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Abstract

This paper examines how household social interaction affects housing and location demand in urban settings. The extended Alonso-Muth urban household model shows that the effects on density and location hinge upon the demand relationship between social activities and housing consumption. Stronger tastes for social activities outside the home lead to lower housing demand and decrease demanded distance from the CBD. Stronger tastes for socializing at home have the opposite effects on housing and location demands. The empirical analysis of interaction survey data yields results consistent with the theoretical framework.

1 Introduction

The production of goods requires physical proximity of inputs in space. This simple fact motivates much of urban economics focusing on how the requirements of proximity drive urban form when one key productive input, land, is distinctly spatial. Simply put, economic interaction (production) shapes and influences land use and the built environment that we characterize as urban space. At the same time, urban planners have long argued that the form of the built environment shapes and influences social interaction (Jacobs 1961). Urban economists have also paid attention to how the urban space influences some aspects of social interaction, especially job search (Kain 1968, Zenou 2011). Urban economists, however, have only recently begun turning their attention to rigorously investigating the interplay of urban space and social interaction in a broader sense. As examples, Glaeser and Gottlieb (2006) discuss how the reduction in crime and a greater demand for interaction fueled a resurgence in urban growth while Helsely and Zenou (2011) describe the effects of social networks and their central players on the location choice of the players involved.

At a fundamental level, though, the question still remains: How does social interaction shape urban space? This paper integrates a simple model of social interaction into urban consumer theory in order to address this question. It adopts the view of social interaction as an agglomeration effect, the outcome of households living in close proximity (e.g., Brueckner and Largey 2008, Caruso et al. 2007). Taking this notion that urban space influences interaction as a starting point, this paper introduces social interaction into the Muth (1969) urban consumer model as a utility generating activity that is itself influenced by the household's consumption and location behavior. This approach reveals how embedding urban households in spatial environments with social interaction affects their demands for location and housing consumption.

The model provides useful insights. Social interaction is not only shaped by urban space, as in the urban planning view, it also shapes urban space. What is new here, is how it shapes urban space. The effects of social interaction on household location and housing consumption are driven by the demand relationship between housing and social interaction. Using the taxonomy of public interaction (social interaction outside private homes) and private interaction (social interaction inside private homes), each type of social interaction has a different but predictable effect on household location and housing demands. In the monocentric environment, public social interaction increases the household's demand for proximity to the city center and decreases its demand for housing. Introducing possible private social interaction into the environment tends to increase the household's commute and housing demand.

The empirical analysis of the relationships between housing, location, and social interaction relies on data from the Social Capital Community Benchmark Survey conducted in 2000. The relationships identified by the theory are tested at the census tract level. Separating the reported social interaction activities into separate public and private categories, both the OLS and IV estimates are consistent with the theoretical results.

The discussion proceeds as follows. Section 2 presents the theoretical model, incorporating different types of social interaction into the canonical Alonso-Muth partial equilibrium consumer framework to examine the implications for the relationships between housing demand, location choice, and social interaction. Sections 3 and 4 describe the data and empirically test the predictions of the social interaction model, respectively. Section 5 concludes.

2 Social Interaction and Household Behavior

We begin by extending the partial equilibrium Alonso-Muth urban household model (Alonso 1964, Muth 1969) to study the link between social interaction, location and housing demand. It turns out to be useful to begin by introducing social interaction as an exogenously determined variable in the location demand model in order to derive key relationships essential to interpreting the implications of endogenous social interaction. Our approach follows that adopted by Turnbull (1995), particularly the graphical constructs. The basic framework is from Muth (1969), DeSalvo (1977) and others (see Turnbull (1995) for details). The model considers an individual household in a monocentric urban area situated on a featureless plane, maximizing utility by choosing housing, nonhousing consumption, and distance from work in the Central Business District (CBD) subject to the spatial budget constraint that spending on housing and other consumption plus commuting exhausts its budget. We also assume household utility is a function of social interaction.

2.1 Exogenous social interaction

More formally, household utility $U(x, y, z)$ is a function of housing consumption, x, non-housing consumption, y, and social interaction, z, with the standard neoclassical properties (increasing strictly quasiconcave in its arguments so that it exhibits a diminishing marginal rate of substitution between housing and non-housing consumption). The distance of the residence from the CBD is k. The housing price is a function of distance, $P(k)$, where $P_k < 0$ and $P_{kk} > 0$ follow immediately as a consequence of location equilibrium, as in the standard model (Turnbull, 1995). Household income is I and commuting costs $T(k, I)$, where $T_k > 0$, $0 < T_I < 1$, $T_{kk} \leq 0$ and $T_{kI} \geq 0$ (Muth 1969, DeSalvo 1977). The household's problem is

$$\max_{x,y,k} U(x, y, z) \quad s.t. \quad I = P(k)x + y + T(k, I) \tag{1}$$

The solution to the household's utility maximization problem for given distance k and (exogenous, for now) social interaction z yields the standard neoclassical (non-spatial) housing and non-housing Marshallian demands

$$\{x(P, I^o, z),\ y(P, I^o, z)\} = \arg\max[U(x, y, z) \quad s.t. \quad I^o = Px + y], \tag{2}$$

where $P = P(k)$ and $I^o = I - T(k, I)$ is income net of transportation costs. The location-dependent indirect utility immediately follows,

$$V(P, I^o, z) \equiv U(x(P, I^o, z), y(P, I^o, z), z). \tag{3}$$

The household's optimal location k^* is therefore

$$k^* \equiv \arg\max V(P(k), I - T(k, I), z) \tag{4}$$

which can be shown to satisfy the usual statement of Muth's equation

$$-P_k x(P, I^o, z) = T_k \tag{5}$$

The top panel of Figure 1 portrays the household's location choice. The right hand side is the marginal cost of distance (MCD), the marginal commuting cost, and is depicted by the downward-sloped (or horizontal when $T_{kk} = 0$) curve in the figure. The left hand side is the marginal benefit of distance (MBD), the savings the household can obtain by consuming its housing farther from the CBD where the housing price is lower (since $P_k < 0$), and is depicted by the MBD curve. As indicated in the figure, k^* satisfies (5).

The household's housing consumption in equilibrium is the Marshallian location-dependent housing demand (2) evaluated at k^*

$$x^* = x(P(k^*), I - T(k^*, I), z) \tag{6}$$

The spatial housing demand is depicted by the curve labeled $x(k)$ in the bottom panel of Figure 1. The housing demand gradient is positive, which can be verified by differentiating the Marshallian demand (2) with respect to distance, substituting Muth's equation $T_k = -P_k x(P, I^o, z)$ (second line) and the Slutsky equation (third line) and simplifying.

$$\begin{aligned}\frac{\partial x}{\partial k} &= \frac{\partial x}{\partial P}P_k - \frac{\partial x}{\partial I^o}T_k \\ &= P_k[\frac{\partial x}{\partial P} + x(P, I^o)\frac{\partial x}{\partial I^o}] \\ &= P_k(\frac{\partial x^h}{\partial P}) > 0, \end{aligned} \tag{7}$$

where the sign follows from the substitution theorem of consumer theory, the negative own-price effect on compensated or Hicksian demand $\partial x^h/\partial P < 0$. Thus, housing demand increases with distance and the spatial housing demand is the upward-sloped curve in the bottom panel of the figure. Graphically, the household's housing consumption is x_0, which is the value corresponding to optimal location k_0 in the bottom panel of Figure 1.

Having summarized the basic relationships describing the household's housing and location choices, we can now consider how the introduction of social interaction alters observed housing and location outcomes. Recall that we begin by treating z as exogenous to household decisions in order to derive intermediate results needed for the endogenous social interaction model. We assume that social interaction provides a benefit to the individual ($U_z > 0$). This additional utility may work through many channels such as information transfer or even simply the enjoyment of friendship or social contact. We do not intend to explain why social interaction occurs; rather, we focus on the behavioral responses of households when such interaction is taken into account.

