difference in the tendency of self-employed versus not self-employed families to have a primary mortgage, for example. Overall, these patterns are suggestive that older self-employed homeowners are more likely to use mortgage debt and home equity as a source of business finance as compared to younger families. Further analysis, however, indicates that such a characterization is only partly correct.

#### **IV. Housing capital gains and transitions into and out of self-employment**

##### *4.1 Sample composition and model specification*

Tables 3-6 report estimates from a series of linear probability models that highlight the drivers of transitions into and out of self-employment. In all cases the dependent variable is 1 if the household head

is currently self-employed and 0 otherwise. In the simplest set of models we compare the impact of house price inflation on the self-employment decisions of renters to that of owner-occupiers. In more fully specified models we focus only on owner-occupiers. Estimating samples are always restricted to instances in which a given household is present in the house for at least two consecutive surveys. This allows us to observe the previous self-employment status of the household head (two years earlier); it also ensures that measures of the homeowner's perceived housing capital gains are based on house value assessments in adjacent surveys that are reported by the same household. Possible selection effects associated with the decision to remain in the home are taken into account in a manner to be made clear.

All of the models include survey year and location fixed effects. The AHS reports MSA (metropolitan statistical area) location if the home is in one of the 145 largest MSAs in the U.S. and one of four regions that cover the U.S. for the remaining homes. Location fixed effects are coded to the MSA or region level depending on whether MSA is identified. All of the models also control for an extensive set of socioeconomic attributes of the household. The latter include the household head's age and age squared; how many years the household has lived in the home, education dummy variables for less than high school (the omitted category), high school, some college, college degree, more than college; whether the household head is married, divorced or other; gender of the household head, race (white or Asian as one group with all others as the alternative category), and number of adults in the household.

It is worth noting that all of the models were run twice, including real family income as a control measure and omitting income. Although income always had a positive and highly significant effect on self-employment, omitting income had little effect on the estimated effect of housing capital gains. We also considered the possibility that income could be endogenous to the household head's self-employment status. For both reasons, we present only results from models that omit income and rely on the various socioeconomic and other controls to proxy for the family's earnings potential.<sup>11</sup>

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<sup>11</sup> Controlling for family income reduced the magnitude of the coefficients on housing capital gains in most instances but by a relatively small amount that did not affect the qualitative patterns of the estimates.

In all cases we table out only the coefficients on the key control variables that pertain to housing capital gains, wealth and previous self-employment status (coefficients on the socio-demographic variables are suppressed to conserve space). The first such variable is the real (adjusted for general inflation) percent change in the FHFA house price index over the previous two years. In the simplest models this variable is interpreted as a proxy for real housing capital gains; in more complete specifications it is used as a proxy for recent growth in the local economy for reasons that will be clarified. The FHFA index is measured at the MSA or region level depending on the geographic detail available for the given home. We treat the FHFA index as exogenous under the assumption that a single individual's self-employment decision would not affect local house price inflation or the strength of the local economy. We cannot rule out of course that common unobserved factors may drive both the strength of the local economy and individual household decisions about whether to transition into or out of self-employment. Our hope is that the many controls in the model along with location and year fixed effects mitigate such concerns. If self-employment is a source of employment of last resort (e.g. Faggio and Silva (2012), Black (1995), Black *et al.* (2001)), then a strengthening local economy would reduce the likelihood of self-employment because of increased wage-employment opportunities. If instead self-employment is a preferred mode of employment it may be enhanced by a strengthening local economy. The sign of the coefficient on the change in the FHFA index is, therefore, of interest.

A second key control measure is the owner's assessment of house value lagged two years (as reported in the previous survey) and measured in 2009, 100,000 dollar units. This variable is used to proxy for household wealth. As emphasized earlier, most previous studies on self-employment report evidence that personal wealth increases the likelihood that an individual would be self-employed (exceptions include Hurst and Lusardi (2004) and to a lesser degree Disney and Gathergood (2009)). If personal wealth helps a prospective entrepreneur to overcome the startup costs associated with establishing a business, then the coefficient on lagged house value should be positive. If instead Hurst and Lusardi (2004) are correct that household wealth plays a lesser role, then a small positive or zero

coefficient could emerge. As with local house price inflation, we treat the lagged value of a family's home as exogenous to the household head's current self-employment status.

The primary variable of interest in our model is the homeowner's *perceived* housing capital gains between two adjacent surveys (measured in year-2009, 100,000\$). In some specifications this is calculated by differencing the homeowner's assessment of house value in the current survey year relative to the owner's assessment of house value from two years earlier. In other specifications we further subtract off recent expenditures on maintenance and home improvements. This helps to ensure that perceived housing capital gains are driven only by nearby rates of house price inflation scaled by the lagged value of the individual's home.<sup>12</sup> If personal wealth and access to credit are positive drivers of self-employment, then we anticipate a positive coefficient on housing capital gains. Moreover, because of fixed costs associated with establishing a business, it seems likely that the influence of capital gains on current self-employment status would differ depending on whether an individual was already self-employed as such individuals would have already overcome initial startup costs. We explore this idea in several of the models to follow.

#### *4.2 House price inflation and self-employment*

We begin with a simple specification that enables us to compare the influence of real house price inflation at the MSA (region) level on the self-employment status of renters and owner-occupiers. These estimates are presented in Table 3. Panel A reports results for renters while Panels B and C report results for owner-occupiers. In Panels A and B, the variables of interest are the percent change in the local house price index over the last two years and the household head's self-employment status two years earlier. The models reported in these panels do not include a control for household wealth. The model reported in Panel C is identical to that reported in Panel B with the exception that we include the value of the home two years earlier as a proxy for household wealth. No such proxy or viable alternative is available for

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<sup>12</sup> As an alternative, we also attempted to proxy for housing capital gains net of maintenance by multiplying the 2-year lagged reported house value by the percent change in the FHFA house price index associated with the home's location (e.g. the MSA). Estimates from this exercise were much less precise and are not presented for that reason.



renters in the AHS data. In all three models estimates are reported for the full sample of household heads and also stratified by previous self-employment status from two years earlier.

Note first that self-employment status is quite persistent across adjacent survey years but at a low enough level that allows for the high failure rate of small businesses described at the start of the paper. For renters (Panel A), in the full sample model the coefficient on the individual's lagged self-employment status is 0.21 with a t-ratio of 26. For owner-occupiers (Panels B and C) the corresponding estimate is roughly 0.45 with very high t-ratios. These estimates imply that, absent the influence of other factors (e.g. age, education, gender, etc.), roughly 80 percent of renters and 55 percent of owner-occupiers who were self-employed two years earlier would not be self-employed today.

For homeowners (Panel C), notice also that lagged house value always has a positive and significant effect on self-employment. The effect is roughly two times larger in magnitude for individuals not previously self-employed as compared to those who were self-employed two years earlier. For the former group, the probability of transitioning into self-employment increases by roughly 1.5 percentage points with each additional \$100,000 of house value (with a t-ratio of 17.91). For individuals who are already self-employed, the corresponding effect on the probability of *remaining* self-employed is 0.77 percentage points (with a t-ratio of 3.30). These patterns confirm that personal wealth plays a much larger role in driving transitions into self-employment as compared to exits. This is suggestive of high startup costs that must somehow be overcome to establish a business. These patterns are also robust in the extensions to follow.

