CONSTRUCTED PREFERENCES AND HOUSING DEMAND*

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Abstract:

People are often uncertain about their own preferences. In such cases, previous research has shown, preferences can be influenced by normatively irrelevant cues, such as arbitrary "anchors." We study this phenomenon by observing people's decisions about how much to spend on housing after moving between cities. Based on a simple model that incorporates uncertainty about preferences, we predict that movers from expensive cities will pay more for housing than their equals moving from cheaper locations. This and other related predictions are supported by our analyses of a sample of 905 movers from the Panel Study of Income Dynamics.

*We thank Steve Klepper, Bill Vogt, Linda Babcock, Colin Camerer, Jeff Dominitz, Marty Gaynor, Chris Mayer, Ted O'Donoghue, Nachum Sicherman, Lowell Taylor and seminar attendees at Carnegie Mellon University, Pontificia Universidad Catolica de Chile, and CEA at Universidad de Chile, for useful comments and suggestions. Loewenstein's participation in this research was supported by the Center for Integrated Study of the Human Dimensions of Global Change, a joint creation of the National Science Foundation (SBR-9521914) and Carnegie Mellon University.

I. Introduction

Imagine you have just moved to a new city and are looking for a home. You have narrowed your search down to two houses, one with three bedrooms and one with four. The homes are identical on all other dimensions. The four-bedroom home sells for $20,000 more than the three-bedroom one. Which should you buy? According to standard economic theory this a trivial task. You consult your complete and stable set of preferences and compare the value of the 4th room to the $20,000 (or at least behave *as if* you did so). If the value of the 4th room is higher than $20,000 you opt for the four-bedroom home.

The reality is that very few people could identify the precise value of an extra room. For one thing, most people lack relevant experience, which in this case might ideally consist of episodes of living in homes with three or four bedrooms. Even if they had such experience, they might find it difficult to introspect about how much utility they derived from the extra room. Moreover, to calculate the opportunity cost of the additional room, one would also need to know the alternative best use of the money, which probably would not be spent on one single item, but on a whole variety of purchases, most of which would be difficult to anticipate ahead of time. Clearly, assessing the value of an extra room is not a trivial calculation, and estimates of such values are unlikely to be precise. Perhaps this is why real estate agents often suggest simple rules of thumb to perplexed would-be homebuyers, such as "buy a house that's four times your gross salary."

The difficulty of estimating the value of an extra room is an example of what decision researchers refer to as "preference uncertainty." Contrary to the assumption that preferences are well defined, people often have little idea about such fundamental issues as how much money they should be saving, how much insurance to purchase, how much to spend on vacations and, most important for the present analysis, what price home to buy or how much to spend on rent.

Despite uncertainty about their own preferences, people still need to make these decisions. To resolve uncertainty and help themselves make decisions, people may use a wide range of possible cues – e.g., how much other people spend or the distribution of

market prices. Decision researchers refer to the preferences that result from such a process as "constructed" [Fischhoff, 1991; Slovic, 1995].[1]

We apply the concepts of preference uncertainty and constructed preferences to understanding decisions by potential homeowners and renters, including the decision of whether to buy or rent, and, contingent upon that choice, the decision of how much to spend.

Housing is an ideal realm in which to examine the implications of preference uncertainty and constructed preferences. On the one hand, housing is a domain in which you would expect to observe constructed preferences: There is limited scope for arbitrage, few opportunity to learn from (one's own) experience, and people are likely to be highly uncertain about their own preference due to the magnitude and uniqueness of the transaction and the multidimensionality of attributes valued in housing (e.g. size, comfort, commuting distance, quality of school district, safety of neighborhood, and so on). Indeed studies have already observed anomalous patterns in housing behavior that have been explained in psychological terms [e.g., Genesove and Mayer, 2001; Case and Shiller, 1988].

Housing is also an ideal domain in which to study constructed preferences because it is important. Most prior empirical investigations of constructed preferences have taken the form of hypothetical choice studies or experiments involving relatively small stakes. Housing is anything but small stakes. For most homeowners, buying and selling houses will be the largest economic transactions they will make in their lives. Housing is the single largest form of savings in old age in the U.S., and the largest bequest that most people leave their descendents. It would be hard to argue that housing decisions are unimportant for economics.

Drawing on the notion of uncertain preferences, we believe that homebuyers and renters have some uncertainty about how much they should spend. Consistent with constructed preferences, we postulate that they decide how much to spend based on a subjective evaluation of whether housing *seems* cheap or expensive. We examine one possible determinant of this subjective evaluation that applies only to people moving from one market to another: *Movers coming from cities where housing was more expensive than their current city should view prices in the new city as cheap and should*

[1] For a review of this literature from an economic perspective, see McFadden [1999], and from a psychological perspective, see Bettman, Luce and Payne [1998].

spend more money on housing than movers coming from cities where housing was less expensive. In other words, we predict, households use previous market prices as cues for constructing their preferences.

We test this prediction empirically, using data from the Panel Study of Income Dynamics (PSID). We estimate standard housing demand equations for movers, modifying the equations to take account of housing prices prevailing in the city they moved from. We find the predicted pattern for both buyers and renters. Buyers moving from cities with higher housing prices spend more on housing. Similarly, renters moving from cities where rents were higher pay higher rents in the new city. Finally, both owners and renters coming from cities where the (own/rent) cost ratio was higher are more likely to own in the new city.

Of course, such a pattern could result from a variety of factors other than preference uncertainty. For example, people coming from cities with expensive housing could be wealthier, have higher taste for housing or systematically different information sets. Any of these factors could lead them to spend more on housing in their new city. We report a series of analyses that test these alternative explanations, and conclude that they do not account for the observed patterns. Moreover, additional predictions that stem from the basic theoretical model developed in Section III are empirically supported but not predicted by these alternative accounts.

In what follows, Section II summarizes relevant psychological research on preference uncertainty and preference construction. Section III presents a simple model that applies insights from the research on constructed preferences to the rental and ownership choices investigated in the paper. Section IV presents results from the empirical tests of the model's predictions. Section V concludes.

II. Preference Uncertainty and Constructed Preferences

Several lines of research conducted by decision researchers point to the conclusion that people are often uncertain about their own preferences. In this section we briefly review the research on preference uncertainty that is most directly relevant to our analysis.

Loomes [1988] has argued that, contrary to the standard assumption of clearly defined indifference curves, people have *regions* of indifference (see, also, Butler & Loomes [1988]). If so, there will no longer be a unique maximizing consumption bundle for any given budget, but rather, for any budget, there will be a set of bundles that a consumer would 'settle' for. Under these circumstances, any factor that influences which bundles are considered first may influence choice.[2] Applying the idea of thick indifference curves to housing, one might imagine that movers between cities search for homes differently depending on where they moved from. Those from expensive markets may look at expensive/good-quality homes first, while those from cheaper ones may search for less-expensive/worse-quality homes first. If so, they will hit their region of indifference from different directions and choose different housing bundles, with those coming from more expensive regions choosing more expensive homes.

Anchoring effects, in which people's judgments and preferences are influenced by irrelevant numbers they are exposed to, provide evidence that revealed preferences can be influenced by the manner in which they are elicited. Johnson and Schkade [1989] found that anchors affected the certainty equivalent given for gambles, and Kahneman and Knetsch [1993] found anchoring effects in a study examining willingness-to-pay for public goods. More recently, Ariely, Loewenstein and Prelec [forthcoming] elicited willingness-to-pay from subjects for a variety of real goods in an experimental market. Subjects were first anchored by asking them whether they valued different goods more or less than a price created from the digits of their social-security-numbers. Then actual maximum buy prices were elicited through an incentive compatible mechanism. Subjects with above median social-security numbers stated values from 57% to 107% higher than those with below median numbers.