Differentiating Marshallian housing demand (2) with respect to z, it can be shown that

$$sgn\left(\frac{\partial x}{\partial z}\right) = sgn\left(\frac{dMRS_{xy}}{dz}\right)$$

If an increase in social interaction strengthens the household's taste for housing vis-a-vis other goods, $dMRS_{xy}/dz > 0$ and the Marshallian demand for housing (at the given k) increases. In this case, housing and social interaction are complements. On the other hand, if greater social interaction weakens the household's taste for housing vis-a-vis other goods, $dMRS_{xy}/dz < 0$, the Marshallian demand for housing decreases and housing and social interaction are substitutes. The case $dMRS_{xy}/dz = 0$ corresponds to unrelated housing demand and social interaction.

To find the effects of changing the social interaction environment on household behavior, first implicitly differentiate Muth's equation to find

$$\frac{dk^*}{dz} = \left(\frac{V_{I^o}}{V_{kk}}\right)\left(\frac{\partial x}{\partial z}\right) P_k \tag{8}$$

Since $V_{kk} < 0$, $V_{I^o} > 0$, and $P_k < 0$, the effect of social interaction on location demand is determined by the sign of the housing demand relationship $\partial x/\partial z$.

The effect of social interaction on the household's housing consumption, x^*, is determined by implicitly differentiating the housing demand function (6) using (8) for the first line and using Muth's equation and the Slutsky equation to simplify the second line,

$$\begin{aligned} \frac{dx^*}{dz} &= \frac{\partial x}{\partial z} + \left(\frac{\partial x}{\partial P} P_k \frac{dk^*}{dz}\right) - \left(\frac{\partial x}{\partial I^o} T_k \frac{dk^*}{dz}\right) \\ &= \frac{\partial x}{\partial z} + \frac{dk^*}{dz}\left(\frac{\partial x^h}{\partial P} P_k\right). \end{aligned} \tag{9}$$

This comparative static result comprises two components. Using Turnbull's (1995) terminology, the first term is the direct effect resulting from a change in social interaction on Marshallian housing demand, $\partial x/\partial z$, at a given location. The remaining component, $(dk^*/dz)(\partial x^h/\partial P)P_k$, is the indirect or location effect. The location effect follows from the fact that social interaction changes the optimal location, which in turn changes the household's housing consumption. Since $(\partial x^h/\partial P)P_k > 0$ the location effect of social interaction on housing demand follows the sign of dk^*/dz,hence $\partial x/\partial z$. What is interesting is that the social interaction location effect on housing demand always reinforces the direct effect on housing demand.

Drawing these results together, we have the following relationship. *The exogenous social interaction effect on housing consumption and location choice depends on the degree of complementarity or substitutability between social interaction and housing:*

$$\frac{dx^*}{dz} \ \& \ \frac{dk^*}{dz} \gtreqless 0 \text{ as } \frac{\partial x}{\partial z} \gtreqless 0, \quad \text{i.e., as } x, z \text{ are} \left\{ \begin{array}{c} \textit{complements} \\ \textit{unrelated} \\ \textit{substitutes} \end{array} \right\}. \tag{10}$$

When social interaction and housing are complements the introduction of exogenous social interaction into the model causes the household to move further away from the center of the city and consume more housing. Intuitively, this household consumes social interaction and housing together. In terms of Figure 1, when housing and social interaction are complements, greater social interaction in the environment increases housing demand at each location, shifting the spatial housing demand curve upward in the bottom panel. This increases the marginal benefit of distance at each location, $-P_k x$, shifting the MBD_1 curve upward to MBD_2 in the top panel of the figure, increasing the household's optimal distance from k_0 to k_2. Reading off this new optimal location in the bottom panel, housing consumption increases to x_2 with the change from x_0 to x_1 representing the direct effect of social interaction on housing demand and the movement from x_1 to x_2 representing the indirect or location effect of social interaction on housing demand.

When social interaction and housing are substitutes, the household moves closer to the CBD and consumes less housing. The substitutes case can also be seen in Figure 1, taking MBD_2 as the starting point and tracing the direct and location effects of the decrease in Marshallian housing demand from x_2 to x_0 and k_2 to k_0.

2.2 Endogenous social interaction

Households choose location, housing, and social interaction together. Social interaction is different from housing or other consumption in that the individual does not consume interaction individually. It is, in effect, a purely agglomeration phenomenon. We follow earlier social interaction frameworks that emphasize that the built space of the household's surroundings dictate the level of social interaction that occurs, specifically that social interaction is determined by the population density (or land consumption) in the household's immediate surroundings (Brueckner and Largey 2008, Caruso et al. 2007). Whether social interaction is higher or lower with greater population density need not be specified at this point, although the agglomeration argument assumes greater population density leads to greater social interaction. What is new in our model is that we allow the level of social interaction, itself determined by surrounding neighborhood conditions, to have different feedback effects on housing and location demands, depending on the household's preference structure, in particular, whether interaction and housing are complements or substitutes. What this means is that social interaction is endogenously determined with both housing consumption and location choice.

In this model, as in earlier approaches, social interaction is an agglomeration phenomenon determined by the population density of the neighborhood. Each neighborhood is defined by a length of arc at distance k from the CBD. The social interaction technology describes the level of interaction in neighborhoods at k as a function of number of neighbors in close proximity, or population density at k. Assuming land is a normal input in the production of housing services, social interaction at k can be expressed as a function of the average housing consumption of the household's neighbors in equilibrium, $\tilde{x}$,

$$z(k) = f(\tilde{x}(k)) \tag{11}$$

Whether $f' > 0$ or $f' < 0$ at this point can be left unspecified. If interaction is greater with greater population density then $f' < 0$ (recall population density is inversely related to housing–hence land–consumption). If, on the other hand, greater population density leads to less social interaction then $f' > 0$. We consider each case in turn.

Given $\tilde{x}_k(k) > 0$, the household's social interaction varies with distance following

$$z_k \gtreqless 0 \quad as \quad f' \gtreqless 0. \tag{12}$$

The household's social interaction gradient is solely determined by how density affects social interaction. If larger lot sizes in the surrounding neighborhood reduces social interaction enjoyed by the household then social interaction declines with distance, as depicted in the bottom panel of Figure 2. If an increase in neighbors' lot sizes increases social interaction enjoyed by the household then social interaction increases with distance, the case depicted in the bottom panel of Figure 3. Of course, when $f' = 0$ neighbors' lot sizes have no effect on the individual's social interaction, which corresponds to the exogenous interaction case discussed earlier.[1]

The household's problem is

$$\max_{x,y,k} U(x,y,z) \quad s.t. \; I = P(k)x + y + T(k,I); \;\; z(k) = f(\tilde{x}(k)) \tag{13}$$

Following the earlier procedure, for each given location k the Marshallian demands are

$$\begin{aligned} \{x(P(k), I - T(k,I); z(k)); \;\; y(P(k), I - T(k,I); z(k))\} \quad &\equiv \\ \arg\max[U(x,y,z) \quad s.t. \; I \quad &= \quad P(k)x + y + T(k,I); \;\; z(k) = f(\tilde{x}(k))] \end{aligned} \tag{14}$$

which yield the location-dependent indirect utility

$$V(P(k), I - T(k,I), z(k)) = U(x(P(k), I - T(k,I); z(k)), \;\; y(P(k), I - T(k,I); z(k)), z(k)). \tag{15}$$

The household's optimal location satisfies

$$V_P P_k - V_{I^o} T_k + V_z z_k = 0. \tag{16}$$

Using the indirect utility function properties, this reduces to the modified Muth's equation for the model with endogenous social interaction

$$-xP_k + \frac{U_z}{V_{I^o}} z_k = T_k. \tag{17}$$

[1] The following discussion compares the spatially varying social interaction cases with the exogenous case by parameterizing $f(x)$ and evaluating the impacts of changing the functional form, specifically increasing (or decreasing) the slope f' when initially evaluated at the exogenous case $f' = 0$. The approach emphasizes a more intuitive and graphical perspective.

The MBD (left hand side) now includes a social interaction component, $(U_z/V_{I^o})z_k$; the effect of this new element on household location choice is determined by the sign of the social interaction gradient z_k. Intuitively, this new term captures the monetized value of the change in utility from the social interaction variation that comes with moving farther from the CBD. When $z_k > 0$ neighborhood social interaction is greater in neighborhoods more distant from the CBD, the added utility of which is an added benefit of locating farther from the CBD. When $z_k < 0$ interaction is lower for neighborhoods more distant from the CBD and the loss of utility from lower interaction reduces the benefit of living farther from the CBD.