Because renters do not own their home they receive no housing capital gains. Any association between changes in the FHFA house price index and change in a renter's self-employment status must, therefore, reflect change in the underlying strength of the local economy: shrinking economies experience falling house prices (e.g. Glaeser and Gyourko (2005)) while growing economies tend to exhibit rising house values.<sup>13</sup> Bearing that in mind, notice that for renters (Panel A), the FHFA house price index has a

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<sup>13</sup> If the supply of developable land is perfectly elastic growing economies will experience only very modest house price increases.

positive but not significant effect on current self-employment status. For all renters, for example (column 1), the coefficient is 0.024 with a t-ratio of 1.40. For owner-occupiers who were previously self-employed (Panel C, column 3) the corresponding coefficient is essentially zero, but for homeowners who were not self-employed two years earlier (Panel C, column 2) the coefficient is positive 0.023 with a t-ratio of 2.22. This suggests that local house price inflation is positively associated with transitions into self-employment and related new business creation. However, the current specification does not allow us to determine how much of this effect arises because of a strengthening local economy versus housing capital gains and related wealth effects enjoyed by the homeowner. This question is addressed in a more fully specified set of models in Tables 4-6, all of which restrict the sample to just owner-occupiers.

#### *4.3 Housing capital gains*

Table 4 extends the homeowner self-employment models in several ways. For each extension estimates are provided for the full sample and also stratified by previous self-employment status. The first extension – reported in columns 1-3 – adds the homeowner’s real housing capital gain from the previous two years as a control. In these columns capital gains are measured by the homeowner’s reported change in real house value between adjacent surveys. Notice that adding this variable causes the coefficient on the FHFA house price index to change sign from positive (in Table 3) to negative. The negative sign is suggestive that a strengthening local economy lures workers away from self-employment, but we emphasize that these estimates are not significant. In contrast, the coefficients on the change in house value are positive and significant, and especially so for individuals not previously self-employed (the corresponding t-ratio is 5.07). This result seems to confirm that positive wealth shocks encourage self-employment. Nevertheless, additional extensions suggest a more nuanced pattern.

Columns 4-6 repeat the specification in columns 1-3 but also control for possible sample selection effects associated with the decision to remain in the home. Columns 7-9 extend the models further by controlling for home improvements when measuring housing capital gains. In all cases the selection models here and in later tables are estimated using Heckman 2-step selection methods. Control variables

for the first-stage model of whether the family was present in the previous survey include year and location fixed effects along with 2-year lags of all of the socio-demographic controls used in the self-employment regression.<sup>14</sup> Also included were five variables that do not appear in the self-employment regression and which serve as exclusion restrictions that strengthen identification. These include number of rooms in the home, percent change in the nominal FHFA house price index since the family moved into the home, the original real-valued price of the home at move in, and 2-year lags of subjective indicators of how much the household likes their home and neighborhood (on a scale of 1 to 10, where 10 is best). Moving costs increase with house size (number of rooms) and deter mobility. Housing capital gains since moving into the home affect the level of equity families have in their homes and related opportunities to move and purchase homes elsewhere (e.g. Genesove and Mayer (2001), Engelhardt (2003), Ferreira, Gyourko, and Tracy (2010), Valetta (2012)). Stronger attachment to the house or neighborhood should reduce mobility. However, having conditioned on house value and the other controls in the self-employment regression, they have little conceptual role in driving an individual's self-employment decision except through mobility. These controls are also very strong predictors of whether a family remains in their home. Complete results for first- and second-stage models associated with columns 7-9 in Table 4 are presented in the appendix. The inverse Mills ratio from each of the selection models is presented near the bottom of each of the relevant columns.

Consider first columns 4-6 of Table 4 which do not allow for the influence of home improvements on reported housing capital gains. Focusing on column (6), notice that for households that were previously self-employed, the coefficient on housing capital gains is reduced in magnitude relative to when selection effects are not taken into account: the coefficient is now 0.0066 with a t-ratio of 0.89 compared to the previous estimate of 0.0136 with a t-ratio of 1.99.<sup>15</sup> In contrast, for individuals not previously self-employed the coefficient on housing capital gains is little changed. Summarizing, the important pattern in columns 4-6 is that housing capital gains appear to have a significant positive

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<sup>14</sup> We also ran the Heckman models omitting the location and year fixed effects from the first-stage probits. This had little effect on the second stage results.

<sup>15</sup> The remaining coefficients in the model are largely as before.

influence on transitions into self-employment but little effect on the tendency for previously self-employed individuals to transition out of self-employment.

Disney and Gathergood (2009) emphasize that a household's change in house value could be endogenous to transitions into self-employment if the family performs home improvements in anticipation of opening a business. The specifications in columns 7-9 address this concern by subtracting off expenditures on home maintenance and home improvements over the previous two years from the owner's reported 2-year change in house value. For individuals who were not previously self-employed (column 8), the coefficient on housing capital gains declines in magnitude from 0.130 to 0.092 but remains positive and significant. For individuals who were previously self-employed, the capital gains coefficient remains small and insignificant. Overall, the primary effect of measuring housing capital gains net of maintenance is to reinforce evidence that housing capital gains encourage transitions into self-employment but have no effect on exits from self-employment. The magnitude of the pattern is also important: for a homeowner who is not currently self-employed, a \$100,000 housing capital gain increases the likelihood that the individual would become self-employed by a bit less than 1 percentage point.

#### *4.4 Stratifying by age of household head*

Older individuals have more wealth and also tend to be more risk averse as they near retirement. For both reasons the determinants of self-employment are likely to differ with age. Table 5 explores this possibility by stratifying the sample into owner-occupiers age 50 and under versus those over age 50. These samples are further stratified by prior self-employment status as before. In all cases we control for selection effects and measure housing capital gains net of maintenance expenditures.

In Table 5, observe that for younger individuals the coefficient on the FHFA house price index is close to zero and insignificant. For older individuals the coefficients on the FHFA index are negative for all three specifications. For individuals not self-employed two years earlier (column 5), the coefficient is -0.0595 with a t-ratio of -3.00. A somewhat larger magnitude coefficient is obtained for individuals who

were previously self-employed (column 6), but that estimate is not significant, possibly because of the small sample (6,191 individuals versus 37,717 in column 5). These results suggest that for household heads over age 50, a strengthening local economy provides alternatives that lure individuals away from self-employment. This is consistent with the view that self-employment is perceived as risky. No such effect is present for younger individuals.

Turning to the housing capital gains variable, the relevant coefficients are similar for both age groups and close to what was found in Table 4. Regardless of whether the household head is under or over age 50, a \$100,000 housing capital gain (in 2009 dollars) increases the likelihood that a previously not self-employed individual transitions into self-employment by roughly 1 percentage point. As before, housing capital gains have no effect on exits from self-employment.

#### *4.5 Asymmetric effects of housing capital gains and losses*

Our final extension considers the possibility that housing capital gains and losses may have asymmetric effects. To address this we split the change in house value net of maintenance into two variables, one that measures positive housing capital gains and a second that measures the absolute value of housing capital losses. Once again, selection effects associated with remaining in the home are taken into account. Results are presented in Table 6 for all households, household heads age 50 or less, and household heads over age 50. These samples are further stratified by previous self-employment status.