Context effects are the demonstrations of constructed preference that are most closely related to the results we report. Context effects occur when the setting in which alternatives are offered affects the choice made by the individual [McFadden 1999]. For example, adding an extreme alternative to a choice set can make other extreme, but not *as* extreme alternatives appear to be "compromise" options, which can increase their market share (violating the principle of independence of irrelevant alternatives) [Simonson and Tversky 1992]. Another type of context effect is the "asymmetric dominance effect" in

[2] Such a process is closely related to the notion of 'satisficing' proposed by Herb Simon, wherein people choose not the best possible bundle but rather a 'good enough' one.

which dominated alternatives are not chosen, but draw market share toward the item they are dominated by [Huber and Puto 1983].

Prelec, Wernerfel and Zettelmeyer [1997] argue that context effects reflect, in part, the use of information provided by context. They propose that when people don't know what's best for them, they evaluate their own relative location in the population's distribution and then choose an alternative that best matches that same relative location in the set of alternatives. To illustrate the idea, they offered subjects choices between ponchos of different lengths (e.g., 35", 45" and 55"). Whatever the specific poncho lengths that were offered, people tended to choose ponchos that matched their relative height – e.g., those who were tall relative to the population average choose the 55" poncho from the above set.

Simonson and Tversky [1992] tested several effects of context on decision-making. One of the experiments in their article presents an especially close analog to the situation studied in this paper, so we discussed it in detail. Their '*Background Contrast'* experiment consisted of two stages.

In the first stage, subjects made hypothetical choices between two computers that differed in price and memory. In the 'expensive memory' condition, the price of memory was $2 per Kb, while in the 'cheap memory' condition the price of memory was $0.5 per Kb. In the second stage all subjects made a hypothetical choice between two computers that differed in memory and price with an implied cost of memory of $1 per Kb (which was deliberately chosen to lie between $.50 and $2 per Kb). Subjects for whom memory had been more expensive in the first stage were more likely to select the machine with more memory in the second stage than subjects for whom memory was cheaper. The natural explanation is that subjects did not know how much they valued memory, and inferred their own preferences in part from the market choices they were offered in the first stage.

The parallel between this "*Background Contrast*" experiment and our study is straightforward. The background is the city where people move from, the target is where they move to, and the implicit tradeoffs are the costs of housing. The prediction, analogous to Simonson and Tversky's, is that people coming from more expensive "backgrounds" will choose more expensive housing in the city they move to.

III. A Simple Model

To model the behavior we are analyzing, we propose a simple modification to the standard consumer choice model. We assume that people are uncertain about the tradeoff that they wish to make between housing and other expenditures, and that they infer their own preferences between housing and money at least partially from market prices. Although we apply the model specifically to housing, virtually the same model can easily be generalized to any two (or potentially more) goods.

We assume that utility is a function of consumption of two goods -- housing and non-housing -- and that the marginal rate of substitution between them depends on a preference shifter: p*. In particular, let $U=U(x_0,x_H;p^*)$, where X_H represents housing services, X_O the consumption of other goods, and p* is the taste-shifter between X_H and X_O. The standard first-order condition for maximization requires that: $MRS(x_0,x_{h;}p^*) = (\partial U(x_0,x_{h;}p^*) /\partial X_H)/(\partial U(x_0,x_{h;}p^*) /\partial X_O) = P_H/P_O$.

The parameter p* incorporates the impact of contextual factors such as relative prices that the individual has been exposed to in the past. It reflects the consumer's idea of the "appropriate" tradeoff between housing and non-housing goods, which means that as p* increases, the consumer's indifference curves shift in favor of housing -- $\partial(MRS(x_o,x_h,p^*))/\partial p^* \geq 0$ -- as illustrated in Figure I.

- Figure I here –

The standard case of stable preferences is therefore a special case of our formulation with $\partial(MRS(x_o,x_h,p^*))/\partial p^* = 0$.[3]

The specific predictions that emerge from the model depend on the assumptions we make about the determinants of p*. For example, if one were studying social transmission of preferences, one might assume that an individual's p* would depend on the tradeoffs made by the people around her. In this paper we are interested in the impact

[3] Reference prices can easily be incorporated into standard utility functions. For example the Cobb-Douglas utility function, $U=X_H^{\beta} X_O^{1-\beta}$, could be modified by making the exponent depend on p* -- e.g., $\beta=f(p^*)$. For further specificity, one could apply the specific function $\beta=P^*_H/(P^*_H+P^*_O)$.

of previous prices on current consumption; hence we represent p* as a function of the present and past price of housing relative to the prices of other goods the consumer faces.

Specifically, and consistent with numerous models of dynamic adaptation [e.g., Ryder and Heal 1973], we assume that $p^*_t=(1-\alpha)p^*_{t-1}+\alpha(p_t)$ with $\alpha \in [0,1]$, which means that p* is a weighted sum of present and past relative prices, with exponentially declining weights for past prices. When $\alpha=1$, then $p_t^*=p_t$, and there is no impact of previous prices on current choices. When $\alpha=0$, then preferences are determined by the first market prices that the consumer observes, and are never revised afterward.

The major prediction of the model, with $0<\alpha<1$, is that, if two identical individuals have different reference prices (for instance because they have lived in different markets), they will consume differently even while facing identical budget constrains. The effect of reference price on housing expenditure is illustrated in Figure II, where P1* and P0* represent the reference prices of otherwise identical consumers, a and b, who moved to the same market from a more expensive or less expensive market, respectively.

- Figure II here -

Prediction 1a: Homebuyers coming from cities where owning costs are higher than in their current city, will buy more expensive homes –all else equal - than homebuyers coming from cheaper cities.

Prediction 1b: Renters coming from cities where renting costs are higher than in their current cities will spend more on rent - all else equal - than movers from less expensive ones.

We can apply virtually the same model to the choice *between* owning and renting. If people have some uncertainty about the correct tradeoff between purchase prices and rents (a very likely if), and they form an impression of what this tradeoff should be in part from their own past experience, then we would expect that:

Prediction 2: Movers will be more likely to rent in their new city, if the previous city had a high rent/own cost ratio.

A third prediction results from the postulated dynamics of p*: As an individual settles in the new city, the reference price, p*, should converge toward the prices prevailing in the market she has moved to, leading, in turn, to an adjustment of consumption:

Prediction 3: As movers stay in the new city they will readjust the amount spent on housing in the opposite direction of the impact that P* initially had on their consumption.[4]

For example, if the individual has moved from a more expensive to a less expensive market, ($p^*_t > p_t$), and, if the individual remains in the same market, then $p^*_{t+1} \leq p^*_t$. If individuals choose their optimal level of housing consumption based in part in the value of p*, then over time movers should become dissatisfied with the quantity of housing they chose when they first moved into a market. As illustrated in Figure III, a person who moved from a more expensive to a less expensive market should initially purchase or rent a more expensive residence than what she ultimately comes to want – i.e. after adapting her preferences to the prices prevailing in her current location.

- Figure III here -

Prediction 3 is particularly useful in ruling out alternative explanations for the first two predictions. A variety of alternative explanations involve the idea that movers leaving expensive cities differ in more than reference prices from those leaving cheaper one. They may, for instance, have higher wealth or differ in their taste for housing. Although such propositions are discussed in detail in section IV, it is worth noting that, if either of these were the cause of the effects described by Predictions 1a and 1b, we would not observe the pattern described in Prediction 3. For example, if people who move from

[4] Movers from expensive cities will readjust downwards while movers from cheap cities will re-adjust upwards, correcting an original 'overspending' and 'underspending' respectively.

more expensive cities purchase more expensive housing because they are wealthier, we would not expect them to systematically revise their housing consumption downwards as they remain in their new city.

Source of the Uncertainty:

The model just proposed leaves unspecified the specific mechanisms that lead to the modifications of the standard assumption of stable, known, preferences. Perhaps most importantly, there is ambiguity about the precise source of the consumer's uncertainty.