Some results immediately follow from the modified Muth's equation above. If we use the standard positive housing demand gradient result, $\tilde{x}_k > 0$, as a starting point, the second term is negative or positive as social interaction increases or decreases with neighborhood population density, respectively. When compared with exogenous social interaction, endogenous social interaction by itself decreases (increases) MBD when $f' < 0$ ($f' > 0$). *Thus, for the same level of social interaction in equilibrium, the household will live closer to the CBD when interaction rises with neighborhood density and will live farther from the CBD when interaction falls with neighborhood density.* Referring to the exogenous interaction comparative statics summarized in (10), this means that, when interaction increases with greater density, the endogenous social interaction effect on household location is stronger than the exogenous interaction effect when interaction and housing are substitutes and is weaker than the exogenous interaction effect when interaction and housing are complements. Similarly, when interaction decreases with greater density, the endogenous social interaction effect on household location is weaker than the exogenous effect when interaction and housing are substitutes and is stronger when they are complements.

Muth's equation describes the household's location. In order to evaluate the housing consumption gradient in the neighborhood of the optimal location, we assume that the average neighborhood housing consumption at any k can be represented by the symmetric Nash equilibrium $\tilde{x} = \hat{x}^2$. Substituting $z = f(\tilde{x})$ into the Marshallian housing demand $x(P(k), I - T(k); f(\tilde{x}))$, housing consumption in symmetric Nash equilibrium therefore satisfies the condition

$$\hat{x} - x(P(k), I - T(k); f(\hat{x})) = 0 \tag{18}$$

Implicitly differentiating to see how housing consumption varies with distance, substituting (17) to find the

[2] The notion that households sort similarly based on social interaction is consistent with Helsely and Zenou (2011).

second equality and the Slutsky equation to find the third equality, we have

$$\begin{aligned}\frac{\partial \hat{x}}{\partial k} &= -\frac{-\frac{\partial x}{\partial P}P_k + \frac{\partial x}{\partial I^o}T_k}{1-\frac{\partial x}{\partial z}f'} \\ &= \frac{\frac{\partial x}{\partial P}P_k + \frac{\partial x}{\partial I^o}xP_k - \frac{\partial x}{\partial I^o}\frac{U_z}{V_{I^o}}z_k}{1-\frac{\partial x}{\partial z}f'} \\ &= \frac{\frac{\partial x^h}{\partial P}P_k - \frac{\partial x}{\partial I^o}\frac{U_z}{V_{I^o}}z_k}{1-\frac{\partial x}{\partial z}f'}\end{aligned}$$

Given $z_k = f'(\hat{x})(\partial\hat{x}/\partial k)$ at the equilibrium, substituting into the numerator of the above result and rearranging yields

$$\frac{\partial \hat{x}}{\partial k} = \frac{\frac{\partial x^h}{\partial P}P_k}{1-\left(\frac{\partial x}{\partial z} - \frac{\partial x}{\partial I^o}\frac{U_z}{V_{I^o}}\right)f'} \tag{19}$$

The numerator is unambiguously positive as in the exogenous interaction model. The denominator, however, is not so clear. The Lipschitz condition (an increase in others' housing consumption affects own housing demand less than an increase in own housing demand does) for a stable Nash housing consumption equilibrium at k requires $1-(\partial x/\partial z)f' > 0$ regardless of the sign of f'. But the term $(\partial x/\partial I^o)U_z/V_{I^o} > 0$ under the maintained assumption that housing is a normal good, leaving the denominator ambiguous. The denominator must be positive for the usual positive housing consumption gradient in the presence of endogenous social interaction, a maintained assumption here. In any case, the expression $(\partial x/\partial z) - (\partial x/\partial I^o)U_z/V_{I^o}$ is unambiguously negative when social interaction and housing are substitutes in demand. When complements, the expression is ambiguous.

What does this relationship mean for the housing consumption gradient? When social interaction and housing are substitutes, decreasing interaction with distance ($f' < 0$) implies the denominator in (19) is less than one. Since the denominator is one in the exogenous interaction case, this indicates a steeper housing consumption gradient under endogenous interaction. Figure 2 compares the exogenous interaction equilibrium to this endogenous case. Clearly, $z_k < 0$ as in the bottom panel. The middle panel depicts the effect just derived: the endogenous social interaction steepens the housing consumption gradient from $x(k)'$ to $x(k)''$. At the same time, the endogenous social interaction increases the MBD in the left hand side of Muth's equation (17) relative to the exogenous interaction case. This leftward shift to MBD_3 decreases the household's optimal distance from the CBD, which in turn decreases housing consumption through an additional location effect, illustrated by the movement along the new steeper gradient from x_2 to x_3. The equilibrium level of social interaction increases, as illustrated by the movement from z_2 to z_3 in the bottom panel of the figure. In sum, introducing endogenous social interaction reinforces the housing consumption and location effects of exogenous interaction when $\partial x/\partial z < 0$ and $f' < 0$.

Now consider the interaction-housing substitutes case but where interaction is increasing with distance ($f' > 0$). Figure 3 compares the exogenous interaction equilibrium to this endogenous case. Clearly, $z_k > 0$ as in the bottom panel. When social interaction and housing are substitutes, greater interaction with distance ($f' > 0$) implies the denominator in (19) is greater than one, so that the housing consumption gradient is shallower with endogenous interaction than with exogenous interaction, as depicted by the rotation from $x(k)'$ to $x(k)''$ in the middle panel of Figure 3. Looking at Muth's equation (17), the endogenous interaction captured by the second left hand side term is now positive, increasing MBD_2 to MBD_3 in the top panel. This increases the household's optimal distance from k_2 to k_3 and prods the household to increase housing consumption through the location effect depicted by the movement along $x(k)''$ from x_2 to x_3 in the middle panel. This implies that introducing endogenous social interaction offsets the effects of exogenous social interaction on housing consumption and location choices when $\partial x/\partial z < 0$ and $f' > 0$.

The remaining two possibilities pertain to the complementary goods case. When complements, the expression $(\partial x/\partial z) - (\partial x/\partial I^o)U_z/V_{I^o}$ in the denominator of (19) is ambiguous. Thus, regardless of the sign of f', the denominator of (19) may be greater or less than one, leaving the possibility of either a steeper or shallower housing consumption gradient relative to the exogenous interaction case. Allowing for this, Figures 4 and 5 illustrate the complements case for $f' < 0$ and $f' > 0$, respectively. In Figure 4, the decreasing social interaction with distance reduces the MBD in the top panel, which by itself prods the household to live closer to the CBD at k_3. Regardless of the relative gradient effect in the middle panel, the reduction in distance prompts lower housing consumption (middle panel) and greater social interaction (bottom panel) relative to the exogenous interaction case. The endogenous aspect of interaction therefore offsets the effect of exogenous interaction on household location and housing consumption. Tracing through the changes illustrated for $f' > 0$ in Figure 5, introducing endogenous social interaction for the complements case increases MBD, increasing equilibrium distance and housing consumption. The endogenous interaction effects therefore reinforce the effects of exogenous interaction on household location and housing consumption.

Pulling the results together, complementary social interaction leads to living further out and consuming more housing, while the notion that social interaction is stimulated by greater population density ($f' < 0$) tempers these effects. Substitute social interaction leads to living closer in and consuming less housing, effects that are reinforced by interaction that rises with density. The admittedly less popular notion that interaction is enhanced by less density leads to stronger complementary interaction effects and weaker substitute interaction effects. The next step is to empirically examine the extent to which these relationships pertain to US urban areas.

