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Multiple-Home Ownership and the Income Elasticity of Housing Demand

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Introduction

Traditional models of the income elasticity of demand do not account for the possibility that households may own two or more homes (Hansen et al. 1998). Although estimates of the number of second homes and the share of households who own them vary, it is possible to use existing surveys to narrowly define second homeowners to exclude those who may own additional properties purely or mostly for investment reasons and then model their housing choices (Carliner, 2002; U.S. Department of Housing and Urban Development, 2004).

This topic is of interest because it stands to reason that households that divide their consumption of housing services among two or more properties may make different choices about their primary residences than households that own a single home. For example, those splitting their consumption among multiple homes may allocate less, all else equal, to their primary home and make decisions about the locations of their primary and second homes that have implications for urban form and the operation of land and housing markets.

This paper examines the determinants of the ownership of multiple homes and the influence of multiple-homeownership on the income elasticity of housing demand. It explores the impact of owning multiple homes on the income elasticity of demand for just primary residences, as well as total housing consumption. To the extent feasible in the datasets used for this analysis, homes owned for purely investment purposes are excluded from the analysis because such investments are little different from investments in other non-housing assets. Homes that are not used by their owners at least in part for seasonal or occasional use do not produce a flow of housing services that they consume. If the intention is not to use them, there is little reason to expect ownership of such homes to affect the income elasticity of demand for primary residences.

Of course owning a home always has an investment element to it because dollars invested in the home have opportunity costs and homes are typically leveraged investments. But the twin consumption and investment motives for homeownership are well established and have not prevented household level estimation of the income elasticity of housing demand.

Both the American Housing Survey (AHS) and the Survey of Consumer Finances (SCF) are used to model second home demand but only the AHS is used to model the income elasticity of demand. A logistic regression is used to analyze the determinants of the demand for multiple-homeownership while log linear models are used to estimate the income elasticity

of demand. We model the impact of the log of estimated permanent income on the log of value of primary homes for single and multiple home owners separately, after controlling for demographic characteristics, and with or without a dummy variable for having investment savings of $20,000 or more. The regression is then repeated to estimate the impact on the log value for the total of all homes owned by households with more than one home. These models test for possible differences in the income elasticity of demand for primary residences subject to the possibility of owning a second home for consumption purposes.

The paper begins with a literature review on the extent and determinants of second home demand. With few empirical investigations of second homeownership to review, this part of the review is brief. The literature on estimating the income elasticity of housing demand is far richer. But much of it focuses on the proper way to measure income for the purposes of estimating the elasticity of demand, as well as other appropriate controls. Our interest is in the impact of second homes. Hence, we also indicate how allowing for multiple ownership might influence elasticities and advance hypotheses about the likely influences on the choice to own a second home. This section is followed by a discussion of data and methods, model findings, and conclusions.

Literature Review

Despite the growing market for second homes, there are very few studies of the determinants of demand for second homes or the propensity of persons to own second homes. While there are numerous studies on the income elasticity of demand for housing, our review found no studies that examined the impact of second homes on the income elasticity of demand either for primary residences or for all residences owned at least in part for consumption purposes.

Propensities to Own Second Homes

Previous studies of the propensity to own second homes have not used formal probability models to estimate the independent influence of different variables on the odds of owning a second home. Using US government data, Di, McArdle & Masnick (2001) explored the characteristics of the owners of second homes, as well as locations, definitions and measurements of second homes. The paper found that that second homes are owned primarily

by white, middle aged homeowners with high incomes, and that 40 percent of second homes are mobile homes, but it did not look at wealth of second homeowners. Looking at wealth, Gutierrez (1999) searched to find any evidence of a wealth effect on the demand for new second homes, but concluded that the data were too unreliable to draw definitive conclusions about whether the wealth building and economic prosperity of the late 1990s were associated with any increases in second home development in areas with large second home shares. Kochera (1997) reported rapid growth in recreational properties in the mid 1990's, but also large numbers of unexplained "other" second homes not used for recreation or investment purposes. More recently, Carliner (2002) reviewed data on second homeownership from the decennial Census, AHS, HVS as well as surveys of homebuyer preferences from NAHB and NAR, and found that second homeownership is strongly associated with age of homeowners. He concluded that although the market still appears to be largely misunderstood, studies indicate that demand for second homes has been holding up and may accelerate somewhat with increases in income and wealth of homeowners and as more baby boomers enter age cohorts with traditionally higher second homeownership rates.

In summary, research on the propensity to own a second homes have shown descriptively that age, race, and income are associated with second homeownership, while wealth, though not examined on a household level, has been generally assumed to play a role. No econometric research has been done to study determinants of second home ownership, nor, as discussed below, have studies been done to measure income elasticity of housing demand in the context of with and without considering second homes.

Estimating Demand Equations

There is a very rich body of research on the income elasticity of housing demand. Demand for housing is an embodiment of a consumer's decision as to how much housing to consume. Standard theoretical models posit that demand for housing is a function of household income, the price of housing services, and the price of all other goods and services. The standard theoretical equation for the housing equation is a log-linear model:

$$(1)\ \log x_i = \beta_0 + \beta_1 \log y + \beta_2 \log p_H + \beta_3 \log p_0 + u$$

In this equation, x_i is the annual real expenditure on housing services, y is income, p_H is the relative price of housing, p_0 is an index of the price of all other goods, and *u* is a disturbance variable. Using a log form, β_1 is the true income elasticity and β_2 is the true price elasticity of demand for housing.

The Debate on Current vs. Permanent Income

When it comes to housing demand models, household income is thought of two ways: current income, which is a highly transitory measurement for earnings in a single year, and permanent income, which is a long-term concept of what household income will be into the future. This concept is shown in equation (2), where Y_i is current income, Y_i^P is the permanent income component of current income, and Y_i^T is the transitory income component of current income.

(2) $Y_i = Y_i^P + Y_i^T$

As a durable good with high transaction costs, it is generally argued that decisions on housing consumption are based on a household's permanent income (Y_i^P), and therefore the transitory income component of a household's current income (Y_i^T) biases demand models that use current income (Y_i), and results in underestimates of demand elasticities.

A review by Carliner (1973) found that demand models attempting to use measurements or proxies for permanent income have achieved significantly higher income elasticities than those using current income. Polinsky and Ellwood, 1979, revisited several studies and showed that, when substituted for each other within the same housing demand equation, permanent income elasticities average about 50 percent higher than those for current income. Polinsky and Ellwood used metropolitan housing sales price and income data to estimate their own measure of permanent income elasticity and found estimates ranging from 0.80 to 0.87 (Polinsky and Ellwood, 1979). Since then Goodman & Kawai (1982) have found permanent elasticities to be 100 percent greater than current income elasticities.

Though it is generally agreed that permanent income is the appropriate measurement for household income within a demand model, there has been much debate over how to correctly estimate permanent income, and also how to treat current income in the process. Reid (1962)

approximated permanent income by using a restricted sample of households with stable incomes and using current incomes as a proxy for permanent incomes. Models by Muth (1965), Winger (1968), and DeLeeuw (1971) used city median incomes as proxies for permanent income, arguing that averaging incomes across metro areas eliminates transitory elements. Other studies, such as Carliner (1973) use a multiyear average of a household's past four years of incomes to approximate permanent income. More recently, Goodman and Kawai (1982) define permanent income as the predicted value of a regression of current household income on the determinant variables of permanent income, with the residual being transitory income. The resulting equation derived from (2) is as follows:

(3) $Y_i = \varphi_0 + \Sigma_j \varphi_j H_j + \Sigma_j \varphi_j N_j + Y_i^T$

where:

(4) $Y_i^P = \varphi_0 + \Sigma_j \varphi_j H_j + \Sigma_j \varphi_j N_j$

In (3) and (4), we see that $\Sigma_j \varphi_j H_j$ is the sum of a vector of human capital components of permanent income and their respective coefficients (age, education, employment status), and $\Sigma_j \varphi_j N_j$ is a sum of a vector of nonhuman capital components of permanent income. To determine permanent income, our model follows the methodology of Wachter and Megbolugbe (1992) in performing a Box-Cox transformation on the dependent variable of the permanent income regression with $\lambda = 0.5$, and then re-transforms the predicted value before including it in the demand model (see Appendix A for model results).