One possible interpretation of the uncertainty is that consumers simply do not possess fundamental preferences for tradeoffs between housing and other forms of consumption, perhaps because they find it impossible to evaluate the relative utility of such incommensurable items, or because they have imperfect access to their own levels of utility (Schooler, Ariely & Loewenstein, forthcoming). This interpretation is closely related to the literature reviewed in the preceding sections.

A second possible interpretation is that consumers do possess fundamental underlying preferences but lack sufficient information to resolve those preferences. Such an interpretation would imply that, with sufficient experience of different housing markets, consumers would eventually learn their true preferences and cease to be influenced by the historical prices they are exposed to. Charles Plott has posited the existence of such uncertainty in an attempt to reconcile systematic deviations from economic theory in individual choice experiments with convergence to predicted equilibriums in market experiments, Plott [1996]. His 'discovered preference hypothesis' suggests that people gain knowledge of their preferences with experience.

While both of these interpretations are consistent with our general theoretical perspective (and are equally well described by the model), the distinction is nevertheless interesting, and would have important ramifications for consumer behavior in domains in which consumers amass more experience than they typically do in the market for housing. Nevertheless, in this paper, we do not attempt to resolve which of these (or any other) interpretations of preference uncertainty is driving our results. In the next section we test the three main predictions from the model by examining housing choices made by people moving between cities.

IV. Empirical Analyses

We use data from the Panel Study of Income Dynamics (PSID) between 1983 and 1993 inclusive. In 1988 and 1989, however, PSID didn't collect information on amount of rent paid by survey respondents, so these years are excluded from the analysis.

We standardize time periods to t-1 for the year previous to moving and t for the year of the move.

Observations included meet all of the following conditions:

- The household head moved from one Metropolitan Statistical Area (MSA) to a different MSA during the previous year (this effectively excludes moves within a city and people moving from or to rural areas).[5]
- Reported household income is at least $10,000.
- The household head is 22 years old or older.[6]
- Reported values for rent or price of house are plausible.[7]

These criteria led to a data set with 905 observations.

- Table I here –

The distribution of homeowners and renters in both periods t and t-1 is reported in Table I, which shows that, out of the 905 movers, 644 rented their home in period t while the remaining 261 owned. A substantial proportion of owners become renters after moving (over 40% of them), while a smaller fraction of renters become owners immediately after moving. It is unclear whether renters who were owners prior to moving should be treated as renters or even included in the sample altogether. First, they are likely to have less familiarity with the price of rentals in their original location (which

[5] Although bigger MSA's may include more than one city, we will use the term MSA and city as interchangeable for the remaining of this paper.
[6] We excluded respondents in the 18-22 year old range because they are likely to receive substantial funding from their parents which is not appropriately capture by income variables.
[7] Extremely unlikely values were deleted assuming they didn't truly represent amount paid for rent or to purchase the home. Rents below $80/month or houses worth less than $20,000 were deleted.

forms the basis for their reference price). Second, many of them are probably renting while they search for a house to buy. These considerations suggest that dropping them from the sample should strengthen our key result, which is what we find and report later, in footnote 19.

Testing our prediction that housing costs in the origin-city will influence subsequent decisions requires a measure of the cost of housing in each city. It is not feasible to estimate these costs based on the PSID itself because most cities have fewer than three observations. Instead, we use the median city-level rent, and median price of purchased homes, provided by the 1990 Census. To estimate median rents for all other years, we adjust the 1990 Census figures by a deflator based on the HUD's Fair Market Rent index, which is available from 1983 on for each of the cities in the sample.[8] To estimate median housing purchase prices, we adjust the median purchase price from the 1990 Census by the index provided by the Office of Federal Housing Enterprise Oversight (OFHEO), also at the city level.[9]

Tables II and III present means and standard deviations of the key variables used in the analyses.[10] There are predictable differences in the demographics and income characteristics of owners and renters: owners have higher incomes, bigger families and more education. This highlights the importance of assessing the impact of a possible selection effect through the endogenous choice of either owning or renting (known as *tenure choice* in the housing literature) when estimating housing demand. To do this we jointly estimate housing demand and tenure choice.

- Tables II and III here-

The moves represented in the sample are geographically dispersed. There are 173 *cities of origin* and 178 different *destination cities* in the sample. The most common destination city accounted for only 40 moves (less than 5% of the sample), and these movers came from 26 different origin cities. Indeed, out of the 905 moves, 604 occur between a unique city pair (i.e. only one household moved between those two specific

[8] Available at http://www.huduser.org/datasets/fmr.html
[9] Available at http://www.ofheo.gov/house/
[10] All dollar amounts have been adjusted by inflation as measured by mid-year CPI index: All monetary amounts refer to US$ of June 2000.

cities). Such dispersion makes it unlikely that our findings are the result of idiosyncratic characteristic of people who move between one specific city and another – e.g., a "New York effect."

For different costs of housing in different cities to have measurable effects of the type we hypothesize, they must be of sufficient magnitude. A cumulative distribution of the difference between Median-Rent and Median-Price between city of origin and destination city is shown in figures IV and V. The average absolute value for the change in cost of rent between origin and destination city was $130 or 20% of the average median rent. Similarly, the average absolute difference in median house cost for owners was approximately $42,000 or an impressive 36% of the average home's median value.[11] In other words, if reference prices were equal to the market prices in the origin-city, the average mover will have an absolute disparity between P^*_t and P_t of 20% if she is a renter, and of 36% if she is a homeowner. (Note that these values refer to differences in median cost of housing at origin and destination cities, not to amount spent in housing for a given household before and after moving).

- Figures IV and V –

According to prediction 1, movers coming from more expensive cities should pay more for housing in their new cities. Table V presents a first, rough, look at this prediction. If previous prices affect current choices, we should observe households paying more than the median more often when they move from a more expensive city than otherwise. Indeed, 46% of renters paid more than the median if they came from a more expensive city, while 31% paid more than the median if they came from a cheaper one. Similarly, 66% of homeowners purchased a home that was more expensive than the median if they came from a more expensive city, while 52% did if they came from a cheaper city. Both differences are statistically significant.

- Table V here –

[11] Both averages are weighted by the number of observations in this sample

This analysis is, of course, only an intuitive first approximation, which does not control for other potential covariates such as income, education, family size, etc. To test Predictions 1a and 1b more rigorously, we estimate standard Housing demand equations for both renters and homeowners separately, and then add the key variable of interest as an additional explanatory variable: the cost of housing in the city of origin. The standard housing demand estimation regresses the log of the amount paid for housing (be it rent or purchase price) on a variety of demographic variables, price and income.[12]

We estimate Housing demand and tenure choice jointly using Heckman's [1979] two-step regression procedure which was designed to deal with the problem that people endogenously choose whether to be a renter or an owner, and hence we only observe price paid for renting by those individuals that chose to rent, and the purchase price of owners. This is the standard procedure in the housing literature see [Rosen 1979; Lee and Trost 1977; Rosenthal, Duca and Gabriel 1991; Wallace 1988; and Rapaport 1997 among others].

There is debate in the literature about whether demand for housing should be a function of current or permanent income. We used both in our estimation, but found that it had no significant impact on the estimates of key parameters.[13] We report the results using permanent income.

A. First Stage: To rent or not to rent:

In the first stage, presented in Table VI, Probit regressions are estimated for the choice of either renting or owning in the destination city. The first and second columns report the estimation results for the whole sample. In column 3 we estimate the tenure choice for a year following the move rather than immediately after the move.[14] This primarily takes care of those temporary renters who purchase a home within a year. In column 4 all observations corresponding to households who rented or owned for only one year are dropped.

[12] Because we are comparing rent in different cities, and expect current cost of housing to enter multiplicatively into the equation, we use a log transformation.
[13] As a proxy for permanent income, we use a four-year average of current income (current income+ next year's income+previous two years' income divided by 4).
[14] Due to sample restrictions, observations from 1993 are dropped.