3 Data and Empirical Models

The data are drawn from the Social Capital Community Benchmark Survey (SCCBS). The survey was conducted in 2000 and the results are distributed by the Roper Center for Public Opinion Research at the University of Connecticut.[3] The survey was designed by the Saguaro Seminar at the John F. Kennedy School of Government, Harvard University, and represents an attempt to provide a uniform measure of social capital. There is a national sample and 41 separate community samples. The national sample includes respondents who were chosen at random across the continental U.S. with over-sampling of blacks and Hispanics.[4] Different institutions sponsored different community samples, so the separate 41 community surveys are based on a variety of spatial definitions, ranging from metropolitan areas to entire states. For example, the Atlanta community is defined as several counties within the Atlanta MSA whereas the Indiana community is a random sample drawn across the entire state. Further, the sampling techniques are not uniform across the communities. For example, one community survey may over sample Hispanics while another over samples Native Americans, reflecting the particular requirements of each sponsor.

Importantly for our purposes, the SCCBS data include social interaction measures describing some aspects of individuals' social activity within their communities. The theory emphasizes how the degree of substitutability or complementarity between social interaction and housing affects location choice. The SCCBS does provide information about individuals' tendency to socialize at home and away from home, which we use to indicate the structure of individuals' preferences for social interaction and housing in terms of substitutes or complements.

The respondent's preference proxy is generated from two variables in the survey, $SocHome$ and $SocPublic$. The $SocHome$ variable is the frequency of having friends visit the home, while the variable $SocPublic$ is the frequency of socializing with friends in public places. These data act as a revealed preference between social interaction and housing. If the individual chooses to socialize at home more often, then the individual has revealed a preference for consuming housing and social interaction as complimentary goods. On the other hand, if the respondent prefers to interact outside the home, then housing and social interaction are consumed as substitute goods. The range for the socializing data is from zero to sixty; this implies a range of socializing never to more than once a week.

The restricted use SCCBS provides each individual's location by the Census tract in which the home is located. The individual response data is aggregated up to the tract level using the sampling weights provided. This generates a tract-level measure of household preference for the degree of substitutability

[3] Access to the unrestricted data can be found through www.roper.uconn.edu.

[4] Blacks and Hispanics account for 500 respondents each which resulted in an additional 288 blacks and 294 Hispanics to be included in the sample than otherwise would have been.

between social interaction and housing. Since the effect on urban location decisions is desired, our sample only includes those tracts that intersect at any point with an urbanized area. Since the Census Bureau defines an urbanized area as densely settled territory which may include all or any size portion of the census tracts that make up the urban area, our data include only those tracts that lie in or proximate to an urbanized area. This procedure yields approximately 7700 tracts, spread out over 276 Metropolitan Areas (MSAs) and 301 different Urbanized Areas (UAs).

We merge the 2000 census tract data with the SCCBS data. The census data provide additional information at the tract level such as the number of households with children, total housing units, median age, structural age distributions and other demographic measures. Most importantly, the census data provides a measure of localized population density, one of the key variables that will be used in the empirical models testing the theoretical predictions regarding observed correlation between the types of social interaction in the neighborhood and population density.

We also examine how the demand relationship between housing and socializing influences location demand. To do so, we use two different measures of distance from the CBD. The first is the straight line distance from the tract centroid to the CBD location within the MSA or UA. The CBD for the straight line distance is a city hall or capitol building, which is geocoded from the address or latitude and longitude data from Google Earth. The second CBD distance measure is the average time spent commuting to work. These data are drawn from the SCCBS and are aggregated to the tract level following the same procedure used to obtain the social interaction sample data. Finally, we also use the land area of each tract from Census geo-data as an alternative proxy for housing demand.

Table 1 provides descriptive statistics for our sample. The average census tract population is 69 percent white, 17 percent black, 51 percent female, and 13 percent foreign born. The median age is just over 35 years and the median income is $49,000. The average tract has just under 2000 housing units and a vacancy rate of 6 percent. Sixty two percent of units are owner occupied on average. Table 1 also describes the social interaction data. Households in the average tract report socializing more often at home than in public, but there is considerable variation across tracts.

Recall the four cases implied by the endogenous social interaction model. When social interaction and housing are demand substitutes, interaction decreases distance and housing consumption. These effects are reinforced or moderated when population density in the surrounding environment increases ($f' < 0$) or decreases ($f' > 0$) interaction, respectively.. When social interaction and housing are complements in demand, greater interaction increases distance from the CBD and housing consumption. These effects are moderated or reinforced when population density in the surrounding environment increases ($f' < 0$) or decreases ($f' > 0$) interaction, respectively. To determine which is indicated by the empirical evidence, we begin by focusing on the relationship between tract population density and both types of social interaction identified in the data. Keep in mind that the two types of social interaction variables in the data are proxies for the substitutes and complements demand relationships.

The first empirical specification examines the relationship observed between census tract population density, social interaction and additional controls:

$$Tractden_i = \beta_1 SocPublic_i + \beta_2 SocHome_i + \Phi X_i + \varepsilon_i. \tag{20}$$

The dependent variable is the population density of the i^{th} tract. The variable $SocPublic_i$ describes the tract residents' preference to socialize in public and $SocHome_i$ reflects the preference for social interaction at home. The vector of additional controls, X_i, is included in the expanded specifications. The controls comprise racial composition, median age, gender composition, household composition (children present), median age of housing structures, percentage of foreign born residents, and median income. We first estimate equation (20) using an ordinary least squares (OLS) framework. When interpreting the estimates, the population density generally declines with greater CBD distance so that $\beta_1 \geq 0$ and $\beta_2 \leq 0$ (and at least one strict inequality) indicates that social interaction decreases distance when a substitute with housing and increases distance when complementary with housing. Since greater housing consumption is correlated with lower density, this coefficient pattern is also consistent with social interaction decreasing housing consumption when substitutes and increasing housing consumption when complements.

We also use additional empirical models to draw out more directly the relationships between the types of social interaction and distance from CBD and the land area of the census tract. We use both straight line distance and commuting time to evaluate the location effects of interaction. Our empirical housing consumption variable is not as clearly defined; we use the land area of the census tract to proxy for the tract level housing consumption. Intuitively, a greater tract land area for a given population suggests greater housing demand. The specification for these tests is

$$Outcome_i = \theta_1 SocPublic_i + \theta_2 SocHome_i + \Phi X_i + \varepsilon_i. \tag{21}$$

The dependent variable is one of the three outcomes: straight line distance, commuting time, or tract land area. The two social interaction terms and the control variables are as the previous specification. In these models, $\theta_1 \leq 0$ and $\theta_2 \geq 0$ (and at least one strict inequality) indicates that social interaction decreases distance or housing demand when a substitute with housing and increases distance or housing when complementary with housing.

4 Empirical Results

Table 2 presents the OLS estimates for four different specifications of the relationship between social interaction and tract population density. The first column is the base model in which tract population is a function of only the two forms of social interaction, *SocPublic* and *SocHome*. The estimates are significant and consistent with the endogenous social interaction model predictions. Greater revealed preference for public interaction (interaction and housing are substitutes) is associated with greater tract population density–a picture consistent with households living closer to the CBD and consuming less housing. The opposite relationship is observed between socializing at home and population density; greater social interaction at home is associated with a lower tract population density. This is consistent with the picture of households whose social interaction and housing are complements living further out and consuming more housing. The magnitudes of the estimated coefficients indicate that one more public interaction on average over a year leads to a 0.63 percent greater tract population density. At the average density, this corresponds to an additional 42 people per square mile, a nontrivial effect. The magnitude is roughly half that and in the opposite direction for an additional interaction at home. The explanatory power of the base model specification is low with an R^2 of only 0.5%, modest for even such a parsimonious framework..

The second column in Table 2 is the base model with fixed effects for MSAs and UAs. The inclusion of fixed effects removes unobserved city differences from the estimated relationships. The results are again consistent with the theoretical framework and are statistically significant. The magnitude of the estimated relationship between both types of social interaction are smaller than in the base model without fixed effects, but the resulting R^2 is much larger at 34%.

The remaining two specifications in Table 2 are the full model and the full model with MSA and UA fixed effects. These models include other control variables that standard urban models suggest may be associated with tract density. The full model and full with fixed effects model point estimates in Table 2 are also in line with the theoretically predicted outcomes, but the socializing at home relationship is no longer significant. The magnitudes indicated by the point estimates for both public and home social interaction effects are reduced as well. The additional control variables yield mixed results. Younger residents reside in higher density areas; the presence of children in the family structure reduces the population density. The older the housing structures the lower the population density–an unexpected result. Foreign born residents choose higher density areas, and as income increases (controlling for age and family structure) so does population density of the tract. The latter is another surprising relationship. As expected, the goodness of fit increases considerably with the addition of more controls: R^2 increases to 56% for the full model and 64% for the version with fixed effects.