Incorporating Demographic and Other Household Characteristics

Housing demand models have grown to include a number of demographic variables in attempts to measure differing "tastes" for housing consumption among a cross section of households with differing characteristics (Goodman, 1990; Hansen, Formby, & Smith, 1998). There has been much disagreement as to the significance of demographic factors within demand models. In a review of several studies, Hansen et. al. (1998) suggests that exclusion of demographic variables likely to be correlated with permanent income, such as race, age, sex,

and household size, will bias estimations of income elasticity, and that the direction of this bias is most likely upward. However, an earlier empirical study by Carliner (1973) finds income elasticity measurements from regressions using demographic terms are higher than those without. Another empirical study from Follain (1979) found income and price elasticities not sensitive to the presence of socio-demographic variables, and a third empirical study by Goodman (1990), found demographic interactions relatively insignificant for populations close to general population means but highly significant for populations away from means, such as those at very low or very high incomes. In light of this diverse array of findings, we felt it necessary to include demographic variables within our model, and that age, race, and family type were the most appropriate factors available within our dataset.

Controlling for House-Price and Non-Housing Cost Indexes

The standard demand model in equation (1) generates price and income elasticities of housing demand based on the utility of housing consumption relative to all other goods. Goodman & Kawai (1984), following examples from DeLeeuw (1971) and Polinsky and Ellwood (1979), estimate a demand model with demographic and housing characteristic variables but without a non-housing cost index, choosing instead to apply various fixed-effect coefficients within the Ordinary Linear Regression.

Due to limited geographic data in the AHS dataset, our model uses this fixed-effect approach to control for relative differences in both house-price and non-housing costs based on regional location as well as metro / non-metro area location.

Our fixed-effect estimated regression equation becomes:

(5) $\log (h_i) = \beta_0 + \beta_1 \log y_i^P + \Sigma_j \varphi_j Z_{ji} + u$

Where h_i is the value of housing consumption and Z_{ji} is a vector of our 12 geographic dummies to control for the relative price of housing and non-housing goods to the individual, as well as demographic and other housing characteristic dummy variables that potentially affect the demand for housing and control for fixed-effects on housing consumption within the model.

We use housing value as our measure of housing consumption (h_i) in our equation. Researchers generally agree that housing consumption for homeowners is best approximated and more easily obtained as a standardized measurement of total housing value, rather than as annual expenditures on homeownership. The common method, used by Goodman and Kawai (1984), involves hedonic regression, whereby a household's housing value is taken as a function of neighborhood and resident characteristics. The housing price index can be determined by the price of a standardized unit of housing according to the hedonic regression, and housing consumption can then be measured as housing value divided by the price of a standardized unit. Including geographic and socioeconomic characteristics within our fixed-effects model enables us to standardize housing value somewhat within the demand model; though using separate hedonic regressions would clearly be superior. Therefore, h_i, in our model is approximated simply as the total value of housing.

Controlling for Other Effects: Wealth and Elderly Status

Wealth variables seem not to have been included in previous studies, although it may have an impact on the propensity of second home ownership and influence on income elasticity estimates. Also, although age has often been included in studies of income elasticity, its effect may not be linear and its interaction with income is very possible. The lack of these variables in previous studies encourages us to include them in our study.

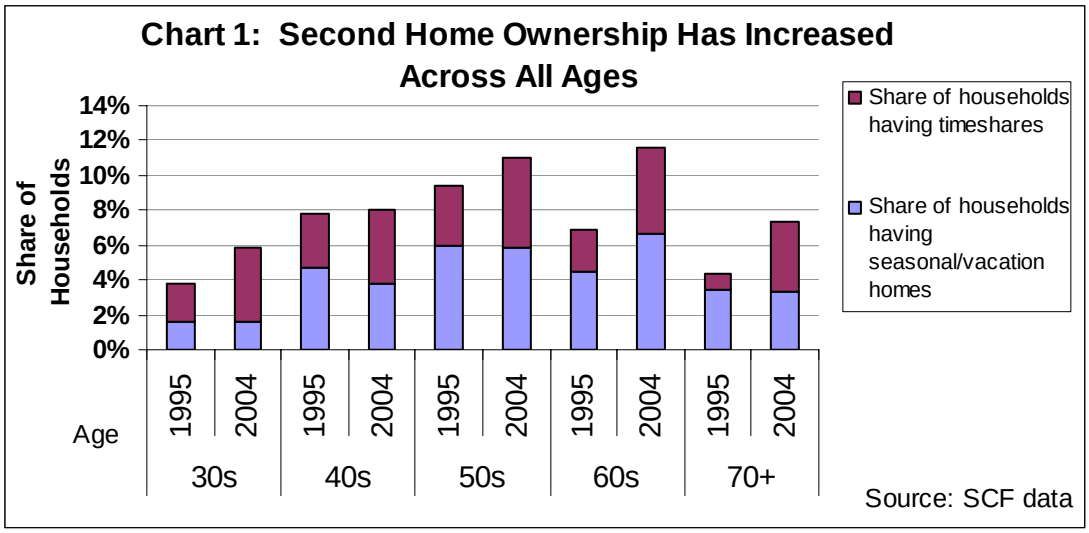
Measures and Magnitude of Second Home Demand

This paper is not intended to reopen debates about the level of income elasticity of housing demand. Instead, it explores whether ownership of second homes influences the income elasticity of demand for primary residences or for the aggregate value of all homes that are owned, at least in part, for consumption. This is increasingly relevant given the apparent increase in second homeownership in recent years.

Statistics on the extent of second homeownership and the number of second homes are often inconsistent. These inconsistencies mostly reflect differences in methods of data collection, especially in how questions about the purpose of vacant or additional owned properties are asked, but also as a result of differences in sample sizes, sampling procedures, and weighting procedures across surveys.

The AHS, Housing Vacancy Survey (HVS), and decennial Census each contain estimates of the number of second homes based on interviewer efforts to determine the status of vacant units. The AHS and the HVS produce estimates of second homes (defined here as homes for seasonal or occasional use and homes occupied by those with a usual residence elsewhere) that are closer to each other than to the decennial Census, which consistently estimates a far smaller number of second homes. However, the AHS produced higher second home estimates than the HVS in the early to mid 1990s and then lower estimates thereafter (Carliner 2002). The HVS registered a strong 20 percent increase in the number of second homes from 1995 to 6.8 million in 2005 while the American Housing Survey reported a smaller but still substantial increase from 5.8 million in 1995 to 6.2 million in 2003.