Consider first the estimates for the full sample that pools individuals by prior self-employment status and age (column 1). Notice that the coefficient on housing capital gains is 0.013 while the coefficient on housing capital losses is -0.0039 (with t-ratios of 2.91 and -1.30, respectively). This suggests that housing capital gains do more to encourage self-employment as compared to the deterrent effect of a comparable magnitude housing capital loss. That asymmetric pattern is even more pronounced for household heads that were not self-employed two years earlier (column 2). For these individuals, the corresponding coefficients are 0.0245 and -0.0009, respectively with t-ratios of 5.69 and -0.32. For previously self-employed household heads (column 3), the pattern is less clear as the coefficients on

housing capital gains and losses are both negative with t-ratios of 2.03 and 1.80, respectively. Stratifying the models by age does not change the qualitative patterns of these coefficients but the standard errors are larger and corresponding t-ratios lower. As a result, the coefficients on housing capital gains and losses for previously self-employed individuals are no longer significant regardless of age group (the t-ratios range in magnitude from .02 to 1.5). The lower precision for this group could simply reflect the smaller sample sizes. In contrast, the remaining key patterns are robust: regardless of age group, for individuals not previously self-employed capital gains increase transitions into self-employment while housing capital losses have little effect. In addition, for Heads over age 50, house price inflation has a negative effect on transitions into self-employment: the coefficient on the FHFA index in column (8) is -0.0701 with a t-ratio of -3.43.

#### *4.5 Summary*

Summarizing, the following core patterns emerge from Tables 3-6. First, personal wealth, as proxied by lagged house value, has a positive impact on self-employment. Most estimates indicate that the likelihood of self-employment increases by 1 to 1-1/2 percentage points for every additional \$100,000 in house value (in \$2009). This is a large effect given sample average self-employment rates among employed individuals of roughly 15 percent (see Table 1b and Table 1-A in the appendix). Second, a strengthening local economy and related house price inflation discourages transitions into self-employment among household heads over age 50. For younger individuals a strengthening local economy has little influence on self-employment. Third, regardless of age, housing capital gains encourage transitions into self-employment but have little influence on exits from self-employment. Moreover, among individuals not currently self-employed, housing capital gains and losses have asymmetric effects: a \$100,000 housing capital gain increases the probability of transitioning into self-employment by 2 to 2-1/2 percentage points while housing capital losses have little effect.

## V. Mechanisms

### 5.1 Overview

The previous section shows that positive housing wealth shocks in the form of housing capital gains increase the likelihood that a household head will transition into self-employment. Evidence also indicated that this effect is present regardless of whether the household head is under age 50 or older than 50. This section sheds light on two mechanisms that likely contribute to these patterns. The first is that homeownership improves access to *potential* sources of financing that could be used to meet business expenses, and in that sense serves as a form of insurance for aspiring homeowner-entrepreneurs. The second is that homeowner-entrepreneurs actually draw on home equity and mortgage debt to finance their business ventures, either directly or indirectly. We refer to the first mechanism as an insurance effect and the second as a personal wealth effect. We begin with homeownership as an insurance mechanism.

### 5.2 The decision to hold mortgage debt

The *potential* to use mortgage debt as a way of diverting home equity into the business provides homeowner-entrepreneurs with an advantage not enjoyed by renters. Home mortgage debt is collateralized and mortgage interest is generally deductible when calculating personal income tax. These features make home mortgage debt easier to obtain and less expensive than small business loans. This creates incentives for self-employed homeowners to hold a mortgage beyond simply a desire to purchase their preferred residence. For similar reasons, homeowner-entrepreneurs have an incentive to take out a home equity line of credit (HELOC) in addition to the primary mortgage. A HELOC gives the homeowner the option (but not the obligation) to extract home equity on demand and with close to zero transactions costs. As such, it is a perfect vehicle to have in place if a prospective entrepreneur values the possibility of being able to quickly divert home equity into the business at some point in the future.<sup>16,17</sup>

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<sup>16</sup> Although homeowner-entrepreneurs could divert home equity to business activity by refinancing the primary mortgage into a larger loan, cash-out refinancing entails substantial transactions costs in both expense and time. In most instances, if the primary motive to refinance is to extract equity (as opposed to securing a lower loan rate), the homeowner-entrepreneur will do better by making a draw on an existing HELOC.

Table 7 provides evidence on these points. Columns 1-4 present linear probability regressions of whether the household holds a primary mortgage (columns 1-4) while columns 5-8 present analogous regressions of whether the household holds a HELOC and restricting the sample to just those individuals that hold a primary mortgage. All of the regressions control for survey year fixed effects and most of the same socioeconomic variables as in the self-employment regressions (differences are highlighted shortly). The primary specifications also include house fixed effects which proxy for unobserved household wealth that should be correlated with the choice of home and neighborhood. Only the self-employment coefficients are reported in the table as that is the primary variable of interest.

Consider first columns 1-4 for which the dependent variable equals 1 if the household holds a primary mortgage and zero otherwise. Column (1) includes individuals of all ages and does not control for house fixed effects. The coefficient on self-employment is -0.02 with a t-ratio of -9.63. This is opposite in sign from what would be anticipated if either of the two mechanisms highlighted above were present. Instead, this result is suggestive that unobserved factors may be biasing the coefficient on self-employment downward. Column (2) addresses this concern by adding house fixed effects to the model. This causes the self-employment coefficient to flip signs and take on a value of 0.004 with a t-ratio of 1.77: the positive sign is consistent with the qualitative implications of the mechanisms highlighted above. Columns 3-4 repeat the specification in column (2) but stratify the sample into individuals below and above age 50. For younger households (column 3), the coefficient on current self-employment status is just 0.0024 with a t-ratio of 0.97. For older individuals (column 4) the self-employment effect is much larger and equals 0.011 with a t-ratio of 2.57.

The very small effect of self-employment on the tendency for younger families to hold a primary mortgage likely reflects that younger households do not have sufficient wealth to purchase their preferred residence without a mortgage. This precludes a further effect from self-employment. On the other hand,

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<sup>17</sup> It is worth noting that home equity can also be used as collateral when seeking a small business loan. Adelino *et al* (2013) provide evidence of this using county-level data from the county business patterns survey. Nevertheless, the extent to which this occurs will tend to differ across states in part because of variation in state bankruptcy laws that affect the extent to which creditors have claims to an individual's home equity in the event of a bankruptcy (e.g. Cao (2013)).



many older individuals do have sufficient wealth to occupy their homes without a mortgage. For these families, there is more latitude to use home mortgage debt to finance business activity, and this likely explains the much larger and significant coefficient on self-employment in column (3).

Columns 5-8 focus on the likelihood that a household holds a HELOC conditional on holding a primary mortgage.<sup>18</sup> Results in columns 5-8 differ in several important ways from those in columns 1-4. First, in the pooled sample without house fixed effects (column 5), the coefficient on current self-employment status is positive and significant. Adding house fixed effects (column 6) has little effect on the estimated coefficient. Stratifying the sample into individuals under and over age 50 also has little effect on the self-employment coefficient. Indeed, looking across the columns, in all cases, the coefficient on self-employment is close to 0.022 and statistically significant. This indicates that regardless of age, conditional on holding a primary mortgage, self-employed household heads are roughly two percentage points more likely to hold a HELOC than those who are not self-employed. This is consistent with the view that homeowner-entrepreneurs view home equity and future housing capital gains as a *potential* source of business financing.

### 5.3 Mortgage debt relative to house value

Table 8 presents linear regressions of current loan-to-value (CLTV) ratio in order to highlight the impact of current self-employment status on the level of mortgage debt held by the household relative to house value. All models include house fixed effects to control for unobserved wealth that affects the degree to which a family must lever up to purchase a given home. Columns 1-3 omit controls for house value while columns 4-6 include the real house value of the home as a further control variable. In these latter columns, house value is treated as endogenous in a GMM specification that uses the physical condition of the structure as an instrument. The physical condition of the structure is assessed at each survey by the individual conducting the interview and varies across surveys. It should also be

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<sup>18</sup> The HELOC regressions include all of the same controls as in the primary-mortgage regressions in addition to controlling for the original loan-to-value ratio of the first mortgage. Note also that the HELOC variable is only reported in the AHS for the 2001 to 2011 surveys which accounts for the much smaller sample size in these regressions relative to the primary mortgage regressions in columns 1-4.

emphasized that the sample of observations includes individuals with positive CLTV ratios and those without a mortgage for whom CLTV equals zero. In all cases, we report results from a linear specification because Tobit models with large numbers of fixed effects are both unwieldy and inconsistent.