These OLS results offer support for the social interaction model; when there is preference for socializing at home, individuals reside in tracts that have much lower population densities (hence greater housing consumption), and when socializing is substitutable for housing individuals choose higher density tracts (hence lower housing consumption). In order to address the effect of social interaction on location choice, we apply the alternative specifications with the different distance dependent variables. Table 3 reports the straight-line distance results. The only statistically significant estimate is the negative relationship between public socializing and distance in the base model with fixed effects. Table 4 reports the results when using the average commuting time measure of the economic distance to the CBD as the dependent variable. The public socializing point estimates are largely as expected; socializing in public leads to shorter commuting times. The point estimates for the socializing at home variable are positive in models (2)-(4) as expected, but not significant. The only significant coefficient estimate for this variable is negative in the base model (1) without MSA and UA fixed effects, a puzzling outcome in light of the other estimates.

The relationship between social interaction and tract area is shown in Table 5. The point estimates are consistent with the theoretical relationships, but the significance varies across empirical models. The preference for socializing in public is associated with smaller tracts, and socializing with friends at home is done more often in larger tracts. The base model (1) exhibits statistical significance for both forms of interaction, while in the base model with fixed effects (2), only the socializing in public result is statistically significant. The full and full with fixed effects models (3) and (4) yield no statistically significant relationships for the socializing variables.

We also report the results for several individual urban areas representing a cross-section of representative urban areas in terms of region and size. Table 6 shows the relationship between tract population density and both variables of interest for: Chicago, IL; Gary, IN; Grand Rapids, MI; Los Angeles, CA; and Washington D.C. Obviously, only the base and full models without fixed effects are estimated on the individual urban area subsamples. While not all results are statistically significant, the point estimates are consistent with the relationships indicated by the pooled sample. At the least, these results emphasize that the nature of the demand relationship between housing and social interaction influences household location choice within individual urban areas.[5]

4.1 An instrumental variables approach

The theory emphasizes that the level of social interaction, even when determined by neighboring households' housing choices, is endogenous with location and housing demand. If true, this creates a classic simultaneity

[5] Meta analyses of the estimates sign patterns and signficance for the individual MSAs and UAs yield no firm conclusions.

problem in the empirical frameworks and the estimates above only depict simple and partial correlations. Therefore, the next step is to purge the possible functional relationship of density on social interaction to focus on the behavioral relationship between housing consumption, location choice and social interaction. An instrumental variables approach is used to purge the expected causality. In the first stage, both socializing in public, *SocPublic*, and socializing at home, *SocHome*, are determined by two instruments. The first instrument, *Television*, is an indicator of television being the primary form of entertainment for the respondent. The intuition is that if individuals spend time watching television they are not socializing with friends. The second instrument, *Internet*, is the amount of time spent on the internet. Keep in mind, these data are from the year 2000, and while the internet was widely available in all urban areas at that time, the activities on the internet were limited to chatting with or e-mailing friends and family. The intuition is that the more socially active respondents spend more time chatting or e-mailing on the internet Both instrument data come from the SCCBS and are aggregated using the same method as the interaction data. Neither activity requires face-to-face contact associated with our social interaction measures, so neither is determined by neighborhood population or structural density.

The first stage models follow

$$SocInteraction_i = \delta_1 Television_i + \delta_2 Internet_i + \Phi X_i + \epsilon_i. \tag{22}$$

The variable *SocInteraction* represents either socializing in public or socializing at home, and the two instruments are *Television* and *Internet*. There are two endogenous regressors and two instruments, so the first stage is exactly identified. The complete set of control variables, X, used in the OLS models are also used in the full models for the instrumental variables technique. The second stage is then estimated as

$$Tractden_i = \beta_1 Soc\hat{P}ublic_i + \beta_2 Soc\hat{H}ome_i + \Phi X_i + \xi_i. \tag{23}$$

Table 7 shows the first and second stage IV results for the base model. The instruments are statistically significantly related to social interaction in the expected ways. Television–an individual non-interactive activity–as the primary form of entertainment reduces the socializing behaviors, whereas internet usage–an interactive activity–increases both socializing at home and socializing in public. The second stage estimates reported in Table 7 are consistent with the theoretical predictions; tract density is positively related with socializing in public and negatively related with socializing at home. Interestingly, the coefficient magnitudes are much larger than in the OLS base model in Table 2. The IV estimates in Table 7 suggest increasing socializing in public by one unit per year leads to an 8.6% increase in tract population density At the average population density this implies an increase of 572 people per square mile. The socializing at home result indicates a reduction in population density by 486 people per square mile. Table 8 reports the full model results with and without MSA and UA fixed effects. These estimates are consistent with the base model results.

5 Conclusions

Social interaction is an important household activity that is finally beginning to garner the serious attention of urban economists. This paper offers a tractable theoretical framework that examines the effect of social interaction on location and housing consumption. The approach taken here emphasizes the need to think about social interaction as comprising different types of activities with fundamentally different effects on both household behavior and the urban environment. The exogenous social interaction model results illustrate how the degree of substitutability between social interaction and housing determines the effect on location and housing choice. The endogenous model builds upon this and finds systematically reinforcing or offsetting effects, depending on the underlying relationship between social interaction and neighborhood density. The empirical tests using social survey data for MSAs and urbanized areas provide results broadly consistent with the theory.

This paper, along with the growing literature on social interaction, implies that informal interaction or face-to-face meetings among friends, neighbors, and family both affect and are affected by the shape and spatial configurations of urban areas in predictable ways. It shows how social interaction effects hinge on whether interaction and housing demand are complements or substitutes in demand. While the social interaction technology describing how built form affects interaction possibilities matters, the theory and empirical results emphasize the important role of the degree of substitutability with housing in the consumption and location responses of households to the opportunities for social interaction. This perspective suggests another dimension over which urban households may sort across the urban plane: the strengths of household tastes for public or private social interaction, and ethnic or cultural backgrounds, to the extent that different backgrounds are reflected in household tastes for different types of social interaction.

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Table 1: Descriptive Statistics

Variable	Mean	Standard Dev.	Minimum	Maximum	Definition
Census 2000 Data					
tractden	8.07	1.32	0.87	12.29	Natural log of the tract population density
pctwhite	0.69	0.28	0	1	Percentage of white population
pctblack	0.17	0.26	0	0.99	Percentage of black population
pctfemales	0.51	0.03	0.04	0.66	Percentage of females
pctforeign	0.13	0.14	0	0.79	Percentage of foreign born population
med_age	35.20	6.05	15.20	77.50	Median age
pctvacant	0.06	0.05	0	0.72	Percentage of vacant housing units
pctmarr_chd	0.22	0.11	0	0.84	Percentage of married households with kids
medstructure	1964.52	15.89	1939	1999	Median age of structures
medincome	49.03	22.29	4.43	200	Median income in thousands
Social Capital Community Benchmark Survey Data					
sochome	21.94	17.79	0	60	Preference for socializing at home
socpublic	16.78	16.65	0	60	Preference for socializing in public
tvone	2.38	1.26	1	5	Television is primary form of entertainment
wwwtime	2.94	4.21	0	25	Time spend on the internet per week

Note: Number of observations for all variables is around 7831 varying slightly due to missing values. All the SCCBS data only come from the respondents of the survey and are used as proxies for the tract's beliefs.