Many surveys ask households questions about whether they own additional properties and then ask them questions about these properties. These include the AHS, the SCF, the Survey of Income and Program Participation (SIPP), the Panel Study of Income Dynamics (PSID), and industry surveys such as one of new homebuyers conducted by the National Association of Home Builders (2000) and by the National Association of Realtors® (NAR) of homebuyers and homeowners. A recent NAR survey of 2005 homebuyers found that about 12 percent of all homes purchased were characterized by their owners as for vacation use and 28 percent for investment purposes. The intricacies of how all the other household surveys are conducted are well summarized by Carliner (2002) and the US Department of Housing and Urban Development (2004). Suffice it to say here that the SCF is the only dataset to ask questions about second homes on a regular (every three year) basis. Like the HVS, it shows growth in second home demand over the past decade (Chart 1). However, for all age groups except those now in their 60s, all of the growth was in households reporting timeshare fractional ownership in a second home. Overall, the SCF shows an increase of about 600,000 homes for "seasonal/vacation use" and in time shares of fully 1.8 million. Assuming that fractional ownership averages 2 week per year, then a 1.8 million increase in timeshare owners translates into only about 70,000 units.



While the figures shown here suggest that second homeownership rates among homeowners peak in their 50s and 60s at about 6-6½ percent, and rates of time shares peak at about 5 percent, these may be undercounts. The reason is that when SCF respondents are asked what type of property they own, they must choose from "seasonal/vacation home," "time share ownership," and a host of structure types including single-family house, condominium, residential, trailer/mobile home, farm/ranch, etc. It is likely that some of those who own homes for occasional use on weekends or for work do not consider them for seasonal or vacation use. Indeed, many of those responding with a structure type do not derive any rental income from their second home, suggesting that in some cases they are at least in part for consumption uses.

With an even greater number of households headed by younger boomers growing into the 50-59 age group by 2015 than the number of households headed by leading edge boomers currently in that age, and each generation accumulating more household net wealth and higher median incomes than previous generation at similar age, demand for second homes are likely to continue to grow in the coming decade (Belsky and Prakken 2004).

Hypotheses

The literature and economic theory suggest the following hypotheses with respect to the likelihood of owning a second home and the impact of owning a second home on income elasticities for housing:

A) *The likelihood of owning a second home will be increasing with permanent income, current income, wealth, and age.* Higher incomes and wealth allow consumers to allocate more of the household budget to housing consumption and investment. Lifecycle factors suggest that even after controlling for income and wealth, second homeownership might be higher for older aged households as they approach or reach retirement and look towards more leisure time. But the impact of the presence of children is more ambiguous because on the one hand it may increase the utility derived from a second home, but on the other may be a drain on the household budget. Geographic location of the primary residence might also have an influence, but again is ambiguous. With most owners having second homes within driving distance of their primary residences, living in a lower cost area could increase the likelihood of owning a second home because the costs of buying a second home are lower. On the other hand, these same areas tend to have lower price appreciation and therefore leave owners with less housing wealth to leverage up for second homeownership.

B) *The income elasticity of demand for primary residences will be lower for those with second homes than for those with just one home.* There are several factors that lead to this expectation. First, households that have a preference for owning second homes divide their housing consumption among more than one property. Because they split their consumption between two homes, one would expect the income elasticity of demand for just their primary home to be lower than for owners of only one home. This holds true whether the initial decision on how much to spend on a primary residence was made with the intention of buying a second home or if instead, over the lifecycle, a homeowner decides to adjust their housing consumption upward by investing in a second home rather than trading-up to a higher valued home or improving their primary residence. Second, second home owners have higher average incomes and housing consumption levels relative to owners of just one home. Indeed, their average income is very close to that of owners in the upper income quartiles of a just a single residence. Therefore, second home owners may be closer to being fully housed. In this case, uses of an incremental dollar other than housing may maximize their overall utility. As a result, increases in income may not in turn result in as large a percentage change in

consumption in their primary (or secondary) homes. Lastly, owners of a single home with no desire for second homeownership may have more of an incentive to maximize the quality and consumption value of their sole home, while those with a propensity to own second homes may under-consume their primary house in favor of second home ownership.

C) The income elasticity of demand with respect to all houses owned by second homeowners will be lower than the elasticity of just their primary property. With consumption split, spending on the primary home will take precedence over spending on the secondary home, and therefore lower elasticities of secondary home demand will drag down overall elasticities of demand which incorporate both primary and secondary home consumption. Given the same income distribution, the income elasticity of demand for the primary home (eP) relates to the elasticity of the second home (eS) as a ratio based on the way in which consumption of these two goods relate to each other, based on the formula[1]:

(6) eS = eP (% Change S / % Change P)

With this equation, if both primary and secondary consumption are treated equally, the two income elasticities are equal. But we posit that consumption of primary home is the first priority because that is where homeowners spend more of their time. Therefore an incremental dollar will contribute more to consumption of a primary home than a second home. Thus, eS is less than eP. So it follows that the elasticity of total housing consumption should be higher than the elasticity for the second home, but lower than for primary home consumption. This should be at least true for non-elderly but seniors may spend half or even more time in their second homes.

[1] With income Y, the primary elasticity is : eP = (dP/P) / (dY/Y) and the second is eS = (dS/S) / (dY/Y);
Solving for y in the former equation, we obtain Y = (eP*P*dY)/dP and substituting this into the latter equation, we have:
eS = eP * (dS/S)/(dP/P), which can be re-written as: eS = eP * [(% Change S) / (% Change P)].

D) *The income elasticity of demand with respect to all properties owned by those who have second homes for consumption purposes will be lower than that of single-home owners*. This is because, similar to the reasoning in (B) above, second homeowners, being on average older with high levels of wealth and income and high levels of housing consumption already, are less likely to be under-housed than the generally lower income owners of a single home. Therefore, income increases are not matched by the same increases in housing consumption seen by the generally lower income owners of a single home only. This may be tested and seen through decreasing elasticities of demand among single-home owners as income levels increase.

E) *Models that do not include the value of second homes and do not control for second homeownership are likely to produce biased estimates of the income elasticity of housing demand*. This is because the ownership of multiple homes is expected to influence the income elasticities of demand in the ways stipulated in (A)-(D) above.

Data and Method

We use the AHS and SCF to provide empirical evidence on determinants of second-home ownership and AHS to explore income elasticity of housing demand when second homeownership is considered. The AHS is conducted by Census for HUD every two years at the national level, and only twice (in 1985 and 1995) did it have a supplemental survey on second homes. In these years, respondents were asked about other residential properties they owned in addition to their primary homes. For these properties, up to 6 such properties are surveyed. For each recorded property, it asks respondents about why they hold such a property and asks them to mark all the reasons that apply. In our paper, we only look at those properties that are marked for recreational use in order to narrow the field as much as possible to households that self-report homes that they view, at least in part, as providing them a flow of housing consumption services.

The regular AHS survey contains detailed household information including current household income, age, race/ethnic background, the education level of household heads, and family type. Unfortunately, geographic detail in the dataset is lacking. While about 100 metropolitan areas are specified, in most cases the number of observations is far too few to

create a meaningful hedonic price index. Instead, to control for differences in the costs of housing and non-housing goods across areas, we rely on the interaction of the 4 census regions and 3 types of metropolitan status (cities, suburbs, or non-metro). This provides 12 variations—an admittedly crude control for housing price differences across the country.

The AHS also has a dummy variable on whether the household has investment savings of $20,000 or more. This is a crude proxy for the level of non-housing wealth of a household. This could have an impact on the income elasticity of housing demand but the current literature overlooks potential wealth effects on income elasticity. Particularly for the propensity of second-home ownership, it may have some influence as a determinant.

Exhibit 1 shows basic descriptive statistics on the variables from the AHS we use to model propensities and elasticities. Because AHS top-codes the value of primary homes at $375,000, we drop these roughly 3 percent of cases in all of our elasticity models to avoid using exactly the same value for all records with house values at the top code. Importantly, the second home value is not top-coded, so models of the total value of properties owned by people who own a home under $375,000 in 1995 are not right-censored on second-home value. We also exclude a couple of hundred cases (less than one percent of the entire sample) in our elasticity models involving owners of multiple homes where no information on the value of second homes was provided.