Consider first columns 1-3 which omit house value as a control. Notice that the coefficients on self-employment for the pooled sample (column 1) and the under age-50 sample (column 2) are both quite small, positive, and not significant. However, the coefficient for the over age-50 sample (column 3) is 0.0065 with a t-ratio of 2.03. Controlling for house value in columns 4-6 yields a similar qualitative pattern but with slightly larger coefficients. For the over age-50 group in column (6), the self-employment coefficient is 0.01 with a t-ratio of 2.83.

The results in Table 8 are consistent with patterns in Table 7. Analogous to the decision to hold a primary mortgage, for younger households, the tendency for self-employed individuals to hold more mortgage debt is not apparent. On the other hand, evidence supports the view that among older households, self-employed individuals hold more mortgage debt. Along with the HELOC results from Table 7, these patterns suggest that homeowner-entrepreneurs of all ages view home equity and mortgage debt as a potential source of business finance. Findings also suggest that it is primarily older self-employed individuals who actually hold more mortgage debt. Backed by the further patterns in Tables 3-6, these results are suggestive that both the insurance aspect of homeownership and the personal wealth effect contribute to self-employment.

## **VI. Conclusions**

Given the central role that small business creation plays in the economy, it is no surprise that a large literature has sought to evaluate the determinants of self-employment. Nevertheless, core questions remain. Chief among these is the degree to which personal wealth and access to credit contribute to small business startups. Earlier studies have used inheritances, lottery winnings, and region or county-level house price appreciation as proxies for changes in personal wealth that may enable entrepreneurs to

overcome startup costs and open a new business. This paper draws on a different data source that enables us to address some of the limitations of previous studies.

Using individual-level data from the 1985-2011 American Housing Survey panel, we confirm that housing capital gains net of home maintenance and improvement expenditures encourage transitions into self-employment. Additional findings suggest that this occurs at least in part because homeownership provides an accessible source of potential financing that serves as a form of insurance for homeowner-entrepreneurs. The link between homeownership and self-employment is also stronger for older homeowners who are wealthier and typically have greater ability to take on discretionary mortgage debt as an investment. Overall, our results provide support for arguments in previous studies that personal wealth and access to credit are important drivers of self-employment.

The qualitative nature of our results is intuitive even though the literature has struggled to confirm the link between personal wealth, access to credit, and self-employment. Small business loans are risky. Partly for that reason, entrepreneurs must develop a relationship with a local lender to overcome information asymmetries in order to secure small business loans. In contrast, home mortgage debt is collateralized by the home, typically sold in a vast secondary market that pools and manages risk, and is therefore more accessible and less expensive.

Our paper also has implications for federal policies designed to promote homeownership, including favorable tax treatment (e.g. Rosen (1979), Rosenthal (1988)), subsidized access to mortgage debt through support for Fannie Mae and Freddie Mac (e.g. Gabriel and Rosenthal (2010)), and more. Previous arguments used to support these policies have emphasized that homeowners are invested in their neighborhoods (e.g. DiPasquale and Glaeser (1999), Rosenthal (2008)), that homeownership may be good for its occupants including children (e.g. Greene and White (1997), Haurin *et al.* (2002)) and the need to counter discrimination against minority loan applicants (e.g. Munnell et al (1996), Gabriel and Rosenthal (2005)). This paper provides a new argument for why owning a home may be good for individuals and their communities, and why government may want to continue its support for homeownership: homeownership expands opportunities for self-employment and entrepreneurship.

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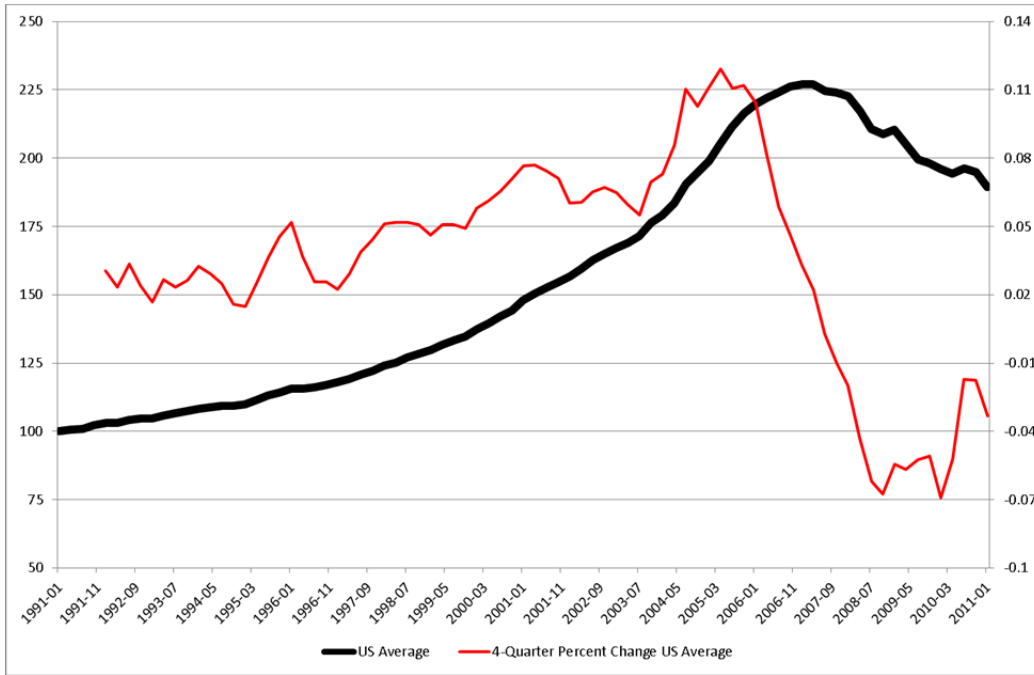
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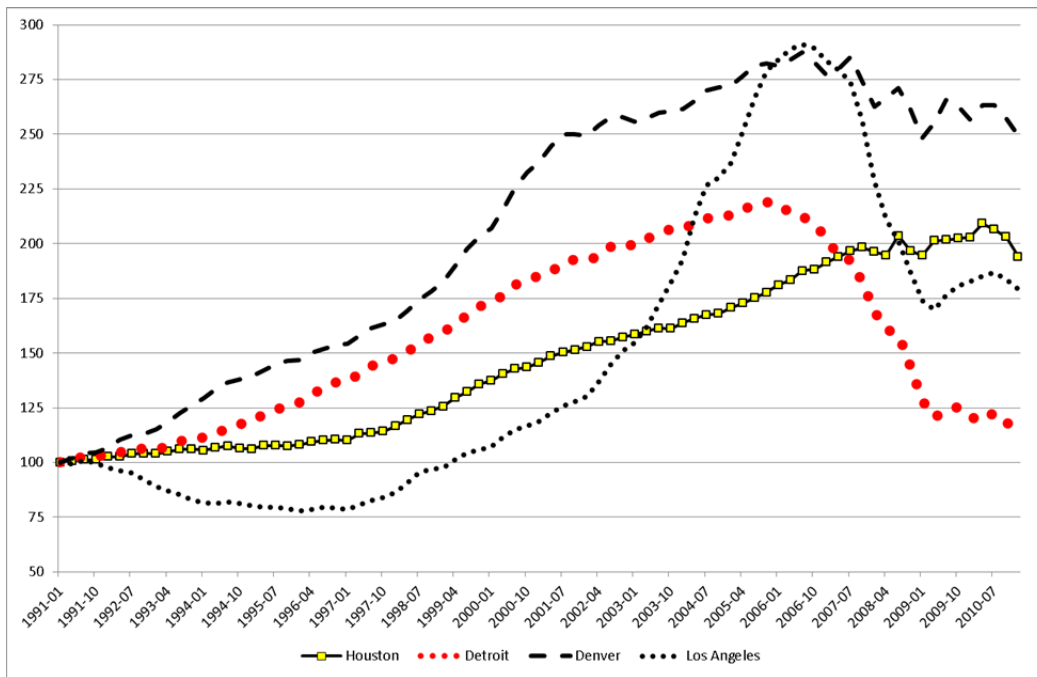
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**Figure 1a: US House Price Appreciation**  
 (Source: FHFA Repeat Sales Index)