Table 2: Effects of Different Social Interactions on Tract Population Density

Dependent Variable : Tract Population Density	(1) Base	(2) Base w/ FE	(3) Full	(4) Full w/ FE
Socializing in Public	0.0063***	0.0044***	0.0017**	0.0013*
	[4.162]	[4.616]	[2.186]	[1.762]
Socializing at Home	-0.0029**	-0.0016*	-0.0003	-0.0003
	[-2.593]	[-1.776]	[-0.436]	[-0.425]
Percentage of Whites†			-0.4399	-0.1962
			[-1.252]	[-0.525]
Percentage of Blacks†			-0.1212	-0.0024
			[-0.318]	[-0.006]
Median Age			-0.1207***	-0.0808***
			[-6.412]	[-6.227]
Median Age Squared			0.0010***	0.0004***
			[4.502]	[2.882]
Percentage of Females			5.4702***	5.5933***
			[7.071]	[8.368]
Percentage of Married Households with Children			-3.7931***	-3.5506***
			[-12.748]	[-10.291]
Median Structure Age			-0.0290***	-0.0261***
			[-10.888]	[-15.867]
Percentage of Vacant Units			-2.8910***	-2.6025***
			[-6.286]	[-6.422]
Percentage of Foreign Born Residents			3.9529***	3.0070***
			[10.065]	[11.042]
Median Income			0.0101***	0.0053**
			[4.664]	[2.391]
Constant	8.0480***	8.0517***	65.4988***	59.1637***
	[64.520]	[392.042]	[13.418]	[18.002]
Includes City Fixed Effects	No	Yes	No	Yes
Observations	7659	7659	7659	7659
R-squared	0.005	0.342	0.562	0.642

Note: Standard errors are clustered at the urban area (190 clusters). T-statistics in brackets.
*, **, *** denotes significance at the 10%, 5% and 1% level, respectively. †The joint F-test is significant at the 1% level for the percentage of whites and Blacks in a tract.

Table 3: Effects of Different Social Interactions on Distance From Central Business District

Dependent Variable : Distance of Tract to CBD	(1) Base	(2) Base w/ FE	(3) Full	(4) Full w/ FE
Socializing in Public	-0.0133	-0.0167**	0.0037	-0.0020
	[-1.574]	[-2.391]	[0.509]	[-0.373]
Socializing at Home	-0.0037	0.0053	-0.0073	-0.0023
	[-0.586]	[0.828]	[-1.296]	[-0.434]
Percentage of Whites†			11.3102**	10.9753***
			[2.458]	[5.811]
Percentage of Blacks†			10.6193**	5.7873***
			[2.273]	[2.794]
Median Age			-0.0772	-0.1443
			[-0.718]	[-1.425]
Median Age Squared			0.0019	0.0024*
			[1.385]	[1.684]
Percentage of Females			7.3368**	6.7699*
			[2.201]	[1.713]
Percentage of Married Households with Children			23.1194***	23.5264***
			[8.282]	[10.385]
Median Structure Age			0.1107***	0.1587***
			[7.028]	[8.467]
Percentage of Vacant Units			5.1731	11.1205***
			[1.141]	[2.764]
Percentage of Foreign Born Residents			10.6026***	-6.6896**
			[3.259]	[-2.526]
Median Income			0.0163	-0.0494***
			[1.219]	[-5.076]
Constant	9.4580***	9.3191***	-228.9784***	-315.0841***
	[14.073]	[82.646]	[-7.666]	[-8.563]
Includes City Fixed Effects	No	Yes	No	Yes
Observations	7659	7659	7659	7659
R-squared	0.001	0.271	0.281	0.564

Note: Standard errors are clustered at the urban area (190 clusters). T-statistics in brackets.
*, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

Table 4: Effects of Different Social Interactions on Average Commute Times of Census Tract

Dependent Variable : Avg. Commute Time of Tract	(1) Base	(2) Base w/ FE	(3) Full	(4) Full w/ FE
Socializing in Public	-0.0081	-0.0110***	-0.0050	-0.0053*
	[-1.607]	[-2.977]	[-1.289]	[-1.784]
Socializing at Home	-0.0097**	0.0010	0.0013	0.0030
	[-2.188]	[0.310]	[0.382]	[1.099]
Percentage of Whites†			2.1676	0.0468
			[0.782]	[0.027]
Percentage of Blacks†			11.6852***	5.8267***
			[3.422]	[3.096]
Median Age			0.1823	0.1960**
			[1.251]	[1.997]
Median Age Squared			-0.0017	-0.0021
			[-0.904]	[-1.545]
Percentage of Females			6.3042	6.6740*
			[1.037]	[1.673]
Percentage of Married			15.3755***	19.4652***
Households with Children			[6.283]	[7.546]
Median Structure Age			0.0079	0.0480***
			[0.389]	[4.126]
Percentage of Vacant Units			0.2815	4.8869**
			[0.089]	[2.443]
Percentage of Foreign Born			17.6908***	-1.6920
Residents			[4.387]	[-1.053]
Median Income			0.0190	-0.0578***
			[1.404]	[-4.794]
Constant	26.7376***	26.5540***	-6.6871	-78.1346***
	[38.454]	[377.629]	[-0.183]	[-3.463]
Includes City Fixed Effects	No	Yes	No	Yes
Observations	7659	7659	7659	7659
R-squared	0.002	0.512	0.275	0.632

Note: Standard errors are clustered at the urban area (190 clusters). T-statistics in brackets.
*, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

Table 5: Effects of Different Social Interactions on Square Miles of Census Tract

Dependent Variable: Square Miles of Tract	(1) Base	(2) Base w/ FE	(3) Full	(4) Full w/ FE
Socializing in Public	-0.0512***	-0.0418***	-0.0190	-0.0182
	[-2.896]	[-2.766]	[-1.437]	[-1.466]
Socializing at Home	0.0358**	0.0231	0.0235	0.0168
	[2.334]	[1.430]	[1.628]	[1.129]
Percentage of Whites			-21.0659	-19.2216
			[-0.770]	[-0.723]
Percentage of Blacks			-25.1639	-21.3965
			[-0.888]	[-0.807]
Median Age			0.5947**	0.2011
			[2.181]	[0.924]
Median Age Squared			-0.0019	0.0028
			[-0.608]	[0.899]
Percentage of Females			-56.6902***	-64.9381***
			[-3.691]	[-3.686]
Percentage of Married			35.6555***	35.2218***
Households with Children			[5.717]	[5.559]
Median Structure Age			0.1691***	0.1754***
			[5.768]	[3.954]
Percentage of Vacant Units			58.3156**	53.6742**
			[2.475]	[2.439]
Percentage of Foreign Born			-37.2229	-38.4884
Residents			[-1.276]	[-1.413]
Median Income			-0.1115***	-0.0860**
			[-2.917]	[-2.038]
Constant	5.2391***	5.3596***	-298.9421***	-301.7191***
	[5.890]	[14.088]	[-6.384]	[-4.516]
Includes City Fixed Effects	No	Yes	No	Yes
Observations	7659	7659	7659	7659
R-squared	0.001	0.090	0.038	0.117

Note: Standard errors are clustered at the urban area (190 clusters). T-statistics in brackets.
*, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

Table 6: A Single MSA Approach on The Effects of Different Social Interactions on Tract Population Density