The SCF is conducted by the Federal Reserve Bank every three years. The most recent survey is 2004 and was just released in March 2006. The survey was originally designed to measure all kinds of debt that people take on, and thus has very rich information on liabilities vs. assets and therefore the net wealth held by each household surveyed. Because of the imbalances in wealth holding and distribution, the SCF over samples wealthy households. Roughly half of its sample is a set of wealthy households and the other half are households distributed across a greater spectrum of household wealth. Because of that, we have to use a weighted sample in modeling work.

One of the benefits of this sampling procedure is that it insures better accuracy at the level of aggregate household net wealth. Therefore, one of the advantages of using the SCF data to model the probability of owning a second home is that SCF data provide the most accurate and detailed wealth information of any household survey. With this data, we are able to obtain non-housing wealth as a variable that omits home equity, which is too closely

correlated to our dependant variable of home value and would induce bias our model. This is more precise than the AHS dummy indicator of savings in excess of $20,000.

The biggest limitation of the SCF data is that it has a small sample size of less than 5,000 households. Because of that, the released file for public use does not have any geographic variables. This prevents us from controlling for any house price variation across even regions or metropolitan status. It also prevents meaningful estimation of permanent income. For this reason, we only use SCF data to model the propensity of owning a second home. The SCF also has some intrinsic problems embedded in the questionnaire design. As noted above, the coding system is such that some households may have chosen structure type categories such as single-family or multi-family units even though the home they own is for their own seasonal or occasional use. Exhibit 2 displays some descriptive statistics of homeowners in the SCF data. Because we run models on weighted samples, both un-weighted and weighted statistics are displayed.

The two different datasets have different estimates on the share of vacation home owners among all households. While 2004 SCF data indicate a 3.7 percent vacation homeownership rate, the 1995 AHS data show a 3.3 percent rate. That is not surprising when considering the growth of vacation homes during the decade and differences in how questions about the purpose of second properties are asked. In both data, we exclude timeshare units from our count of recreational second homes.

With the compelling theoretical and empirical arguments for using permanent income rather than current income as the appropriate correlate to estimate income elasticity, in our preferred AHS models we use the Box-Cox square root transformation in a two-step method first estimating household permanent income as described in Appendix A and then plugging in predicted values into the propensity and income elasticity of demand regressions. We did not estimate permanent income in SCF data because it lacks any kind of geographic information control for regional wage differentials. Thus, in our models using AHS data we put in permanent income while in our propensity model using SCF data we put in both current household income and the education level of household heads, which is often a proxy indicator for permanent income.

In our elasticity models, we run non-elderly (Table 4a) and elderly (Table 4b) samples separately, as we suspect they may have statistically significant differences in elasticity with

respect to permanent income, especially since our predicted values for permanent income are apt to have larger residual errors for older people because the correlation of current incomes and the right-hand side predictors is weaker for retirees. We also run models with (Tables 4a/4b) and without (Tables 4c/4d) the wealth variable to see how it affects other coefficients, especially income elasticities.

In Model 1, we estimate the elasticity among those who own only a single home, using the value of primary home as the dependent variable. In Model 2, we estimate the elasticity of demand for just the primary residence among those who own more than one home, again using the value of primary home as the dependent variable. This is our principal test of the hypothesis that the income elasticity of demand for primary residences will be lower for second homeowners than others because they split their consumption among multiple properties.

In Model 3, we estimate the income elasticity of demand using total value of all homes owned by owners with second homes as the dependent variable to test the hypothesis that it will be lower because a percentage point increase in income will bring about a smaller percentage point increase in a larger combined first and second home total value. In Model 4, we estimate the income elasticity of demand just for second homes among second homeowners to test the hypothesis that it will be lower than the primary home demand elasticities, indicating relatively low income elasticities for second home demand, preference for primary home consumption, and most importantly, the negative influence of second home ownership on demand elasticities for total housing consumption. In Model 5, we present a single model of housing value for all homeowners with a dummy variable indicating ownership of a second home. This is included to provide an unbiased estimate of the income elasticity of housing demand that incorporates the possibility of second home ownership.

Lastly, we perform a secondary test of the hypothesis that, because they have higher average incomes than the general population of homeowners that own just one home, second home owners have lower elasticities of demand for primary residences. To accomplish this, we divide the owners of one home into income quartiles to see if the income elasticity of demand is in fact lower among owners with average incomes similar to the population of second home owners.

It should be noted that our data do not include geographic controls for second home location. Therefore, since our models proxy housing consumption with house value,

uncontrolled-for location-based differences in appreciation levels of second homes may bias measurements of income elasticities based on current second home values. Although most second homes are within driving distance of the first home and may have similar rates of appreciation, if a significant number of second homes bought at the same price point had significantly different appreciation rates, then the current value does not equally reflect total home consumption. In the end, we assume that second home location and appreciation rates have some effect on income elasticities and owners' adjustments to housing consumption that lie beyond the scope of this paper.

The functional form of our propensities models is logistic and the form of our elasticity models is log-linear. Hence the variables in propensities infer differences in the odds of owning a home conditional on each individual variable holding the others constant. The coefficients on income in the log-linear models can be interpreted as the elasticity of housing demand with respect to income and assumes constant elasticities across all values of the dependent variables.

More formally, our logit model takes the following form:

$$(7)\ P(S_i) = \varphi_0 + \varphi_1 Y_i^P + \varphi_2 \text{MINORITY}_i + \Sigma\psi_j \text{AGE}_{ji} + \Sigma\tau_k \text{FAMILY}_{ki} + \Sigma\omega_l \text{GEOGRAPHY}_{li} + \varphi_3 \text{ELDERINCOME}_i + U_i$$

Where $P(S_i)$ is the probability of owning a second home, Y_i^P is permanent income, MINORITY is a dummy variable indicating whether or not the household head is non-Hispanic white (1 if minority and 0 otherwise); AGE_j is 4 dummy variables flagging 10-year age cohorts (35-44 years, 45-54 years, 55-64 years, and 65+ years old, with under 35 as the reference group); FAMILY_k is 5 dummy variables flagging the type of family (married with children, single parents, other family type, single person, and other non-family type, with married without children as the reference group); GEOGRAPHY_l is 11 dummy variables controlling for regional and metropolitan level fixed effects (Northeast suburb, Northeast non-metro, Midwest city, Midwest suburb, Midwest non-metro, South city, South suburb, South non-metro, West city, West suburb, West non-metro, with Northeast city as the reference group), and U_i is a disturbance variable. In our propensity model using AHS data we also include an interaction

variable ELDERINCOME containing the income of elderly assuming their income may have quite different impact on second home ownership.

Our elasticity models take the following form:

(8) $\log (h_i) = \beta_0 + \beta_1 \log y_i^P + \beta_2 SAVINGSOVER20K + \beta_3 MINORITY_i + \Sigma\tau_k FAMILY_{ki} + \Sigma\omega_l GEOGRAPHY_{li} + U_i$

Where h_i is the value of the primary home or the total value of all homes; y_i^P is the predicted permanent income; w_i is a dummy variable flagging household savings and investments of over $20k (1 if yes and 0 otherwise); MINORITY is a dummy variable indicating whether or not the household head is not non-Hispanic white; $FAMILY_k$ is 5 dummy variables flagging the type of family (married with children, single parents, other family type, single person, and other non-family type); $GEOGRAPHY_l$ is 11 dummy variables controlling for regional and metropolitan level fixed effects (Northeast suburb, Northeast non-metro, Midwest city, Midwest suburb, Midwest non-metro, South city, South suburb, South non-metro, West city, West suburb, and West non-metro); and U_i is a disturbance variable.