The parameter estimates are quite similar across the specifications. Estimates conform to expectations: Higher income households are more likely to own, which has consistently been found previously. Rosen [1979] argues that this may indicate declining risk aversion or that owning a house is a normal good.

Previous owners are more likely to own after relocating. This term picks up unobservable differences that may lead to owning such as taste, higher mobility, etc. Age has the expected positive impact on the likelihood of owning.[15] The current relative cost of owning (with respect to renting)[16] has a negative coefficient, which is simply the law of demand (the cheaper owning gets, the more people want to own). College has a positive estimate, reflecting that higher human capital leads to higher likelihood of homeownership. Finally, bigger families are more likely to own.

Of greater interest for this paper, the own/rent cost ratio in the city of origin has the predicted positive impact on the decision of owning vs. renting today. Consistent with Prediction 2, the more expensive owning *was* (with respect to renting) in the city of origin, the more likely a household is to own in the destination city. The results are only significant, however, in columns 3 and 4, when we attempt to remedy the potential problems associated with owners renting while they search for an appropriate home to purchase.

B. Second Stage: Conditional on renting or owning: how much to spend?

In the second stage, we estimate housing demand using OLS, controlling for self-selection into renting and owning. As specified by Heckman [1979], we use the inverse of Mill's ratio from the first stage estimate as an extra control variable. We use Probit 2 to estimate this control variable. Using Probit 3 or 4 hardly affects the results.

The results for Owners are presented in table VII. The first and second columns present OLS results with no correction for selection effects. The first column excludes the main variable of interest – the cost of housing in the origin city – while the second column includes it. The third and fourth columns present 2-stage Heckman estimation

[15] Although the inclusion of a quadratic term for age would allow age to have a negative effect, it doesn't have a predicted negative effect until around 130 years, which is well beyond the sample (or population) range.

[16] Defined as (median price for homes/median rent).

results, where selection effects are controlled for, through the inclusion of the inverse of the Mills ratio arising from the first stage. Robust standard errors are in italics below the parameter estimates.

- Table VII here -

The estimated income elasticity, which varies between 0.49 and 0.54 depending on the specification, falls within the range of previous findings. All the other standard coefficients come out as they usually do in Housing demand studies. The coefficient for current price (Median Price DESTINATION) varies between 0.35 and 0.44[17]

The estimated impact of previous median cost of housing in the city of origin on current amount paid is, consistent with Prediction 1a, positive and significant at the 1% level. A mover from a city with housing costs one standard deviation higher, would spend $12,400 more in a new home (evaluating at sample means). [18]

The fact that homeowners are affected by previous prices is encouraging evidence compatible with our main hypothesis, but we should be cautious: Homeowners who moved from more expensive areas had, on average, more expensive homes and hence are likely to have greater access to mortgages, be wealthier and/or have a greater taste for housing. Also they may have had tax benefits on buying a more expensive home in period t.

We provide detailed analyses of such alternative explanations in the next section, but before we do that we will look at renters' behavior. The aforementioned potential explanations for the observed behavior of owners are, for the most part, inapplicable to renters. The parallel analysis of renters, therefore, provides a stronger test of the hypothesis that previous prices affect current choices by behaving as reference prices.

The results for renters, which are reported in Table VIII, are qualitatively similar to those reported for homeowners.

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[17] Because this estimation is in logs, this is equivalent to a 0.57-1=-0.43 "*price* elasticity of demand".

[18] The standard deviation of the median cost of housing is $49,950 (see table I), which corresponds to 42% of the median. Multiplying this by the elasticity of 0.21 leads to an expected difference of 8.9%. In turn, 8.9% of the average house purchased, $140,000 is approximately $12,400. It is interesting to note that the average absolute change in cost of housing between the two cities a household moved between is very similar to the standard deviation.

- TableVIII here -

Of primary interest to this paper, the impact of previous costs is, as it was for homeowners, a significant predictor of renter's behavior. Renters have a 'cost of housing in origin city' elasticity of approximately 0.21, which is incidentally almost identical to that of homeowners. The impact of previous prices is significant at the 1% level.[19] The impact of a difference of one standard deviation in median rent in the city of origin is (according to calculations analogous to those conducted for homeowners) approximately $270 per year.

In summary, we conduct both standard OLS and 2-step joint estimation of housing demand with tenure choice. The results for the standard variables such as price and income fall within the range of previous studies. Compatible with Predictions 1a and 1b, previous cost of housing significantly and substantially influences what households decide to spend on housing.

C. Readjusting Consumption. (Testing Prediction 3).

According to Prediction 3, people should readjust housing expenditure in the opposite direction to the difference in housing costs from the previous to the current market. The intuition behind this is the following: If, as claimed, people are making decisions based on reference prices which differ from current prices, then, as these reference prices are updated, their optimal consumption levels should be as well. This is a critical prediction. Most alternative explanations for the findings from the previous sections assume that movers from expensive cities are different in some unobservable way from those from less expensive one. If they are stably different, however, we should not be able to predict how they re-adjust consumption once they have moved into the city.

[19] As mentioned earlier, it is unclear what prices current renters who were owners in t-1 would use as reference prices (p*). If the analysis is limited to those who were renters in both periods (n=516), the estimated elasticity of previous cost of renting is increased to 0.26,which is also significant at the 1% level.

To test Prediction 3 we focus on renters in period t+1 who moved *within* the same city during that period.[20] (We include both those that came from other cities in t-1 and those that didn't). We run a regression in which the change in rent paid between periods t+1 and t is the dependent variable, and the change in family size and income are the independent variables. For those who lived in a different city in period t-1, we add another control variable: the difference in cost of housing between their city in t-1 and in t.

We estimate:

$$(1)\ \Delta Rent_{t+1} = \alpha_0 + \alpha_1 (\Delta Income_{t+1}) + \alpha_2 (\Delta adults_{t+1}) + \alpha_3(\Delta children_{t+1}) + \alpha_4\ Dummy\ x\ (P^*_t - P_t) + \alpha_5\ Dummy + \varepsilon,$$

where:

Δ_{t+1} is the change between period t+1 and t for the respective variables

Dummy = 1 If household moved between different cities between t-1 and t.

0 otherwise.

P^*_t : Reference price in period t, (i.e. median cost of housing in t-1).

P_t : Median cost of housing in city where household lives in t..

Prediction 3 implies $\alpha_4<0$.[21] Because this is a regression in differences, individual fixed effects such as wealth or taste, disappear.

The results of this estimation, both for absolute and percentage changes, are reported in table IX. The OLS estimations are run both for all movers (columns 1 and 3) and for only those who came from a different city on the previous year (columns 2 and 4).

- Table IX here -

[20] Too few homeowners move again in a short period of time, so we don't test Prediction 3 for homeowners.

[21] If people who moved from expensive cities originally over-pay, if the subsequently adjust, they should do so downwards. This leads to the negative coefficient.

As expected, both change in income and in family size have a positive impact on the change in rent. More importantly, the estimate of α_4 is negative and significant as predicted, both when the changes are defined in absolute terms and in % terms. This provides support for Prediction 3.

The results just reported are consistent with all of our predictions: Movers are more likely to purchase in the city they move to, the higher was the own/rent cost ratio in the city they lived in prior to moving. Conditional on being a renter or an owner, movers spend more on housing if they come from more expensive cities, and subsequent to their move they readjust consumption in the opposite direction. Our interpretation of these results is that households use previous market prices as reference and make decisions accordingly.

D. Alternative Explanations

A useful way to sort the array of different alternatives explanations is through their impact on the assumptions underlying the basic regression analysis just presented.

The regressions run in the previous sections took the general form:

(2) $\ln(\$ \text{ housing})_{i,t}=X_{i,t}\beta_1 + \beta_2 P_t + \beta_3 P_t^* + \varepsilon_{i,t}$

Where:

$X_{i,t}$ are demographic characteristics of household i in period t

P_t is the median rent for renters, and median price of houses sold for owners in the city where they reside in t

P^*_t is the imputed reference price, equal to the median price or rent, in the city where household i lived in period t-1.