**Figure 1b: House Price Appreciation in Select Metropolitan Areas**  
 (Source: FHFA Repeat Sales Index)





**Table 1a**  
**Self-Employment Rates Among Employed Household Heads**  
**in the American Housing Survey<sup>a</sup>**

Year	Renters Age >= 20	Owners Age >= 20	Renters + Owners Age >= 20	Renters + Owners Age 20-30	Renters + Owners Age 30-40	Renters + Owners Age 40-50	Renters + Owners Age 50-60	Renters + Owners Age >= 60
1985	0.085	0.215	0.170	0.078	0.152	0.200	0.192	0.248
1987	0.080	0.217	0.172	0.072	0.150	0.191	0.202	0.262
1989	0.069	0.200	0.154	0.062	0.137	0.169	0.186	0.227
1991	0.070	0.217	0.168	0.066	0.136	0.185	0.206	0.256
1993	0.073	0.207	0.160	0.065	0.131	0.172	0.192	0.253
1995	0.080	0.207	0.162	0.064	0.144	0.175	0.195	0.233
1997	0.064	0.187	0.145	0.051	0.118	0.152	0.182	0.237
1999	0.056	0.167	0.129	0.045	0.097	0.136	0.157	0.220
2001	0.052	0.167	0.130	0.045	0.100	0.134	0.156	0.221
2003	0.049	0.158	0.124	0.050	0.090	0.128	0.149	0.200
2005	0.113	0.203	0.175	0.092	0.149	0.186	0.198	0.250
2007	0.109	0.208	0.177	0.092	0.152	0.182	0.194	0.282
2009	0.107	0.206	0.174	0.099	0.139	0.170	0.199	0.268
2011	0.126	0.207	0.179	0.093	0.143	0.178	0.201	0.272

<sup>a</sup> Individuals are coded as self-employed if they responded “yes” the survey question which asked whether any self-employment income was received (qbus prior to 2005 and qself from 2005 onwards).

**Table 1b**  
**Self-Employment Rates Among Employed Household Heads**  
**in the Census and American Community Surveys**

Year	<b>Renters</b> Age >= 20	<b>Owners</b> Age >= 20	<b>Renters +</b> <b>Owners</b> Age >= 20	<b>Renters +</b> <b>Owners</b> Age 20-30	<b>Renters +</b> <b>Owners</b> Age 30-40	<b>Renters +</b> <b>Owners</b> Age 40-50	<b>Renters +</b> <b>Owners</b> Age 50-60	<b>Renters +</b> <b>Owners</b> Age >= 60
2000	0.095	0.184	0.157	0.069	0.126	0.167	0.191	0.263
2003	0.098	0.182	0.159	0.068	0.125	0.164	0.189	0.257
2005	0.102	0.186	0.165	0.073	0.128	0.166	0.191	0.262
2007	0.099	0.185	0.162	0.072	0.125	0.163	0.186	0.254
2009	0.096	0.173	0.152	0.066	0.116	0.153	0.175	0.230
2011	0.097	0.169	0.148	0.066	0.108	0.143	0.168	0.226

<sup>a</sup> Individuals are classified as self-employed if they report having received any self-employment income based on the IPUMS variable *INCBUS00* or are identified as self-employed based on the IPUMS variable *classwkr*.

**Table 2a**  
**Mortgage Attributes of Not Self-Employed and Self-Employed**  
**in the American Housing Survey by Year**

	Percent Homeowners With Primary Mortgage		Percent of Homeowners With a Primary Mortgage that Hold a 2 <sup>nd</sup> Mortgage		Average CLTV Including 1 <sup>st</sup> and 2 <sup>nd</sup> Mortgages Among Homeowners With a Primary Mortgage	
	Not Self-Emp	Self-Emp	Not Self-Emp	Self-Emp	Not Self-Emp	Self-Emp
1985	0.526	0.548	0.065	0.077	0.723	0.700
1987	0.519	0.547	0.061	0.098	0.690	0.677
1989	0.545	0.597	0.086	0.100	0.670	0.656
1991	0.561	0.616	0.108	0.145	0.680	0.669
1993	0.584	0.645	0.082	0.116	0.694	0.676
1995	0.647	0.719	0.096	0.138	0.691	0.671
1997	0.638	0.687	0.034	0.056	0.686	0.655
1999	0.660	0.715	0.034	0.042	0.670	0.631
2001	0.706	0.733	0.119	0.136	0.657	0.619
2003	0.711	0.760	0.095	0.106	0.654	0.624
2005	0.729	0.825	0.116	0.127	0.642	0.625
2007	0.745	0.834	0.118	0.150	0.633	0.620
2009	0.761	0.851	0.108	0.127	0.720	0.709
2011	0.777	0.854	0.061	0.079	0.758	0.735

**Table 2b**  
**Mortgage Attributes of Not Self-Employed and Self-Employed**  
**in the American Housing Survey by Year**  
**Households Age 50 and Under**

	Percent Homeowners With Primary Mortgage		Percent of Homeowners With a Primary Mortgage that Hold a 2 <sup>nd</sup> Mortgage		Average CLTV Including 1 <sup>st</sup> and 2 <sup>nd</sup> Mortgages Among Homeowners With a Primary Mortgage	
	Not Self-Emp	Self-Emp	Not Self-Emp	Self-Emp	Not Self-Emp	Self-Emp
1985	0.788	0.724	0.064	0.089	0.734	0.719
1987	0.781	0.737	0.062	0.092	0.706	0.685
1989	0.810	0.770	0.088	0.103	0.687	0.666
1991	0.831	0.799	0.113	0.143	0.700	0.684
1993	0.847	0.819	0.082	0.119	0.715	0.691
1995	0.894	0.869	0.096	0.145	0.718	0.690
1997	0.870	0.833	0.035	0.056	0.715	0.677
1999	0.873	0.865	0.036	0.049	0.703	0.654
2001	0.899	0.881	0.125	0.160	0.687	0.647
2003	0.892	0.887	0.101	0.104	0.684	0.644
2005	0.903	0.912	0.130	0.139	0.681	0.656
2007	0.917	0.916	0.138	0.161	0.685	0.657
2009	0.926	0.926	0.127	0.139	0.785	0.769
2011	0.932	0.929	0.071	0.091	0.833	0.807

**Table 2c**  
**Mortgage Attributes of Not Self-Employed and Self-Employed**  
**in the American Housing Survey by Year**  
**Household Age Greater than 50 Years**