Findings from the Propensity Models

Models run on both the AHS and SCF data find that age is the most predominant determinant for vacation homes. The AHS model finds that the odds of owning a vacation home are 3.7 times higher for 45-54 year olds than the odds for those under 35. For the age group between 55 and 64, the odds ratio is as high as 6.5. In our SCF model, the numbers are even more dramatic. Compared to the odds for household heads under 35, the odds of owning a vacation home are 11.2 times as large for those between 55 and 64 years old. Why this should be true even after controlling separately for income and especially wealth (which we can do with some precision in the SCF model) is unclear. Wealth is correlated with age so it is conceivable that the estimates on age are biased and picking up some of the wealth effect. It could also be that at later ages, mortgage payments of homeowners make up a smaller share of their overall budget, freeing them up to spend more on a second home. Nevertheless, it seems

plain that lifecycle matters a great deal when it come to the likelihood of owning a second home.

Both datasets suggest that minority households are less likely to own second homes, all else equal. Both income (current and permanent) and non-housing wealth are positively associated with second homes in both datasets. But in our propensity model using SCF data, though these two variables are statistically significant, they have little practical impact. With $10,000 more non-housing wealth, a household's odds ratio of having a vacation home vs. not having one is only 1.001, and a $10,000 increase in household current income only raises the ratio to 1.005. Again, this is surprising and suggests that the correlation of age with wealth and income may be distorting the results.

In the SCF data, education is positively associated with owning a second home. The estimated odds that a college educated household head would own a vacation home versus no vacation home are over 4 times more than that of a household head with less than high school education. In AHS data, there is statistically significant interaction between permanent income and elderly status, suggesting that the impact of permanent income on propensity is indeed different for elderly and non-elderly households.

None of the geographic dummy variables in AHS is statistically helpful in predicting second homes. So second-home ownership is not favored or disfavored by homeowners in any particular location regarding their primary residence. Having investment savings of more than $20,000 in the AHS data or higher level of non-housing wealth in the SCF data is more likely to own a vacation home. Exhibit 3a and 3b show our propensity models in AHS and SCF data. The patterns observed in two different data sets collected 9 years apart seem amazingly consistent.

Findings from the Elasticity Models

We obtain log-linear estimates in our elasticity models. Both among the non-elderly and elderly households, our models show that vacation home owners have somewhat lower income elasticity of demand for primary housing (Model 2) compared to those not having vacation homes (Model 1). When adding the value of vacation homes to that of primary homes, the elasticity is further lower (Model 3) compared to those without second homes, having been dragged down by very low demand elasticities for second homes (Model 4). For comparison to

the above, our estimate of the normal income elasticity of demand for all housing consumption among all homeowners (Model 5) shows that there is a slight positive bias in models that fail to incorporate the lower fixed effects behind second homeownership. These results are in line with our expectations.

In our models, income elasticity estimates among the non-elderly sample are higher than those found among the elderly sample, though in part this reflects larger sample sizes for the non-elderly. Taking out the dummy variable on investment savings of $20,000 or more does not change the elasticity pattern (see Exhibit 4c-4d in comparison to 4a-4b).

Our additional test of income elasticities by income level for those not owning a vacation home (Exhibit 5) shows decreasing income elasticities of demand as income levels rise,[2] supporting our hypothesis that the generally higher income level of second homeowners partly explains their lower overall elasticities of total housing demand relative to those not owning a second home. However, the very low elasticity levels of second homeowners go beyond what would be expected based on incomes alone. This final test provides compelling evidence that the choice to adjust consumption by adding a second home rather than by increasing the value of the primary residence (through trading up to a higher valued home or making improvements to an existing home) must lower demand elasticities for primary homes among second homeowners even more.

Exhibit 6 summarizes our income elasticity models. It is worth noting that statistical significance tests revealed that for the non-elderly sample, the difference in coefficients of income elasticity of housing demand between those having and not having vacation homes was significant at the 90 percent confidence level, both in models with and without the wealth variable. For the elderly sample in neither case is the difference in elasticities significant.

Conclusion

The propensity models reported here are perhaps the first efforts to model the determinants of second home ownership. We find that especially the age of the household head but also the minority status of the household head and household income (both current and

[2] The bottom income quartile is an exception perhaps because they have a higher utility for basic necessities other than housing.

permanent), as well as household non-housing wealth are good predictors of second-home ownership.

Our income elasticity models produce results consistent with the hypothesis that those having second homes have somewhat lower income elasticity of housing demand, as their resources have to be divided among more than one home. Even when including second home value in measuring housing consumption, homeowners with second homes still have lower income elasticity.

Exhibit 1: Descriptive Statistics (AHS Data)

Sample Group: All Homeowners

Variables	Unweighted N					
	Yes	%	No	%	Mean	SD
Less than High School	5,140	17.5	24,244	82.5		
High School	9,146	31.1	20,238	68.9		
Some College	7,333	25.0	22,051	75.0		
College Plus	7,765	26.4	21,619	73.6		
Minority Status	4,767	16.2	24,617	83.8		
Under 35	4,059	13.8	25,325	86.2		
35-44	6,768	23.0	22,616	77.0		
45-54	6,189	21.1	23,195	78.9		
55-64	4,494	15.3	24,890	84.7		
65+	7,874	26.8	21,510	73.2		
Married Couple without Kids	10,759	36.6	18,625	63.4		
Married Couple with Kids	8,212	27.9	21,172	72.1		
Single Parent	1,537	5.2	27,847	94.8		
Other family Household	2,415	8.2	26,969	91.8		
Single Person Household	5,550	18.9	23,834	81.1		
Other Non-Family Household	911	3.1	28,473	96.9		
New England City	2,961	10.1	26,423	89.9		
New England Suburb	1,617	5.5	27,767	94.5		
New England Non-metro	1,990	6.8	27,394	93.2		
Midwest City	4,057	13.8	25,327	86.2		
Midwest Suburb	2,464	8.4	26,920	91.6		
Midwest Non-metro	2,069	7.0	27,315	93.0		
South City	3,520	12.0	25,864	88.0		
South Suburb	3,729	12.7	25,655	87.3		
South Non-metro	1,819	6.2	27,565	93.8		
West City	2,735	9.3	26,649	90.7		
West Suburb	1,151	3.9	28,233	96.1		
West Non-metro	1,256	4.3	28,128	95.7		
Total Value of All Homes					117,520	90,148
Value of Primary Home					115,092	84,158
Current Household Income					48,741	38,091
Having Investment Savings of More than 20K	1,256	4.3	28,128	95.7		
Having Recreational 2nd Homes	972	3.3	28,412	96.7		

Exhibit 2: Descriptive Statistics (SCF Data)