Dependent Variable : Tract Population Density	Chicago Base	Chicago Full	Gary Base	Gary Full	Grand Rapids Base	Grand Rapids Full	Los Angeles Base	Los Angeles Full	Washington D.C. Base	Washington D.C. Full
Socializing in Public	0.0015	0.0028	0.0112	0.0059	0.0334***	0.0171**	0.0025	0.0020	0.0232*	0.0226**
	[0.440]	[1.252]	[1.575]	[1.012]	[3.239]	[2.516]	[0.813]	[1.007]	[1.975]	[2.270]
Socializing at Home	-0.0020	-0.0016	-0.0148**	-0.0106**	-0.0269***	-0.0110**	-0.0094***	-0.0021	-0.0012	-0.0039
	[-0.626]	[-0.764]	[-2.299]	[-2.160]	[-3.479]	[-2.002]	[-3.423]	[-1.166]	[-0.115]	[-0.446]
Percentage of Whites		-1.0433*		1.3960		-4.3459		0.5880*		-2.9941
		[-1.756]		[0.323]		[-1.250]		[1.760]		[-0.728]
Percentage of Blacks		-0.5082		2.0429		-3.1052		0.2980		-1.5391
		[-0.862]		[0.472]		[-0.952]		[0.738]		[-0.381]
Median Age		-0.1069*		-0.5891		0.0278		-0.2367***		-0.3239
		[-1.894]		[-1.294]		[0.156]		[-4.446]		[-1.303]
Median Age Squared		0.0009		0.0067		-0.0004		0.0023***		0.0033
		[1.145]		[1.071]		[-0.144]		[2.973]		[0.938]
Percentage of Females		6.1909***		-21.8761**		5.1958*		8.0356***		7.5090
		[3.481]		[-2.516]		[1.674]		[5.804]		[1.650]
Percentage of Married		-3.7436***		-17.3154***		-4.6815***		-4.1432***		-1.3163
Households with Children		[-8.169]		[-3.770]		[-2.801]		[-8.552]		[-0.611]
Median Structure Age		-0.0307***		-0.0365**		-0.0333***		-0.0138***		-0.0355***
		[-11.677]		[-2.678]		[-5.364]		[-4.254]		[-2.891]
Percentage of Vacant Units		-2.3231**		-19.1782***		-11.5069***		-7.8117***		2.0827
		[-2.100]		[-4.150]		[-3.692]		[-7.497]		[0.332]
Percentage of Foreign Born		2.9354***		5.8803		0.2512		2.9590***		2.2416
Residents		[5.587]		[0.997]		[0.090]		[8.228]		[0.931]
Median Income		0.0107***		0.0577*		0.0118		-0.0046*		0.0135
		[4.209]		[2.015]		[1.009]		[-1.893]		[1.558]
Constant	8.5959***	69.1668***	7.6160***	103.6538***	8.1024***	74.9509***	9.2385***	37.6817***	8.0602***	82.3720***
	[105.154]	[13.300]	[35.760]	[4.008]	[37.190]	[6.972]	[123.221]	[5.953]	[32.075]	[3.266]
Observations	541	541	54	54	80	80	389	389	54	54
R-squared	0.001	0.590	0.099	0.625	0.177	0.721	0.001	0.590	0.080	0.556

Note: T-statistics in brackets. *, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

Table 7: A Two Stage Least Squares Approach on The Effects of Different Social Interactions on Tract Population Density

	First Stage	First Stage	Second Stage
Dependent Variable :	Sochome	Socpub	Tract Density
Televison is Primary Form of	-1.1169***	-1.9966***	.
Entertainment	[-6.683]	[-11.062]	
Weekly Internet Usage	0.4368***	0.4150***	.
	[7.791]	[7.312]	
Socializing in Public	.	.	0.0860***
			[2.743]
Socializing at Home	.	.	-0.0730***
			[-3.040]
Constant	18.1930***	25.4309***	8.2429
	[37.053]	[48.522]	[45.011]
Includes MSA Dummies	No	No	No
Observations	7637	7637	7637
F-Test Statistic	60.98	100.63	.
Wald Chi-Squared Test Statistic			9.75
R-squared	0.022	0.033	.

Note: Standard errors are clustered at the urban area (190 clusters). T-statistics in brackets.
*, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

Table 8: A Two Stage Least Squares Approach on The Effects of Different Social Interactions on Tract Population Density

	First Stage	First Stage	Second Stage
Dependent Variable :	Sochome	Socpub	Tract Density
Televison is Primary Form of	-1.1117***	-1.9249***	.
Entertainment	[-6.552]	[-10.463]	
Weekly Internet Usage	0.4162***	0.4053***	.
	[7.401]	[7.082]	
Socializing in Public	.	.	0.0333*
			[1.945]
Socializing at Home	.	.	-0.0198
			[-1.508]
Percentage of Whites	1.0687	-0.5609	-0.4948
	[0.373]	[-0.184]	[-1.341]
Percentage of Blacks	-2.3713	-5.2638	-0.1567
	[-0.790]	[-1.663]	[-0.402]
Median Age	-0.2711	-0.2670	-0.1172***
	[-1.534]	[-1.454]	[-5.770]
Median Age Squared	0.0000	0.0009	0.0010***
	[0.000]	[0.392]	[4.255]
Percentage of Females	4.6440	1.2829	5.3185***
	[0.670]	[0.180]	[6.312]
Percentage of Married	-16.09279***	-7.5077***	-3.3915***
Households with Children	[-6.112]	[-2.651]	[-10.887]
Median Structure Age	-0.0139	-0.0174	-0.0290***
	[-1.014]	[-1.170]	[-10.833]
Percentage of Vacant Units	-5.6727	2.3922	-2.6488***
	[-1.203]	[0.462]	[-5.403]
Percentage of Foreign Born	0.1672	-7.1135**	3.7885***
Residents	[0.051]	[-2.132]	[9.403]
Median Income	0.0266**	0.0184	0.0094***
	[2.192]	[1.444]	[4.431]
Constant	55.0467**	69.9872***	65.3101***
	[1.990]	[2.353]	[13.298]
Includes MSA Dummies	No	No	No
Observations	7637	7637	7637
F-Test Statistic	18.17	21.25	.
Wald Chi-Squared Test Statistic			972.74
R-squared	0.033	0.04	.

Note: Standard errors are clustered at the urban area (190 clusters). T-statistics in brackets.
*, **, *** denotes significance at the 10%, 5% and 1% level, respectively.

Figure 1. Social Interaction, Housing Consumption and Location Choice.

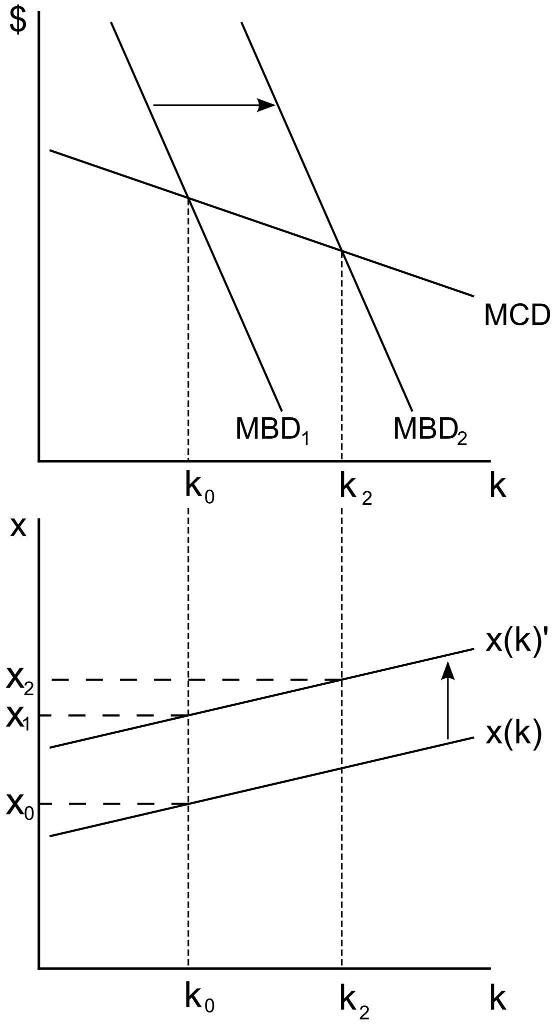

Figure 2. Social Interaction and Housing as Substitutes; Social Interaction Gradient Decreasing.