We now discuss what we consider the most plausible alternative explanations, using equation (2) as a framework:

D.1 Possible correlation of $\varepsilon_{i,t,}$ with P^*_t:

The estimation of (2) assumes that P^*_t is not correlated with $\varepsilon_{i,t}$. This assumption could be violated if some omitted variables correlate with P^*_t, either directly or through

other independent variables. The most obvious omitted variables that might lead to such problem are wealth and taste for housing. It seems reasonable to at least entertain the possibility that people's wealth or taste for housing varies systematically across cities of origin. We will evaluate each of these possibilities separately.

A third way in which the error term could be correlated with P* is through the impact of capital gains taxation. Capital gains arising from housing appreciation were exempt (until 1998) from taxes if another home was purchased with a price that exceeded that of the previous one within two years. Such a tax structure leads to a kinked budget constrain which *could* result in a violation of the previously mentioned identifying assumption. This could happen because the location of such a kink for an individual depends on the cost of their home in the previous city, which is likely to be correlated with the median cost of housing in that city. Households coming from an expensive market had, on average, more expensive homes and therefore the kink in their budget constrain will be higher which could induce them to purchase a more expensive home so as to avoid paying the capital gains tax.

Unobserved wealth

The ideal way to determine the effect of wealth in housing demand would be to include it as a control in the regression analysis. However, the PSID collects information on wealth -- investments in stocks, net-savings, automobiles, real-estate and business ownership – only every 5 years, making it difficult to add wealth as a control variable in our previous analyses. To test whether wealth is in fact related to the prices of housing in the city where households live, therefore, we ran a regression for data from 1989 with the median cost of housing in the city where the household lives as the dependent variable, and household's wealth, income, age, age squared and schooling as independent variables (the latter 3 are included as proxies for human capital). If wealthier households do decide to live in more expensive cities, then we should observe a positive and significant effect of wealth on the cost of housing in the city where households live. The resulting estimates, however, don't reject the null that wealth has no impact on the cost of housing of the city a household chooses to live (p-value=0.67). Income, age and education, on the

other hand, are significant predictors (each at the 5% level).[22] Income and education have a positive impact on the cost of housing.

Although this result is encouraging, the estimate of wealth used in this analysis is imperfect. There remains a portion of wealth that is unobserved, including, most importantly, expected future wealth. However, the fact that observable wealth is non-predictive of the cost of housing in the city where a household lives greatly reduces the likelihood that the key findings in the previous section are caused by 'omitted wealth bias'. In addition, wealth as an omitted variable is unable to explain the findings that are consistent with prediction 3. Why should wealthier households systematically revise downwards their housing consumption decisions after moving? Finally, we should expect the impact of wealth on renters to be much smaller than on owners, the impact of previous cost of housing for the two groups of movers is, however, of similar magnitude.

Taste for Housing

Tastes are difficult to measure, so the analysis of the potential impact of tastes must necessarily be more indirect than that of wealth. Economic theory doesn't provide unambiguous predictions about whether cities that have more expensive housing will have households who like housing more, less, or the same, than in other cities. On the one hand, people with high taste for housing could endogenously choose to live in cheaper cities in order to consume more housing, generating a negative correlation between taste and P^*. This would create a bias towards zero in β_3. On the other hand, cities could be more expensive *because* people that live in them have higher taste for housing. In this case the relationship between taste and P^*_t would be positive and β_3 would be biased away from zero.

Using data from the American Housing Survey of 1989, we estimated the relationship between 'quality of housing' and cost of housing by city. This relationship was reliably negative. More expensive cities have smaller homes and fewer bedrooms per home (which seem to be valid proxies for housing quality).

[22] These results are for a linear estimation. A log-log regression (adding $20,000 to each household's wealth so that households with negative wealth are included in the estimation) results in a *negative* and significant impact of wealth. Permanent income and education maintain their positive estimates.

It is worth pointing out that what has been referred all along as housing price, actually consists of total expenditure. Homes can be thought of as being composed of standardized units of housing Q, which have a unitary price P. The rent or 'price' of a house is hence product of these two: P*Q. It is possible that the variation in P*Q across cities is driven by different Q's, not P's. In other words, cities with higher P*Q may not be 'more expensive' but simply have higher average quality of housing, and hence higher total cost of it too. The fact that the relationship between Q*P and Q is negative (as reported in the previous paragraph), however, eliminates this possibility.[23]

Price and quality are, of course, the result of the interaction of city-level supply and demand. To properly assess taste differences, these would need to be estimated for every city, which is prohibitive. Instead, indirect evidence sheds light on this issue. If movers from expensive cities had higher (stable) taste for housing, and not higher preference *induced* by higher reference prices, then they should systematically continue to pay higher amounts on housing as they stay in their new location. The evidence found earlier supporting prediction 3 indicates this is not the case. Systematic variation in taste is an unlikely confound behind our results.

Capital Gains

Until 1998, capital gains arising from real estate appreciation were taxable.[24] Such tax was not paid, however, if another residence of higher value was purchased within two years. [25] The impact of previous capital gains is typically ignored in housing demand estimations because most people tend to buy homes that are more expensive than their previous residences, regardless of the tax regime they face, rendering the kinked segment of the budget constraint irrelevant.[26] In our case, however, this could potentially be a problem since movers from more expensive cities owned, on average, more expensive homes and hence face different budget constraints from those movers from cheaper locations, contrary to the identifying assumption in our model that all movers into any given city face the same relative prices.

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[23] We thank Bill Vogt for pointing out this potential problem.
[24] Since 1998 such gains are not taxable if the property is used as a residence by the taxpayer.
[25] US Income tax Title 26.A.Chapter 1, subchapter 0. Part III, Sec 1034 (http://www.fourmilab.ch/ustax/www/t26-A-1-O-1034.html)
[26] Although see Zheng Yan [1999], William Hoyt and Stuart Rosenthal [1990], and Hoyt and Rosenthal [1992] for detailed analyses of the impact of capital gains taxation on housing demand.

Although we don't incorporate capital gains in our previous analysis, we believe such omission is not driving the results, for the following reasons:

a. Movers who were renters before moving, and became homeowners in their destination city, faced no tax incentive to 'overspend' in housing. If capital gains are driving our results, limiting our analysis to this sub-group should make the impact of previous cost of housing at the city level disappear. To the contrary we find similar results for this sub-group. There are 84 households that rented prior to moving and later decided to own. Estimating equation (2) for them results in an estimated elasticity of previous costs of housing of η=0.19 with a t-value=1.75

b. The proportion of movers buying homes that are more expensive than their previous residences is actually higher for those coming from cheaper locations than for those coming from more expensive ones (51% vs. 40%).[27]

c. In the presence of a kinked budget constrain, a cluster along a kink *may* be a good indicator of how much of an impact the kink is having [Moffit 1990]. The proportion of households locating at the kink is minimal (around 16% of the sample) and not significantly different for those coming from more expensive cities (p-value>0.7).[28] Excluding those movers who located in the kink leaves the results almost unchanged.

d. Capital gains taxation does not apply to renters, yet they show the same pattern as homeowners.

D.2 Endogeneity of P_t

Another identifying assumption is that the cost of housing in the *destination* city is exogenous, i.e. people do not choose where to move to, *based* on housing costs. A-priori it is hard to establish the consequences of the potential violation of this assumption. The most intuitive selection process would consist of those willing to pay more for

[27] This is probably caused by the fact that movers coming from cheaper cities had cheaper homes to begin with and hence are more likely to buy a more expensive home in their destination city.
[28] We define a household as consuming at the kink if the current value of their home is inside a +-3% interval of their previous home.

housing locating in more expensive destination cities than those with lower willingness to pay. This would primarily bias the estimate of the current price coefficient towards zero (β_2).