	Percent Homeowners With Primary Mortgage		Percent of Homeowners With a Primary Mortgage that Hold a 2 <sup>nd</sup> Mortgage		Average CLTV Including 1 <sup>st</sup> and 2 <sup>nd</sup> Mortgages Among Homeowners With a Primary Mortgage	
	Not Self-Emp	Self-Emp	Not Self-Emp	Self-Emp	Not Self-Emp	Self-Emp
1985	0.290	0.331	0.077	0.013	0.623	0.596
1987	0.274	0.317	0.051	0.129	0.577	0.638
1989	0.300	0.381	0.076	0.087	0.576	0.603
1991	0.311	0.391	0.084	0.151	0.577	0.601
1993	0.342	0.428	0.081	0.103	0.602	0.615
1995	0.411	0.517	0.099	0.112	0.593	0.605
1997	0.411	0.512	0.032	0.056	0.592	0.589
1999	0.454	0.553	0.028	0.024	0.583	0.579
2001	0.518	0.575	0.102	0.086	0.584	0.559
2003	0.540	0.631	0.079	0.110	0.586	0.586
2005	0.577	0.722	0.089	0.104	0.565	0.562
2007	0.603	0.739	0.087	0.130	0.546	0.554
2009	0.636	0.780	0.080	0.111	0.630	0.627
2011	0.674	0.794	0.049	0.065	0.668	0.653

**Table 3**  
**Transitions Into and Out of Self-Employment for Renters and Owner-Occupiers**  
 (Dependent Variable: 1 if Self-Employed; 0 Otherwise  
 t-ratios based on robust standard errors in parenthesis)<sup>a,b</sup>

	All Household Heads (1)	Not Self- Employed Two Years Earlier (2)	Self-Employed Two Years Earlier (3)
<b>Panel A: Renter-Occupied</b>			
% change in real FHFA house price Index in previous 2 years	0.0243 (1.40)	0.0147 (0.89)	0.0841 (0.87)
Self-employed 2 Years Earlier (1 if yes)	0.2129 (26.22)	- -	- -
Observations	37,155	33,945	3,210
R-squared	0.089	0.033	0.111
MSA and Region Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
<b>Panel B: Owner-Occupied</b>			
% change in real FHFA house price Index in previous 2 years	0.0130 (1.60)	0.0077 (1.01)	0.0398 (1.16)
Self-employed 2 Years Earlier (1 if yes)	0.4505 (173.03)	- -	- -
Observations	260,920	221,681	39,239
R-squared	0.233	0.021	0.042
MSA and Region Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
<b>Panel C: Owner-Occupied with lagged house value</b>			
% change in real FHFA house price Index in previous 2 years	0.0197 (1.81)	0.0228 (2.22)	0.0009 (0.02)
House value 2 years earlier (\$2009) in 100,000s	0.0122 (14.78)	0.0147 (17.91)	0.0077 (3.30)
Self-employed 2 Years Earlier (1 if yes)	0.4464 (132.35)	- -	- -
Observations	156,240	132,668	23,572
R-squared	0.231	0.022	0.044
MSA and Region Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes

<sup>a</sup>All models estimated by ordinary least squares.

<sup>b</sup>Additional controls in the self-employment regressions are not shown to conserve space and include the following: age and age squared of the household head, how long the household has lived in the home, education dummy variables for less than high school (the omitted category), high school, some college, college degree, more than college, marital status, gender of the household head; race as measured by white or Asian versus all other race and ethnicity, and number of adults in the household. When pooling individuals regardless of prior self-employment status, self-employment in the previous survey two years earlier was also included in the model.

**Table 4**  
**Owner-Occupied Transitions Into and Out of Self-Employment Controlling for Housing Capital Gains**  
**(t-ratios for OLS models are based on robust standard errors;**  
**t-ratios for selection models are based on the 2-step Heckman procedure)**

	Control for Change in House Value <sup>a,c</sup>			Control for Selection Effects Associated With Remaining in the Home <sup>b,c</sup>			Control for Maintenance from Previous 2 Years When Measuring Change in House Value <sup>b,c</sup>		
	All Household Heads (1)	Not Self-Employed Two Years Earlier (2)	Self-Employed Two Years Earlier (3)	All Household Heads (4)	Not Self-Employed Two Years Earlier (5)	Self-Employed Two Years Earlier (6)	All Household Heads (7)	Not Self-Employed Two Years Earlier (8)	Self-Employed Two Years Earlier (9)
% change in real FHFA house price Index in previous 2 years	-0.0160 (-1.21)	-0.0118 (-0.94)	-0.0768 (-1.45)	-0.0170 (-1.15)	-0.0246 (-1.78)	-0.0223 (-0.36)	-0.0086 (-0.57)	-0.0167 (-1.19)	-0.0041 (-0.07)
Change in house value (\$2009) in 100,000s	0.0117 (5.07)	0.0123 (5.36)	0.0136 (1.99)	0.0112 (5.17)	0.0130 (6.24)	0.0066 (0.89)	- -	- -	- -
Change in house value net of maintenance in previous 2 years (\$2009; 100,000s)	- -	- -	- -	- -	- -	- -	0.0071 (3.26)	0.0092 (4.36)	0.0013 (0.18)
House value 2 yrs earlier (\$2009; 100,000s)	0.0149 (15.36)	0.0165 (17.18)	0.0131 (4.64)	0.0149 (16.92)	0.0165 (19.23)	0.0121 (4.02)	0.0145 (15.92)	0.0162 (18.36)	0.0111 (3.57)
Self-employed 2 Years Earlier (1 if yes)	0.4455 (120.03)	- -	- -	0.4337 (156.51)	- -	- -	0.4416 (157.11)	- -	- -
Years in the home	0.0007 (6.51)	0.0004 (4.58)	0.0024 (4.95)	0.0007 (4.09)	0.0005 (2.83)	0.0023 (3.17)	0.0007 (4.16)	0.0005 (2.77)	0.0026 (3.50)
Inverse Mills Ratio	- -	- -	- -	0.0197 (1.85)	0.0124 (1.27)	0.0214 (0.46)	0.0184 (1.72)	0.0133 (1.35)	0.0136 (0.29)
Observations	131,373	111,952	19,421	120,755	103,159	17,596	117,264	100,116	17,148
Censored	-	-	-	14,513	12,497	2,016	14,513	12,497	2,016
Not Censored	-	-	-	106,242	90,662	15,580	102,751	87,619	15,132
R-squared	0.230	0.022	0.045	-	-	-	-	-	-
MSA and Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

<sup>a</sup>All models estimated by ordinary least squares.

<sup>b</sup>All models estimated using Heckman 2-step linear probability specifications.

<sup>c</sup>Additional controls in the self-employment regressions are not shown to conserve space and include the following: age and age squared of the household head, education dummy variables for less than high school (the omitted category), high school, some college, college degree, more than college, marital status, gender of the household head; race as measured by white or Asian versus all other races, and number of adults in the household. When pooling individuals regardless of prior self-employment status, self-employment in the previous survey two years earlier was also included in the model.