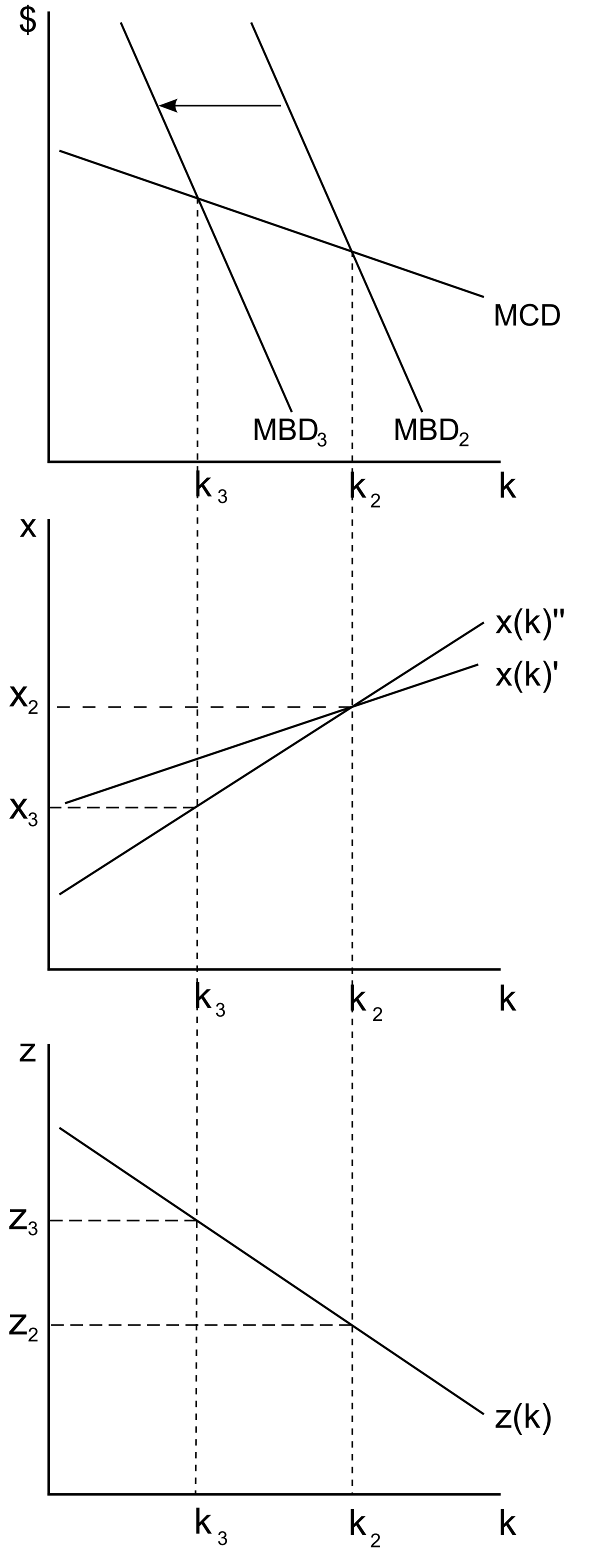

Figure 3. Social Interaction and Housing as Substitutes; Social Interaction Gradient Increasing.

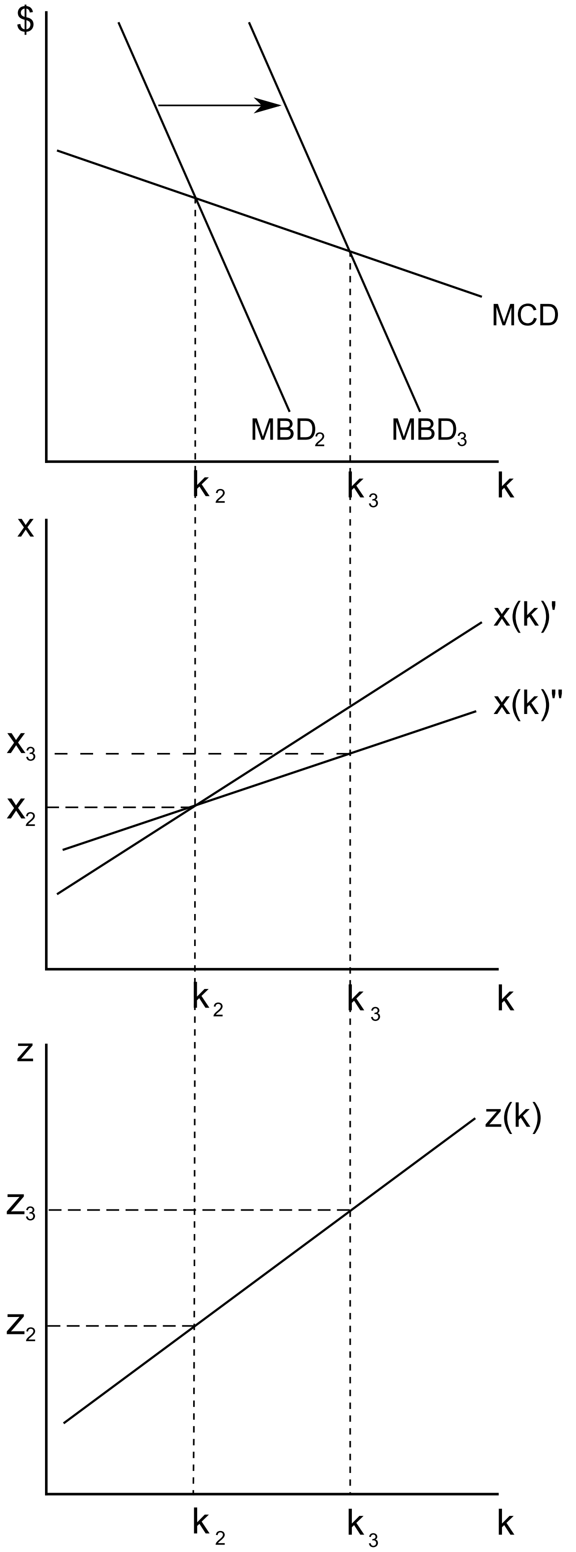

Figure 4. Social Interaction and Housing as Complements; Social Interaction Gradient Decreasing.

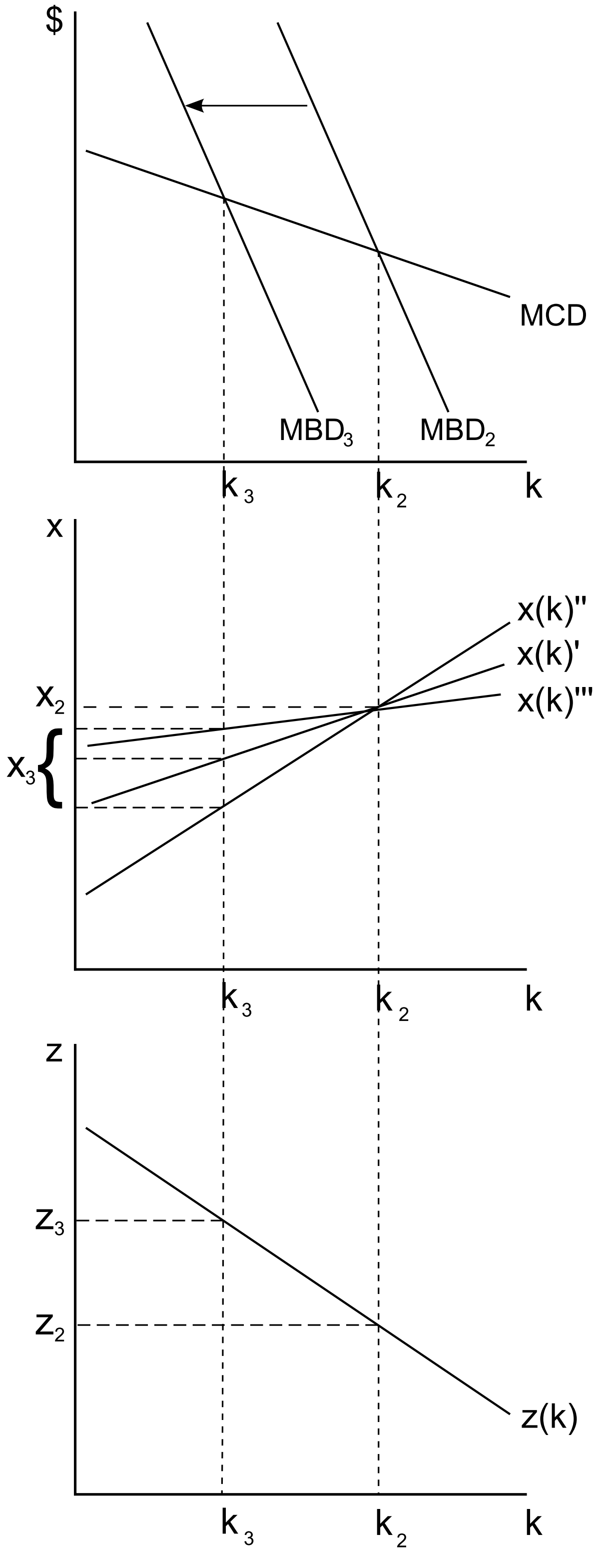

Figure 5. Social Interaction and Housing as Complement; Social Interaction Gradient Increasing.