To the extent that P* is correlated with P_t, β_3 would also be biased. The correlation between P* and P_t is positive (around 0.2) hence β_3 would be biased *towards* zero, which means that our tests are conservative. Nevertheless, to test whether people are endogenously choosing where to move, we attempt to predict, based on observables, whether people move to locations that are cheaper or more expensive that their origin-city.

We use two additional predictors, which consist of dummy variables for those households explicitly stating they were moving in search of a cheaper/smaller home, and for those looking to move to a bigger/more expensive home.[29] Two different regressions are run:

A probit for either choosing more expensive (Y=1) or cheaper (Y=0) city to move to, and

An OLS regression where the dependent variable is the change in housing costs between the two cities that a household moves between.

The explanatory variables are change in income, change in family size, and the two dummies.

In the Probit regression, none of the variables individually are significant predictors at the 10% level. Furthermore a Chi-square test that all parameters are 0 doesn't reject the null (p-value = 0.49). Similarly, in the OLS regression none of the independent variables is significant. An F-test of all parameters being zero has a p-value of 0.69.

In summary, although the selection problem mentioned above may exist, there is no evidence that it does. Even if it did, we would expect it to bias β_4 towards zero. Endogeneity of destination is an unlikely alternative explanation for the findings reported above.

[29] These are not exhaustive options. Other possible answers were: involuntary move, work related, mixed reasons, etc. Only 46 households mentioned they were moving with the explicit purpose of readjusting housing consumption. This is not surprising, since there is no need to move to a different city to pursuit such objective.

D.3 Imperfect Information

If households don't know that cities differ in cost of housing, then the results from this paper could potentially be compatible with a stable preference model in which households have imperfect information.

This alternative explanation, however, has several weaknesses:

1. Cost of Information: If households search for information optimally, they should do so until the expected payoff of the information is equal to its cost. Information about housing costs is very cheap -- arguably almost unavoidably acquired by movers. When looking for a new home, people must get information about what is being offered (looking up classifieds in the paper, driving around town, stopping by a realtors office, etc). Such information gathering process should be useful in coming up with an estimate of the difference in cost of housing between current and previous location of residence, or at least recognition that housing costs are different. Indeed, it would be difficult for a mover to search for a home *without* acquiring information about local housing costs. The expected average impact of fixating on previous prices was estimated at around $12,400 for homeowner's.[30] It is unlikely that search costs would be even close to this figure. Therefore, if a household over or under-consumes housing due to imperfect information, the household is most likely not engaging in optimal information search.

2. Even if households had imperfect information, additional auxiliary assumption would be needed to *explain* the observed patterns. If households are not choosing their optimal home due to not knowing about its existence, it does not follow that those coming from expensive markets will *spend* more than those coming from cheaper markets. Even assuming that the search costs were higher for those from expensive cities (due to higher cost of staying there longer for instance) this would predict that movers from expensive cities will choose homes which *differ* by more (in

[30] The net loss is most likely smaller that the impact itself. Buying a home that is $10,000 too expensive is not nearly as bad as loosing $10,000 in cash.

terms of *all* attributes) from the optimal, but this would not lead them to purchase more expensive homes, since price is only one of the multiple attributes that are valued. Higher search costs lead to systematically higher prices only in the presence of a uniform quality good, which is hardly the case of the housing market. In the case of housing, a shorter search should lead to a less optimal housing bundle, which can be too cheap (if the household would be willing to pay a higher price for more quality) or too expensive (if the household would be willing to reduce housing quality in exchange of a lower price).

3. Finally, an imperfect information approach is incapable of explaining the experimental results based on which this study was motivated. In such experiments subjects are given complete information yet behave in ways very much compatibles with both the model and the results of this paper. We consider the imperfect information explanation, therefore, to be incomplete and ad-hoc.

An interpretation of our results which is related to that of imperfect information involves mental accounting [Thaler 1999]. According to mental accounting, people manage money in their minds in non-fully fungible ways (e.g. some money is mentally separated to be used for consumption while other funds are mentally assigned to housing expenditures). If these accounts were static, (i.e. if people have a "housing budget" which they fail to revise after moving) we would observe people continuing to spend in their new cities what they are 'used' to spending, and hence those coming from more expensive ones would spend more. We test for this pattern by running a regression in which the price paid for housing in the city of origin is included as an explanatory variable. If people have static budgets, they should continue to spend a very similar amount to what they spent in the previous period. We estimated such a regression under a variety of different specifications ($ amount with and without covariates, % of income with and without covariates and in logs with and without covariates). In every case the estimated parameter corresponding to the price paid in the previous period was significantly different from 1. This doesn't rule out that people use mental accounts for housing, but it does rule out a simple static budget as an explanation for the observed phenomenon.

D.4 Summary of the alternative explanations discussion.

As with any empirical study, there are scenarios under which the identifying assumptions used in the analysis would not hold. The most plausible ones, however, do not seem to pose a serious threat to the validity of analyses. The fact that Prediction 3 is supported by the data is a particular difficult hurdle for any alternative explanation. If somehow the observed behavior of spending more on housing on the part of those moving from expensive cities is optimal, then we should not be able to predict future decisions of such households, based on –now irrelevant- information which was available to them at the time of such decision. This, however, is precisely what the findings congruent with Prediction 3 indicate.

V. Discussion and Conclusion

As predicted, movers coming from markets that had higher prices for housing behaved as if their preferences were affected by such prices. They also behave *as if* their preferences were updated once current prices become internalized, through subsequent readjustments in their spending in housing. With just minor modifications to the standard consumer choice model -- arguably as minor as those needed to apply general models to any specific situation -- novel predictions arise, in line with experimental findings and psychological theories. The support we obtain for these predictions bolsters earlier demonstrations of constructed preferences by showing that they apply to economically significant behavior in which people have a powerful incentive to behave in an optimal fashion.

A. Implications for the measurement of preferences

Our findings have significant implications for empirical investigations of preferences. Applied economists from various fields use observed consumer behavior to infer preferences in an array of different settings such as wage differentials in labor economics, hedonic prices in housing economics and travel costs in environmental economics among many others. The validity of such studies relies on the assumption that

the preferences that are revealed for the goods and services the researchers are studying exist and are stable. If as the results from this paper suggest, preferences are affected by arbitrary cues, future empirical work should strive to identify such cues and include them in the analysis, particularly if they are likely to be affected by the very policy under review.

We illustrate this last point by carrying out a hypothetical evaluation of the impact of a 10% subsidy using the estimates from our housing demand estimation with and without the inclusion of reference prices as an explanatory variable. We will use our results for the renters' housing demand reported in table VIII columns three and four:

Column three corresponds to a housing demand estimation that does not recognize the possibility that preferences are shaped, at least partially, by reference prices (standard housing demand). According to this estimation the price elasticity of demand is –0.45. [31] A 10% subsidy, therefore, would lead to a 4.5% increase in housing demand. Taking account of the fact that people use reference prices affects the prediction in two ways:

1. When the reference price is included in the estimation equation (in table VIII, column 4), the estimated elasticity is slightly changed to –0.49
2. As reference prices gradually adapt to the lower market prices (as our models suggests), we should observe an impact on demand in the opposite direction of the subsidy. The reference-price elasticity was estimated at 0.21, hence a drop of 10% of p* has a negative impact on demand equivalent to -10%*0.21 = - 2.1%. The net impact of the subsidy would therefore be of 4.9%-2.1% just a 2.8% increase. As people 'get used' to the lower price and adjust their preferences accordingly, the subsidy has a considerably smaller impact.

Of course this analysis is simplified by, among other factors, leaving out market interactions. It is nevertheless illustrative of how policy studies may be modified to take into account the proposed endogeneity of preferences.