**Table 5**  
**Owner-Occupied Transitions Into and Out of Self-Employment**  
**Stratifying Sample by Age of Household Head**  
**(t-ratios based on the 2-step Heckman selection model)**

	Household Heads Age 50 or Less <sup>a,b</sup>			Household Heads Over Age 50 <sup>a,b</sup>		
	All Household Heads (1)	Not Self-Employed Two Years Earlier (2)	Self-Employed Two Years Earlier (3)	All Household Heads (4)	Not Self-Employed Two Years Earlier (5)	Self-Employed Two Years Earlier (6)
% change in real FHFA house price Index in previous 2 years	0.0106 (0.54)	-0.0054 (-0.28)	0.0356 (0.46)	-0.0612 (-2.76)	-0.0595 (-3.00)	-0.1089 (-0.16)
Change in house value net of maintenance in previous 2 years (\$2011; 100,000s)	0.0107 (3.54)	0.0139 (4.64)	0.0044 (0.45)	0.0114 (3.77)	0.0116 (4.15)	0.0134 (0.18)
House value 2 yrs earlier (\$2011; 100,000s)	0.0147 (12.01)	0.0170 (14.16)	0.0080 (1.99)	0.0148 (11.80)	0.0155 (13.14)	0.0154 (0.51)
Self-employed 2 Years Earlier (1 if yes)	0.4227 (116.49)	- -	- -	0.4484 (105.11)	- -	- -
Years in home	0.0007 (2.63)	0.0007 (2.67)	0.0010 (0.94)	0.0006 (2.94)	0.0004 (2.03)	0.0021 (0.34)
Inverse Mills Ratio	0.0208 (1.50)	0.0074 (0.56)	0.0126 (0.22)	0.0495 (2.13)	0.0695 (3.53)	-3.1872 (-0.19)
Observations	76,847	65,442	11,405	43,908	37,717	6,191
Censored	11,755	10,143	1,612	2,758	2,354	404
Not Censored	65,092	55,299	9,793	41,150	35,363	5,787
MSA and Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

<sup>a</sup>All models estimated using Heckman 2-step linear probability specifications.

<sup>b</sup>Additional controls in the self-employment regressions are not shown to conserve space and include the following: age and age squared of the household head, education dummy variables for less than high school (the omitted category), high school, some college, college degree, more than college, marital status, gender of the household head; race as measured by white or Asian versus all other races and ethnicities, and number of adults in the household. When pooling individuals regardless of prior self-employment status, self-employment in the previous survey two years earlier was also included in the model.



**Table 6**  
**Owner-Occupied Transitions Into and Out of Self-Employment**  
**Decomposing Housing Capital Gains and Absolute Value of Capital Losses**  
**(t-ratios for selection models are based on the 2-step Heckman procedure)**

	All Age Household Heads <sup>a,b</sup>			Household Heads Age 50 or Less <sup>a,b</sup>			Household Heads Over Age 50 <sup>a,b</sup>		
	All Household Heads (1)	Not Self-Employed Two Years Earlier (2)	Self-Employed Two Years Earlier (3)	All Household Heads (4)	Not Self-Employed Two Years Earlier (5)	Self-Employed Two Years Earlier (6)	All Household Heads (7)	Not Self-Employed Two Years Earlier (8)	Self-Employed Two Years Earlier (9)
% change in real FHFA house price Index in previous 2 years	-0.0118 (-0.77)	-0.0247 (-1.74)	0.0154 (-0.25)	0.0215 (-1.06)	0.0032 (-0.16)	0.0634 (-0.8)	-0.0631 (-2.77)	-0.0701 (-3.43)	-0.0647 (-0.01)
Absolute value of change in house value net of maintenance in previous 2 years (\$2009; in 100,000s)									
Increase in house value	0.013 (2.91)	0.0245 (5.69)	-0.0317 (-2.03)	0.0108 (1.81)	0.0219 (3.76)	-0.0299 (-1.47)	0.0144 (2.16)	0.0269 (4.31)	-0.0268 (-0.02)
Decrease in house value	-0.0039 (-1.30)	-0.0009 (-0.32)	-0.0187 (-1.80)	-0.0047 (-1.09)	-0.0026 (-0.61)	-0.0169 (-1.24)	-0.0035 (-0.84)	0.0008 (-0.22)	-0.0231 (-0.03)
House value 2 yrs earlier (\$2009; 100,000s)	0.0138 (13.62)	0.0144 (14.72)	0.0148 (4.27)	0.0136 (9.71)	0.015 (10.89)	0.0105 (2.28)	0.0137 (9.51)	0.0135 (10.02)	0.0175 (0.08)
Self-employed 2 Years Earlier (1 if yes)	0.4416 (157.1)	- -	- -	0.4321 (117.5)	- -	- -	0.4538 (104.7)	- -	- -
Years in home	0.0007 (4.12)	0.0004 (2.67)	0.0026 (3.57)	0.0008 (2.84)	0.0007 (2.62)	0.0016 (1.42)	0.0006 (2.72)	0.0003 (1.71)	0.0023 (0.05)
Inverse Mills Ratio	0.0185 (1.73)	0.0136 (1.39)	0.0141 (0.30)	0.0214 (1.52)	0.0078 (0.59)	0.0191 (0.32)	0.0474 (2.08)	0.0709 (3.76)	-21.286 (-0.00)
Observations	117,264	100,116	17,148	74,800	63,688	11,112	42,464	36,428	6,036
Censored	14,513	12,497	2,016	11,755	10,143	1,612	2,758	2,354	404
Not Censored	102,751	87,619	15,132	63,045	53,545	9,500	39,706	34,074	5,632
MSA and Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

<sup>a</sup>All models estimated using Heckman 2-step linear probability specifications.

<sup>b</sup>Additional controls in the self-employment regressions are not shown to conserve space and include the following: age and age squared of the household head, education dummy variables for less than high school (the omitted category), high school, some college, college degree, more than college, marital status, gender of the household head; race as measured by white or Asian versus all other race and ethnicity, and number of adults in the household. When pooling individuals regardless of prior self-employment status, self-employment in the previous survey two years earlier was also included in the model.

**Table 7: Linear Probability Models of the Impact of Self-Employment  
on the Decision to Hold a Mortgage  
(t-ratios based on robust standard errors in parenthesis)**

	Primary Mortgage <sup>a</sup>				HELOC Conditional on Holding a Primary Mortgage <sup>b</sup>			
	All Ages (1)	All Ages (2)	Age <= 50 (3)	Age > 50 (4)	All Ages (5)	All Ages (6)	Age <= 50 (7)	Age > 50 (8)
Currently Self-Employed	-0.0215 (-9.63)	0.0040 (1.77)	0.0024 (0.97)	0.0110 (2.57)	0.0248 (5.82)	0.0223 (4.05)	0.0217 (2.90)	0.0198 (1.92)
House FE	No	39,920	29,479	24,428	No	21,225	15,280	10,294
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	202,533	202,533	116,716	85,817	65,335	65,335	39,481	25,854
R-Squared	0.290	0.706	0.582	0.807	0.044	0.504	0.543	0.591

<sup>a</sup>Additional controls are not shown to conserve space and include the percent change in the local house price index over the two preceding years, the age of the household head, age squared, education dummy variables for less than high school (the omitted category), high school, some college, college degree, more than college, marital status, gender of the household head, race (white or Asian with all others as the omitted category), number of adults in the household, real house value, real income, and year fixed effects for each survey year from 1989 to 2011. Data are from the 1985-2011 American Housing Survey Panel.

<sup>b</sup>Additional controls for the HELOC regressions include those for the primary mortgage regressions and also the original loan to value ratio. The HELOC variable is only reported from 2001 to 2011 which accounts for the smaller sample size relative to the primary mortgage regressions in columns 1-4.