Sample Group: All Homeowners

Variables	Unweighted N						Weighted N					
	Yes	%	No	%	Mean	SD	Yes		No		Mean	SD
Less than High School Education	1,418	8.6	14,977	91.4			10,084,611	13.0	67,329,712	87.0		
High School Education	3,349	20.4	13,046	79.6			21,595,072	27.9	55,819,252	72.1		
Some College	2,870	17.5	13,525	82.5			17,012,350	22.0	60,401,974	78.0		
College Graduate and Higher	8,758	53.4	7,637	46.6			28,722,291	37.1	48,692,033	62.9		
Minority Status	2,397	14.6	13,998	85.4			14,894,182	19.2	62,520,141	80.8		
Age Under 35	1,401	8.5	14,994	91.5			10,341,166	13.4	67,073,158	86.6		
Age 35-44	2,905	17.7	13,490	82.3			15,783,863	20.4	61,630,461	79.6		
Age 45-54	4,250	25.9	12,145	74.1			17,988,831	23.2	59,425,493	76.8		
Age 55-64	3,983	24.3	12,412	75.7			13,517,649	17.5	63,896,675	82.5		
Age 65+	3,856	23.5	12,539	76.5			19,782,815	25.6	57,631,508	74.4		
Married Couples	11,755	71.7	4,640	28.3			47,580,287	61.5	29,834,037	38.5		
Male-headed Households	2,265	13.8	14,130	86.2			12,963,143	16.7	64,451,181	83.3		
Female-headed Households	2,375	14.5	14,020	85.5			16,870,894	21.8	60,543,429	78.2		
Total Value of All Homes					1,187,458	3,112,890					263,594	456,240
Value of Primary Home					870,106	1,882,222					246,807	359,768
Current Household Income					1,061,331	4,499,026					87,069	250,929
Household Non-housing Wealth					12,259,998	46,399,527					462,304	
Have Vacation Home	2,323	14.2	14,072	85.8			2,885,714	3.7	74,528,610	96.3		

Exhibit 3a: Propensity Model for Vacation Home Ownership (AHS Data)

Dependent variable: Owning a Recreational Home
Sample group: All homeowners

Variable	Coefficients		Odds ratio
Intercept	-5.7521		
Permanent Income (in $10,000s)	0.2671	***	1.306
Having Savings & Investments Over $20K	0.3951	**	1.484
Minority	-0.3973	**	0.672
Age 35-44	0.8688	***	2.384
Age 45-54	1.3011	***	3.673
Age 55-64	1.8718	***	6.5
Age 65+ (Elderly)	1.0153	***	2.76
Married with Children	-0.1936	~	0.824
Single Parents	-0.3904	ns	0.677
Other Family type	-0.8844	***	0.413
Single Person	-0.0958	ns	0.909
Other Non-family type	-0.3631	ns	0.696
New England Suburb	-0.1537	ns	0.857
New England Non-metro	0.0987	ns	1.104
Midwest City	-0.0982	ns	0.906
Midwest Suburb	-0.0414	ns	0.959
Midwest Non-metro	-0.1117	ns	0.894
South City	-0.0297	ns	0.971
South Suburb	-0.1107	ns	0.895
South Non-metro	-0.2279	ns	0.796
West City	-0.1410	ns	0.869
West Suburb	-0.0602	ns	0.942
West Non-metro	-0.2206	ns	0.802
Permanent Income(in $10,000s)*Elderly	0.2660	***	1.305

Note: ~ p <.10
* p <.05
** p <.01
*** p <.001

Exhibit 3b: Propensity Model for Vacation Home Ownership (SCF Data)

Dependent variable: Owning a Vacation Home
Sample group: All homeowners

Variable	Coefficients		Odds ratio
Intercept	-6.0876		
Household Income (in $10,000s)	0.0050	*	1.005
Non Housing Wealth (in $10,000s)	0.0009	***	1.001
High School Education	0.3881	ns	1.474
Some College	1.1650	~	3.206
College Graduate and Higher	1.4906	*	4.44
Minority Status	-0.9540	*	0.385
Age 35-44	1.3422	~	3.827
Age 45-54	2.2785	**	9.762
Age 55-64	2.4220	**	11.268
Age 65+ (Elderly)	2.1596	**	8.667
Male-headed Households	-0.5896	~	0.555
Female-headed Households	-1.5790	***	0.206
Household Income(in $10,000s)* Elderly	0.0030	ns	1.003

Note: ~ p<.10
* p <.05
** p <.01
*** p <.001

Exhibit 4a: Elasticity Model using Predicted Permanent Income & Wealth Variables (Non-Elderly)

Sample group: Non-Elderly Homeowners

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Dependent variable:	Value of primary home		Value of primary home		Total value of all homes		Value of vacation home(s)		Value of all homes	
Sample Sub-Group:	Do not own a vacation home		Own a vacation home		Own a vacation home		Own a vacation home		All non-elderly homeowners	
Intercept	-1.6110		0.9363		3.1226		3.1082		-1.5382	
Predicted permanent income (in $10,000s)	1.1814	***	0.9741	***	0.8343	***	0.7237	**	1.1750	***
Having Savings & Investments Over $20K	0.0341	ns	-0.2720	~	-0.3273	*	-0.3932	ns	0.0206	ns
Minority	0.0213	ns	0.1925	~	0.0784	ns	0.0489	ns	0.0218	ns
Age 35-44	0.0147	ns	-0.1388	ns	-0.1127	ns	-0.1530	ns	0.0145	ns
Age 45-54	0.0452	**	-0.1167	ns	-0.0914	ns	-0.1143	ns	0.0442	**
Age 55-64	0.2843	***	0.1052	ns	0.0091	ns	-0.1894	ns	0.2805	***
Married with kids	0.0719	***	0.1220	ns	0.0567	ns	-0.0756	ns	0.0724	***
Single parents	0.3478	***	0.3153	ns	0.2272	ns	0.1944	ns	0.3454	***
Other family type	0.0539	*	-0.0223	ns	0.1098	ns	0.3299	ns	0.0551	*
Single person	0.3302	***	0.2166	ns	0.3546	**	0.5761	**	0.3317	***
Other non-family type	-0.0337	ns	-0.0802	ns	-0.0525	ns	0.1189	ns	-0.0331	ns
New England Suburb	0.2006	***	0.1257	ns	0.0116	ns	0.1789	ns	0.1945	***
New England Non-metro	0.1056	**	0.3636	~	0.3665	**	0.7736	**	0.1099	**
Midwest City	-0.1737	***	0.1363	ns	-0.0355	ns	0.0347	ns	-0.1732	***
Midwest Suburb	0.0029	ns	0.0122	ns	-0.1514	ns	-0.0911	ns	-	ns

Exhibit 4a: Elasticity Model using Predicted Permanent Income & Wealth Variables (Non-Elderly)

Sample group: Non-Elderly Homeowners

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Dependent variable:	Value of primary home		Value of primary home		Total value of all homes		Value of vacation home(s)		Value of all homes	
Sample Sub-Group:	Do not own a vacation home		Own a vacation home		Own a vacation home		Own a vacation home		All non-elderly homeowners	
Midwest Non-metro	-0.1586	***	-0.0776	ns	-0.2995	*	-0.3196	ns	0.0023 - 0.1631	***
South City	-0.0479	ns	-0.0986	ns	-0.2755	ns	-0.1047	ns	- 0.0532	ns
South Suburb	-0.0263	ns	0.0576	ns	-0.1005	ns	0.0630	ns	- 0.0286	ns
South Non-metro	-0.2027	***	0.0411	ns	-0.1694	ns	-0.1764	ns	- 0.2032	***
West City	0.3884	***	0.3840	*	0.2318	ns	0.1494	ns	0.3843	***
West Suburb	0.3738	***	0.3752	*	0.4075	**	0.5040	~	0.3740	***
West Non-metro	0.1520	***	-0.1161	ns	-0.2153	ns	-0.0615	ns	0.1426	***
Own a Vacation Home									0.6946	***
R-squared	0.2354		0.2301		0.2630		.1287		0.2509	

Note: ~ p <.10
* p <.05
** p <.01
*** p <.001

Exhibit 4b: Elasticity Model using Predicted Permanent Income & Wealth Variables (Elderly)