[31] Again, price elasticity of demand is simply the expenditure elasticity –1. We find more illustrative to carry out this hypothetical example with quantity instead of expenditure as the dependent variable.

B. Final comments

This study is, to our knowledge, the first to systematically test for the effect of constructed preferences in an important domain of economic behavior. More studies are needed to analyze how widespread this phenomenon is.[32] It is possible, for example, that housing is especially prone to constructed preference effects due to the dearth of feedback that people get on their decisions. Most people only purchase or rent a small number of houses or apartments over the course of their lives, and rarely change houses or apartments more than once a year. It would be interesting to test for similar effects in markets in which consumers engage in repeated transactions.

Other special features of housing are that it is extremely lumpy, and relatively unique. For both of these reasons, the satisfactions derived from housing are difficult to compare with those that could be obtained from alternative uses of the money. For example, imagine trying to assess whether one derives more pleasure from an extra bedroom or from 5 restaurant dinners each month. Even this comparison is much easier than those that really needed to be made, since one should really compare the benefit of the extra bedroom to the benefit derived from the best possible alternative allocation of the money, which would likely consist of a diverse bundle of goods and services distributed over time.

On the other hand, housing has many properties that weigh against finding evidence of constructed preferences. Housing is a good that is traded competitive markets, experienced daily throughout people's life, and is of sufficient magnitude to provide strong incentives for people to make the decision carefully. It is natural to expect that preferences over less tangible and seldom, if ever, directly dealt with 'goods,' such as clean air, human capital, diseases, the value of time and even time discounting, would be at least as unstable and susceptible to arbitrary cues.

A curious feature of housing, when it comes to the results reported here, is that information about housing prices in different areas is, in fact, widely known. Most people know that housing prices in New York and Silicon Valley are high and that housing in Indiana is cheap. Despite this knowledge, people seem to be especially

[32] One such attempt is already underway by one of us. Simonsohn [2002] looks at constructed preferences for commuting decisions and finds effects very much in line with those reported here.

affected by their own personal experience in a particular city. A similar effect of personal experience has been observed in the insurance literature, in which insurance purchases, including floods and earthquakes, which are widely publicized, appear to be especially sensitive to an individual's personal experiences and those of immediate family members [Browne and Hoyt 2000].

If further studies replicate our findings and generalize them to other domains, the consequences could be important for economics. If consumer behavior can be affected by arbitrary cues, then the interpretation we give to consumer sovereignty, welfare and even the very concept of utility seems to be in need of re-examination.

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Table I

Distribution of Owners vs. Renters

	Owner (t-1)	**Renter (t-1)**	Total t-1
Owner (t)	177	84	***261***
Renter (t)	128	516	***644***
Total in (t)	***305***	***600***	**905**

Table II

Descriptive Statistics for Renters in Destination City

Variable	**Age**	**Household Income**	**Adults p/ Household**	**Children p/ Household**	**Rental Cost**	**Black**	**College**
Mean	33.2	$42,450	1.54	0.73	$512	22%	65%
Standard Deviation	*11*	*$28,650*	*0.49*	*1.06*	*$315*		

Descriptive Statistics for Owners in Destination City

Variable	**Age**	**Household Income**	**Adults p/ Household**	**Children p/ Household**	**Value of home**	**Black**	**College**
Mean	38.7	$68,189	1.68	0.81	$139,706	8%	75%
Standard Deviation	*14*	*$55,482*	*0.46*	*1.04*	*$76,297*		

Table IV

Origin / Destination Matrix by Region of the Country

		Origin					
		North-East	**Central**	**South**	**West**	**Total**	**Total**
Destination	**North-East**	57.6%	11.8%	24.7%	5.9%	100.0%	85
	Central	3.8%	62.4%	21.7%	12.1%	100.0%	157
	South	12.6%	15.1%	60.9%	11.5%	100.0%	358
	West	3.5%	13.8%	11.8%	70.9%	100.0%	289
							889

Note: 16 moves occurred to/from other regions (Hawai, Alaska or Puerto Rico).

Table V
Proportion of Households paying More and Less
than destination City's Median

RENTERS

	Origin was Cheaper	**Origin was More Expensive**
Pays More	31%	46%
Pays Less	69%	54%
	n=340	*n=304*

Chi-Square=15.7
p-value=<0.01

OWNERS

	Origin was Cheaper	**Origin was more Expensive**
Pays More	52%	66%
Pays Less	48%	34%
	n=106	*n=155*

Chi-Square=5.08
p-value<0.05

Table VI
Probit Regression. Y=1 if Owner, 0 if Renter

Variable	Probit 1	Probit 2	Probit 3	Probit 4
Intercept	**-5.323**	**-5.906**	**-6.611**	**-8.290**
	1.786	1.786	*1.786*	*2.295*
Log Permanent Income	**0.557**	**0.545**	**0.746**	**0.828**
	0.110	0.110	*0.105*	*0.147*
Owner in t-1	**0.922**	**0.943**	**0.492**	**0.798**
	0.1117	0.1117	*0.117*	*0.141*
age	**0.069**	**0.068**	**0.061**	**0.095**
	0.022	0.022	*0.024*	*0.027*
(age2)/100	**-0.046**	**-0.045**	**-0.0410**	**-0.0670**
	0.023	0.023	*-0.024*	*0.029*
college	**0.1036**	**0.1073**	**0.149**	**0.115**
	0.1212	0.1212	*0.124*	*0.152*
Adult	**0.318**	**0.321**	**0.222**	**0.515**
	0.147	0.147	*0.162*	*0.200*
Child	**0.100**	**0.099**	**0.097**	**0.137**
	0.053	0.053	*0.056*	*0.067*
Female Head	**-0.026**	**-0.033**	**0.070**	**0.180**
	0.178	0.178	*0.191*	*0.235*
Black	**-0.328**	**-0.320**	**-0.518**	**-0.490**
	0.165	0.165	*0.169*	*0.201*
log(Buy/Rent Cost in t)	**-0.602**	**-0.675**	**-1.321**	**-1.250**
	0.250	0.250	*0.264*	*0.320*
log(Buy/Rent Cost in t-1)	**--**	**0.218**	**0.640**	**0.454**
	--	*0.209*	*0.212*	*0.256*
N=	*905*	*905*	*797*	*680*
-2 Log Likelihood	**774**	**772**	**732**	**503**
Pseudo-R Square	***28.81%***	***28.98%***	***27.67%***	***37.52%***

Note: Standard errors below parameter estimates

Column 3 drops year 1993 since there is no data for 1994

Table VII
Results for Owners. Y=log(Price of Home)

Variable	OLS 1	OLS 2	2-stage 1	2-stage 2
Intercept	**-0.208**	**-1.589**	**0.136**	**-1.107**
	1.257	*1.319*	*1.334*	*1.380*
Log(Perm.Income)	**0.545**	**0.535**	**0.519**	**0.493**
	0.058	*0.065*	*0.069*	0.069
# of Children	**0.028**	**0.065**	**0.062**	**0.053**
	0.071	*0.025*	*0.014*	0.014
# of Adults	**0.121**	**0.123**	**0.104**	**0.096**
	0.094	*0.113*	*0.000*	0.000
Age of Head	**0.028**	**0.027**	**0.024**	**0.021**
	0.013	*0.018*	*0.070*	0.069
(Age Squared)/100	**-0.025**	**-0.025**	**-0.020**	**-0.020**
	0.013	*0.019*	*0.096*	0.095
College	**0.069**	**0.065**	**0.025**	**0.032**
	0.029	*0.068*	*0.030*	0.030
Female	**0.327**	**0.314**	**0.331**	**0.319**
	0.123	*0.139*	*0.121*	0.120
Black	**-0.058**	**-0.045**	**-0.036**	**-0.009**
	0.111	*0.158*	*0.114*	0.113
log(Median Price DESTINATION)	**0.425**	**0.347**	**0.438**	**0.363**
	0.094	*0.104*	*0.094*	0.096
log(Median Price ORIGIN)	--	**0.207**		**0.219**
	--	*0.071*	--	0.073
Selection Bias (1/Mill's Ratio)	--	--	**-0.066**	**-0.011**
	--	--	*0.097*	*0.097*
Adjusted R.Sq.	**39.8%**	**41.5%**	**39.7%**	**41.5%**

n=261 All Models
note: Robust standard errors below parameter estimates.