**Table 8**  
**The Impact of Self-Employment on Current Loan-to-Value Ratio**  
**(t-ratios based on robust standard errors in parenthesis)**

	House Fixed Effects Omitting House Value <sup>a</sup>			House Fixed Effects Instrumenting for House Value <sup>a,b</sup>		
	Full Sample (1)	Age 20-50 (2)	Age 50 plus (3)	Full Sample (4)	Age 20-50 (5)	Age 50 plus (6)
Self Employed	0.0010 (0.41)	0.0012 (0.36)	0.0065 (2.03)	0.0044 (1.79)	0.0019 (0.61)	0.0100 (2.83)
Log house value	- -	- -	- -	-0.3846 (-2.53)	-0.1173 (-0.51)	-0.4254 (-2.07)
KP Weak identification test stat	-	-	-	12.99	6.91	4.87
Hansen J over-ID P-value stat	-	-	-	0.452	0.355	0.825
House Fixed Effects	30,949	21,437	18,607	21,410	14,131	10,836
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Overall R-squared	0.318	0.186	0.261	0.305	0.225	0.220
Observations	134,503	69,845	64,658	109,438	59,574	45,304

<sup>a</sup> Additional controls are not shown to conserve space and include the following: age and age squared of the household head, how long the household has lived in the home, the change in the FHFA house price index since moving into the home, real household income, education dummy variables for the household head based on less than high school (the omitted category), high school, some college, college degree, more than college. Also included are marital status, gender of the household head, and race as measured by white or Asian versus all other races.

<sup>b</sup> Estimated by GMM using the physical condition of the home as an instrument for the log value of the home. The physical condition of the home is classified in three 0-1 variables as excellent, good, or bad.

Appendix

**Table A1: Complete First and Second Stage Self-Employment Regressions from Columns 7-9 of Table 4  
(t-ratios based on Heckman 2-step selection model standard errors)**

	Second-Stage Linear Probability Self-Employment Regression <sup>a</sup>				First-Stage Probit of Whether the Household Was in the Home Two Years Earlier <sup>b</sup>		
	All Household Heads	Not Self- Employed Two Years Earlier	Self-Employed Two Years Earlier		All Household Heads	Not Self- Employed Two Years Earlier	Self- Employed Two Years Earlier
%Δ FHFA Indx prev. 2 yr	-0.0086 (-0.57)	-0.0167 (-1.19)	-0.0041 (-0.07)	%Δ FHFA Indx since move-in	-0.0201 (-15.02)	-0.0207 (-15.26)	0.0244 (0.00)
Change in House value	0.0071 (3.26)	0.0092 (4.36)	0.0013 (0.18)	Like house (1 to 10; 10 is best)	-0.0331 (-2.28)	-0.0290 (-1.90)	-0.0738 (-1.32)
House value 2 yrs earlier	0.0145 (15.92)	0.0162 (18.36)	0.0111 (3.57)	Like neigh (1 to 10; 10 is best)	0.1206 (9.75)	0.1194 (9.28)	0.1463 (2.75)
Self-emp two years Earlier	0.4416 (157.11)	- -	- -	Num. rooms in House	-0.0244 (-1.84)	-0.0236 (-1.66)	-0.0273 (-0.61)
High school Degree	-0.0022 (-0.64)	-0.0027 (-0.85)	0.0082 (0.51)	House value	-0.0000 (-0.99)	-0.0000 (-1.28)	0.0000 (1.35)
Some college	0.0042 (1.20)	0.0066 (2.08)	-0.0059 (-0.38)	High school Degree	0.2206 (3.38)	0.2180 (3.21)	0.2999 (1.15)
College Degree	0.0102 (2.76)	0.0121 (3.54)	-0.0008 (-0.05)	Some college	0.1994 (3.08)	0.1729 (2.55)	0.6885 (2.70)
More than college	0.0200 (4.89)	0.0233 (6.10)	-0.0007 (-0.04)	College Degree	0.1856 (2.78)	0.1836 (2.61)	0.3751 (1.48)
Age	0.0029 (6.19)	0.0020 (4.59)	0.0087 (3.68)	More than college	0.2029 (2.75)	0.1937 (2.49)	0.3162 (1.15)
Age squared	-0.0000 (-8.26)	-0.0000 (-7.15)	-0.0001 (-3.62)	Age	-0.0302 (-4.39)	-0.0278 (-3.90)	-0.0842 (-2.56)
Female	-0.0128 (-5.31)	-0.0063 (-2.82)	-0.0485 (-4.73)	Age squared	0.0001 (1.37)	0.0001 (0.94)	0.0007 (1.98)
White or Asian	0.0203 (6.63)	0.0144 (5.16)	0.0805 (5.41)	Female	0.0982 (2.54)	0.0913 (2.23)	0.2517 (1.77)
Married	0.0155 (5.49)	0.0191 (7.31)	-0.0113 (-0.91)	White or Asian	-0.2599 (-4.80)	-0.2728 (-4.83)	-0.1141 (-0.50)
Divorced	-0.0063 (-1.15)	0.0155 (3.06)	-0.1370 (-6.10)	Married	-0.2475 (-5.60)	-0.2559 (-5.50)	-0.0024 (-0.01)
Number of adults	0.0023 (1.55)	0.0058 (4.24)	-0.0246 (-3.99)	Divorced	-1.3543 (-2.62)	-1.2451 (-2.51)	-9.8350 (.)
Years in home	0.0007 (4.16)	0.0005 (2.77)	0.0026 (3.50)	Number of adults	0.0832 (2.83)	0.0856 (2.77)	0.1066 (0.85)
Inverse Mills Ratio	0.0184 (1.72)	0.0133 (1.35)	0.0136 (0.29)	Years in home	2.663 (87.08)	2.567 (83.79)	15.57 (0.07)
Observations	117,264	100,116	17,148		117,264	100,116	17,148
Censored	14,513	12,497	2,016		-	-	-
Not Censored	102,751	87,619	15,132		-	-	-
MSA/Reg. FE	Yes	Yes	Yes		Yes	Yes	Yes
Year FE	Yes	Yes	Yes		Yes	Yes	Yes

<sup>a</sup>All models estimated using Heckman 2-step linear probability specifications.

<sup>b</sup>All of the control variables in the first stage probit model are lagged one survey, or 2 years.

**Table A2: Supplemental Summary Statistics<sup>a</sup>**

Variable	Observations	Mean	Std. Dev.
Self-Employed (household head)	202,533	0.147	0.354
Hold a primary mortgage	202,533	0.786	0.410
Hold a second mortgage	202,533	0.077	0.266
Hold a HELOC	86,132	0.124	0.330
Current LTV including all mortgage debt	169,114	0.505	0.365
Present in same home 2 years earlier	186,808	0.859	0.348
Years since moved into home	202,467	10.188	9.582
Like the home (1 = worst; 10 = best)	199,401	8.510	1.550
Like the neighborhood (1 = worst; 10 = best)	198,304	8.292	1.659
Number of rooms in the home	202,533	6.077	1.578
Change in FHFA HPI index since mortgage origination	180,652	53.697	65.388
Change in FHFA HPI index in previous 2 years	202,533	1.018	0.110
Purchase price of home (\$2009)	193,902	195,373	160,193
Current assessed home value (\$2009)	202,533	1.925	1.494
Change in assessed home value prev. 2 yrs. net maint. (\$2009)	140,626	-0.098	0.518
High School Degree (household head)	202,533	0.266	0.442
Some College (household head)	202,533	0.254	0.436
College Degree (household head)	202,533	0.211	0.408
More than College (household head)	202,533	0.127	0.333
Age of household head	202,533	48.630	14.899
Female household head	202,533	0.313	0.464
White or Asian ((household head)	202,533	0.852	0.355
Married (household head)	202,533	0.689	0.463
Divorced (household head)	202,533	0.031	0.172
Number of adults in household	202,533	2.040	0.793

<sup>a</sup> Summary statistics are reported for homes included in the sample used for column (1) of Table 7. Observation counts for individual variables (and the corresponding regression models in which they were used) differ because not all of the variables are defined or present in each year of the AHS.