Sample Group: Elderly Homeowners

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Dependent Variable:	Value of primary home		Value of primary home		Total value of all homes		Value of vacation home(s)		Value of all homes	
Sample Sub-group:	Do not own a vacation home		Own a vacation home		Own a vacation home		Own a vacation home		All elderly homeowners	
Intercept	4.3833		6.2127		6.8609		5.8369		4.4123	
Predicted permanent income (in $10,000s)	0.6643	***	0.5208	**	0.5230	**	0.5408	~	0.6618	***
Savings & Investments Over $20K	0.0749	**	-0.3180	*	-0.3630	*	-0.5054	~	0.0680	**
Minority	-0.0451	ns	-0.2572	ns	-0.1809	ns	-0.2659	ns	-0.0484	ns
Married with kids	0.0458	ns	1.3486	*	1.5085	*	1.9337	~	0.0798	ns
Single parents	-0.2238	ns	0.0000	NA	0.0000	NA	0.0000	NA	-0.2267	ns
Other family type	0.0317	ns	0.3511	ns	0.2368	ns	-0.0058	ns	0.0326	ns
Single person	0.2980	***	0.2246	ns	0.4152	*	0.8192	*	0.2976	***
Other non-family type	-0.0305	ns	-0.1464	ns	-0.1108	ns	0.2406	ns	-0.0306	ns
New England Suburb	0.2538	***	0.1125	ns	-0.1024	ns	-0.5305	ns	0.2471	***
New England Non-metro	0.0584	ns	-0.1768	ns	-0.1438	ns	-0.1841	ns	-0.1438	ns
Midwest City	-0.1281	**	-0.2419	ns	-0.4009	ns	-0.6424	ns	-0.1297	**
Midwest Suburb	0.0023	ns	-0.2337	ns	-0.4886	~	-0.9928	~	-0.0053	ns

Exhibit 4b: Elasticity Model using Predicted Permanent Income & Wealth Variables (Elderly)

Sample Group: Elderly Homeowners

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Dependent Variable:	Value of primary home		Value of primary home		Total value of all homes		Value of vacation home(s)		Value of all homes	
Sample Sub-group:	Do not own a vacation home		Own a vacation home		Own a vacation home		Own a vacation home		All elderly homeowners	
Midwest Non-metro	-0.0938	~	-0.4499	ns	-0.7384	*	-1.1928	*	-0.1013	**
South City	0.02576	ns	-0.11892	ns	-0.28319	ns	-0.58427	ns	0.024	ns
South Suburb	-0.08877	~	0.04567	ns	0.04439	ns	0.01921	ns	-0.0835	**
South Non-metro	-0.15649	**	0.03585	ns	-0.39357	ns	-1.79853	**	-0.15873	***
West City	0.45768	***	0.2668	ns	-0.01365	ns	-0.42189	ns	0.45	***
West Suburb	0.33943	***	0.29476	ns	-0.01042	ns	-0.68952	ns	0.33476	***
West Non-metro	0.20072	***	0.19681	ns	-0.07404	ns	-0.68283	ns	0.19816	***
Own a Vacation Home									0.67716	***
R-squared	0.1799		0.2798		0.2650		0.2066		0.1990	

Note: ~ p <.10
* p <.05
** p <.01
*** p <.001

Exhibit 4c: Elasticity Model using Predicted Permanent Income, No Wealth Control Variable (same as Model 4a but without "Savings & Investments over $20K")

Sample group: Non-Elderly Homeowners

	Model 1		Model 2		Model 3		Model 4		Model 5	
Dependent variable:	Value of primary home		Value of primary home		Total value of all homes		Value of vacation home(s)		Value of all homes	
Sample Sub-Group:	Do not own a vacation home		Own a vacation home		Own a vacation home		Own a vacation home		All non-elderly homeowners	
Intercept	-1.6109		0.7233		3.0282		2.8045		-1.5378	
Predicted permanent income (in $10,000s)	1.1814	***	0.9941	***	0.8438	***	0.7523	**	1.1749	***
Minority	0.0208	ns	0.1923	~	0.0766	ns	0.0485	ns	0.0215	ns
Age 35-44	0.0148	ns	-0.1417	ns	-0.1231	ns	-0.1574	ns	0.0146	ns
Age 45-54	0.0456	**	-0.1288	ns	-0.1017	ns	-0.1317	ns	0.0444	**
Age 55-64	0.2858	***	0.1039	ns	0.0074	ns	-0.1912	ns	0.2814	***
Married with kids	0.0720	***	0.1252	ns	0.0572	ns	-0.0711	ns	0.0724	***
Single parents	0.3481	***	0.3067	ns	0.2129	ns	0.1818	ns	0.3456	***
Other family type	0.0539	*	-0.0068	ns	0.1261	ns	0.3523	ns	0.0550	*
Single person	0.3312	***	0.2157	ns	0.3468	**	0.5745	**	0.3323	***
Other non-family type	-0.0330	ns	-0.0968	ns	-0.0763	ns	0.0948	ns	-0.0327	ns
New England Suburb	0.2004	***	0.1221	ns	0.0094	ns	0.1738	ns	0.1944	***
New England Non-metro	0.1057	**	0.3322	~	0.3285	~	0.7283	*	0.1100	**
Midwest City	-0.1738	***	0.1166	ns	-0.0582	ns	0.0063	ns	-0.1732	***
Midwest Suburb	0.0028	ns	0.0066	ns	-0.1737	ns	-0.0995	ns	-0.0023	ns
Midwest Non-metro	-0.1584	***	-0.0901	ns	-0.3158	~	-0.3378	ns	-0.1630	***
South City	-0.0478	ns	-0.1098	ns	-0.2915	~	-0.1209	ns	-0.0531	ns
South Suburb	-0.0263	ns	0.0509	ns	-0.1092	ns	0.0534	ns	-0.0286	ns

Exhibit 4c: Elasticity Model using Predicted Permanent Income, No Wealth Control Variable (same as Model 4a but without "Savings & Investments over $20K")

Sample group: Non-Elderly Homeowners

	Model 1		Model 2		Model 3		Model 4		Model 5	
Dependent variable:	Value of primary home		Value of primary home		Total value of all homes		Value of vacation home(s)		Value of all homes	
Sample Sub-Group:	Do not own a vacation home		Own a vacation home		Own a vacation home		Own a vacation home		All non-elderly homeowners	
South Non-metro	-0.2026	***	0.0377	ns	-0.1757	ns	-0.1814	ns	-0.2032	***
West City	0.3886	***	0.3682	~	0.2135	ns	0.1266	ns	0.3845	***
West Suburb	0.3739	***	0.3671	*	0.3993	*	0.4923	~	0.3741	***
West Non-metro	0.1527	***	-0.1769	ns	-0.2893	ns	-0.1494	ns	0.1431	***
Own a Vacation Home									0.6949	***
R-squared	0.2354		0.2250		0.2508		.1238		0.2509	

Note: ~ p <.10
* p <.05
** p <.01
*** p <.001

Exhibit 4d: Elasticity Model using Predicted Permanent Income, No Wealth Control Variable (same as Model 4b but without "Savings & Investments over $20K")