Table VIII
Results for Renters. Y=log(Rent)

Variable	OLS 1	OLS 2	2-stage 1	2-stage 2
Intercept	**-0.491**	**-1.527**	**-0.343**	**-1.369**
	0.607	*0.703*	*0.590*	*0.695*
Log(Income)	**0.274**	**0.273**	**0.251**	**0.250**
	0.028	*0.028*	0.008	*0.008*
# of Children	**0.052**	**0.052**	**0.047**	**0.048**
	0.017	*0.017*	0.000	0.000
# of Adults	**0.133**	**0.135**	**0.122**	**0.124**
	0.044	*0.043*	0.035	0.035
Age of Head	**0.008**	**0.006**	**0.005**	**0.003**
	0.007	*0.007*	0.042	0.041
Age Squared/100	**-0.006**	**-0.004**	**-0.0038**	**-0.0024**
	0.007	*0.008*	0.0081	0.0076
College	**0.113**	**0.115**	**0.104**	**0.106**
	0.035	*0.035*	0.045	0.045
Female	**0.026**	**0.022**	**0.034**	**0.030**
	0.047	*0.047*	0.041	0.040
Black	**-0.109**	**-0.107**	**-0.087**	**-0.086**
	0.043	*0.043*	0.031	0.031
log(Median Rent Destination)	**0.529**	**0.486**	**0.552**	**0.509**
	0.083	*0.086*	0.079	0.080
log(Median Rent Origin)	**--**	**0.211**	**--**	**0.208**
	--	*0.078*	**--**	0.076
Selection Bias (1/Mill's Ratio)	**--**	**--**	**0.146**	**0.143**
	--	**--**	*0.069*	0.068
Adjusted R.Sq.	**29.6%**	**30.3%**	**30.0%**	**30.7%**

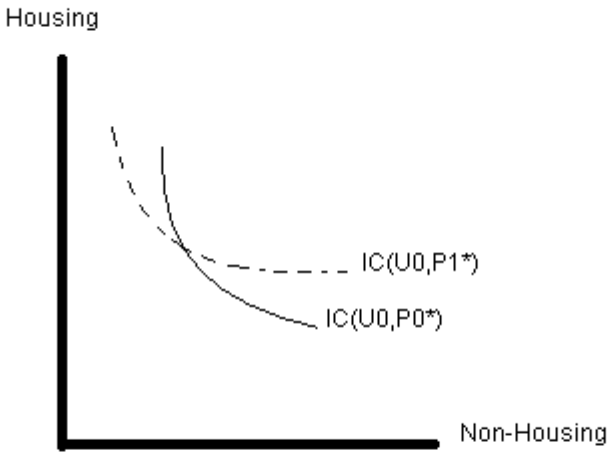
n=644 All Models
note: Robust standard errors below parameter estimates.

Table IX
Adjustment of Rent in t+1. Y=Rent(t+1)-Rent(t)

Variable	Absolute 1	Absolute 2	Percentage 1	Percentage 2
Intercept	**10.674**	**58.394**	**0.023**	**0.086**
	7.397	24.886	0.016	0.038
Change in Adults	**57.950**	**193.954**	**0.137**	**0.336**
	20.855	88.556	0.045	0.137
Change in Children	**40.780**	**119.140**	**0.080**	**0.152**
	11.438	67.590	0.025	0.101
Change in Income	**0.001**	**0.002**	**0.334**	**0.612**
	0.001	0.002	0.143	0.332
Dummy	**49.090**	**--**	**0.064**	**--**
	21.062	**--**	**0.045**	**--**
Dummy x (P(t) - P*(t))	**-0.506**	**-0.593**	**-1.465**	**-1.705**
	0.112	0.153	0.602	0.588
Adj.R sqr.	***5.53%***	***14.57%***	***3.82%***	***14.81%***
N	946	119	946	119

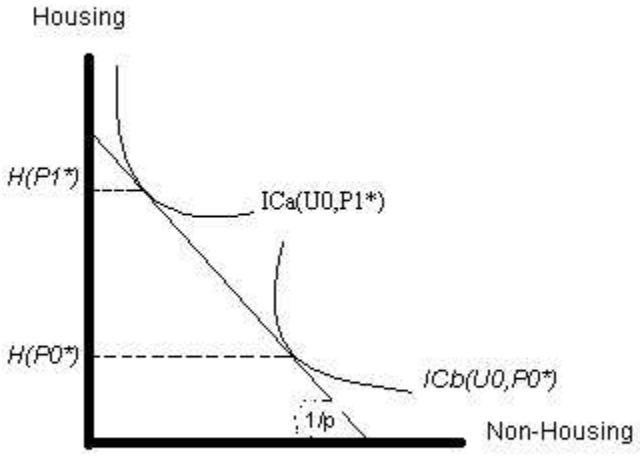
Robust standard errors below parameters

Figure I



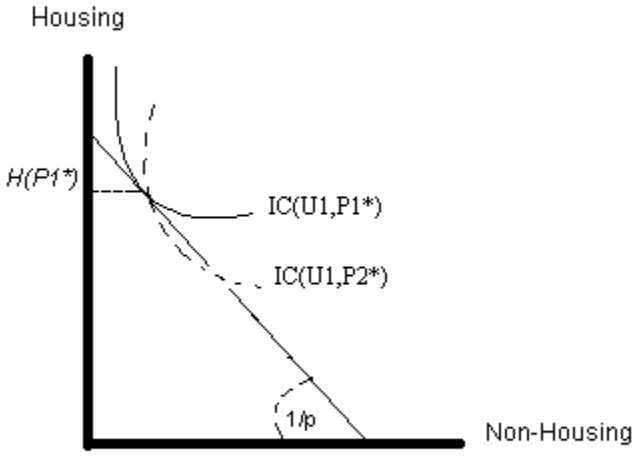
Identical consumers with different relative reference prices (P1*>P0*) have different preferences.

Figure II



Consumer A with reference price P1*>P0*, chooses a higher level of housing consumption that consumer: H(P1*)>H(P0*).

Figure III



As reference prices adjust from P1* to P2* (with P1*>P2*>P), indifference curves shifts towards a lower 'taste' for housing.

Figure IV. Distibution of differences in city-level redian rental costs between origin and destination city

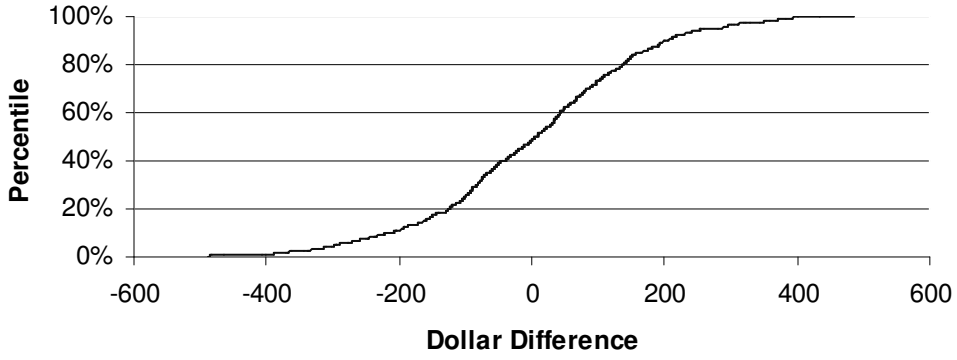


FIgure V Distribution of differences in city-level median price of purchased homes between origin and destination city