Sample Group: Elderly Homeowners

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
Dependent Variable:	Value of primary home		Value of primary home		Total value of all homes		Value of vacation home(s)		Value of all homes	
Sample Sub-group:	Do not own a vacation home		Own a vacation home		Own a vacation home		Own a vacation home		All elderly homeowners	
Intercept	4.3661		5.8300		6.4240		5.2286		4.3983	
Predicted permanent income (in $10,000s)	0.6663	***	0.5519	**	0.5586	**	0.5904	~	0.6635	***
Minority	-0.0490	ns	-0.1962	ns	-0.1112	ns	-0.1688	ns	-0.0521	~
Married with kids	0.0400	ns	1.3571	*	1.5182	*	1.9472	~	0.0744	ns
Single parents	-0.2265	ns	0.0000	NA	0.0000	NA	0.0000	NA	-0.2292	ns
Other family type	0.0299	ns	0.3317	ns	0.2146	ns	-0.0367	ns	0.1597	ns
Single person	0.3037	***	0.1535	ns	0.3340	~	0.7062	*	0.3029	***
Other non-family type	-0.0262	ns	-0.1344	ns	-0.0970	ns	0.2597	ns	-0.0267	ns
New England Suburb	0.2577	***	0.1136	ns	-0.1011	ns	-0.5286	ns	0.2507	***
New England Non-metro	0.0623	ns	-0.1441	ns	-0.1065	ns	-0.1321	ns	0.0606	ns
Midwest City	-0.1228	*	-0.2140	ns	-0.3691	ns	-0.5981	ns	-0.1249	*
Midwest Suburb	0.0066	ns	-0.1814	ns	-0.4290	ns	-0.9098	ns	-0.0017	ns
Midwest Non-metro	-0.0852	ns	-0.3940	ns	-0.6746	*	-1.1039	~	-0.0938	~
South City	0.02862	ns	-0.05629	ns	-0.21169	ns	-0.48473	ns	0.02645	ns
South Suburb	-0.08564	~	0.06143	ns	0.06238	ns	0.04425	ns	-0.08075	~

Exhibit 4d: Elasticity Model using Predicted Permanent Income, No Wealth Control Variable (same as Model 4b but without "Savings & Investments over $20K")

Sample Group: Elderly Homeowners

	Model 1		Model 2		Model 3		Model 4		Model 5	
Dependent Variable:	Value of primary home		Value of primary home		Total value of all homes		Value of vacation home(s)		Value of all homes	
Sample Sub-group:	Do not own a vacation home		Own a vacation home		Own a vacation home		Own a vacation home		All elderly homeowners	
South Non-metro	-0.15423	**	0.10301	ns	-0.3169	ns	-1.69179	**	-0.15685	**
West City	0.46045	***	0.29434	ns	0.01778	ns	-0.37813	ns	0.45241	***
West Suburb	0.34438	***	0.30352	ns	-0.000414	ns	-0.67559	ns	0.3393	***
West Non-metro	0.20717	***	0.25103	ns	-0.01215	ns	-0.59667	ns	0.2037	***
Own a Vacation Home									0.67769	***
R-squared	0.1791		0.2583		0.2373		0.1901		0.1984	

Note: ~ p <.10
* p <.05
** p <.01
*** p <.001

Exhibit 5: Demand elasticities decline with income among higher-income non-elderly homeowners, except for low-income households who have strived a lot to achieve homeownership

Do not own a second home

Income Quartile	Annual Permanent Household Income Level	Income Elasticity of Primary Housing Demand
High	Over $61,578	1.00
High-Mid	$49,840 - $61,578	1.28
Low-Mid	$40,140 - $49,839	1.66
Low	Less than $40,140	0.92
Overall Mean	$50,934	1.18

Own a Second Home

	Annual Permanent Household Income Level	Income Elasticity of Primary Housing Demand	Income Elasticity of Total Housing Demand
Overall Mean	$56,568	0.97	0.83

Exhibit 6: Summary Table of Income Elasticity of Housing Demand

Sample Group: Non-Elderly Homeowners

Dependent variable	Sample Sub-groups	Income Elasticity With Wealth Control Variable	Income Elasticity Without Wealth Control
Value of primary home	Do not own a vacation home	1.18137 ***	1.18136 ***
Value of primary home	Own a vacation home	0.97407 ***	0.99413 ***
Value of all homes	Own a vacation home	0.83426 ***	0.84375 ***

Sample Group: Elderly Homeowners

Dependent variable	Sample Sub-groups	Income Elasticity With Wealth Control Variable	Income Elasticity Without Wealth Control
Value of primary home	Do not own a vacation home	0.66429 ***	0.66632 ***
Value of primary home	Own a vacation home	0.52075 **	0.55193 **
Value of all homes	Own a vacation home	0.52298 **	0.55856 **

Note: ~ p <.10
* p <.05
** p <.01
*** p <.001

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Appendix Table 1: Permanent Income Regression (Box-Cox λ=0.5)

Variable	DF	Coefficient	Type II Sum of Squares	Mean Square	F Value	Pr > F
Intercept	1	403.86801	1.109E8	1.109E8	6785.57	<.0001
High School	1	35.38528	3725311	3725311	227.91	<.0001
Some College	1	65.19025	1.11E7	1.11E7	679.24	<.0001
College Graduate or Higher	1	127.61739	4.126E7	4.126E7	2524.14	<.0001
Minority	1	-24.84862	2040145	2040145	124.81	<.0001
Age 35-44	1	24.90867	1501197	1501197	91.84	<.0001
Age 45-54	1	33.39170	2498400	2498400	152.85	<.0001
Age 55-64	1	-7.97708	109798	109798	6.72	0.0096
Age 65+	1	-81.02657	1.294E7	1.294E7	791.76	<.0001
Married with children	1	-4.44193	60606	60606	3.71	0.0542
Single parents	1	-100.95346	1.148E7	1.148E7	702.51	<.0001
Other family type	1	-41.75909	3199519	3199519	195.74	<.0001
Single Person Household	1	-116.24828	4.584E7	4.584E7	2804.29	<.0001
Other non-family type	1	-38.83794	1178943	1178943	72.13	<.0001
New England Suburb	1	21.33853	379576	379576	23.22	<.0001
New England Non-metro	1	-18.22930	222799	222799	13.63	0.0002
Midwest City	1	-8.13391	49158	49158	3.01	0.0829
Midwest Suburb	1	4.77603	20730	20730	1.27	0.2601
Midwest Non-metro	1	-25.81154	523873	523873	32.05	<.0001
South City	1	-17.94502	241412	241412	14.77	<.0001
South Suburb	1	-12.29114	134174	134174	8.21	0.0042
South Non-metro	1	-36.61865	1198814	1198814	73.34	<.0001
West City	1	5.97286	24587	24587	1.50	0.2200
West Suburb	1	5.68575	26090	26090	1.60	0.2065
West Non-metro	1	-24.32725	334514	334514	20.46	<.0001

Root MSE	127.85071
Adjusted R. Square	0.3523
N	27908

Appendix Table 2: Variable Definitions for Permanent Income Regression

Variable	Definition
High School	1 if high school graduate, 0 otherwise
Some College	1 if some college education, 0 otherwise
College Graduate or Higher	1 if college graduate, 0 otherwise
Minority	1 if minority, 0 otherwise
Age 35-44	1 if 35-44, 0 otherwise
Age 45-54	1 if 45-54, 0 otherwise
Age 55-64	1 if 55-64, 0 otherwise
Age 65+	1 if 65 or over, 0 otherwise
Married with children	1 if married with kids, 0 otherwise
Single parents	1 if single parents, 0 otherwise
Other family type	1 if other family type, 0 otherwise
Single Person Household	1 if single person household, 0 otherwise
Other non-family type	1 if other non-family type household, 0 otherwise
New England Suburb	1 if NE suburb, 0 otherwise
New England Non-metro	1 if NE non-metro, 0 otherwise
Midwest City	1 if Midwest city, 0 otherwise
Midwest Suburb	1 if Midwest sub, 0 otherwise
Midwest Non-metro	1 if Midwest non-metro, 0 otherwise
South City	1 if South city, 0 otherwise
South Suburb	1 if South sub, 0 otherwise
South Non-metro	1 if South non-metro, 0 otherwise
West City	1 if West city, 0 otherwise
West Suburb	1 if West sub, 0 otherwise
West Non-metro	1 if West non-metro, 0 otherwise