

Lifecycle, Housing Consumption, And Spatial Distribution Of Households Across
Metropolitan Regions:
Evidence From Five U.S. Metropolitan Statistical Areas

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Abstract: Explaining spatial redistribution patterns of households across metropolitan areas is a key area of research for demographers from both sociological and economic perspectives. Building on residential mobility and satisfaction rationale, we develop a theory for spatial distribution of households that improves conceptualization of the current patterns in metropolitan areas. Our theory connects intra-metropolitan residential mobility of households to the distribution of the bundle of housing services across metropolitan areas. We hypothesize a lifecycle-based redistribution pattern for households across metropolitan areas based on the degree of suburbanization. Using Census 2010 data, we provide evidence from five U.S. metropolitan regions to further verify the validity of our conceptual model.

Keywords: Metropolitan Redistribution Patterns; Residential Mobility; Suburbanization; Lifecycle Stages.

Introduction

Spatial theorists have often conceptualized the distribution of population across metropolitan areas from economic, social, or socio-economic standpoints; yet, a functional explanation remains elusive. Nevertheless, the economic approaches (such as Teibout and Alonso models) have shaped much of the current understanding of the mechanism of urban growth and succession (Nechyba & Walsh, 2004). A main shortfall of economic models in explaining population distribution patterns is their overestimation of the role of utility maximization in residential mobility process. Economists have traditionally focused on the economic man, and rarely consider that in reality, households also have passions, needs and desires (Alonso, 1974). The consumer-voters in economic accounts primarily move across jurisdictions in order to maximize their locational utility in its economic denotation (for example see Tiebout, 1956). Such a concept, however, is often deficient across the range of residential mobility motivations. Although the motivation for household mobility is still a continuing debate in the literature, it appears that most residential movements happen in response to dissatisfaction from the actual location of residence (Rossi, 1955; Clark & Cadwallader, 1973; Speare, 1974; Clark & Onaka, 1983; Brown & Moore, 1970; Alonso, 1974).

Dissatisfaction, as the key determinant in the initiation of mobility inspiration, is often due to a mismatch between the actual and desired levels of consumption of the bundle of housing services in a given residential location. Residential mobility is as much, if not more, a demographic event as an economic one (White & Mueser, 1988). Using the dissatisfaction concept, it is possible to approximate mobility behaviors of households in association with changes in their needs and desires over the course of lifecycle transformations (Clark & Onaka, 1983).

Satisfaction results from an interaction between household's characteristics and aspirations, and contextual attributes of the residential location (Speare, 1974; Wilson & Dowlatabadi, 2007). These factors determine residential mobility and housing consumption behaviors in connection with socioeconomic characteristics of households (Clark & Dieleman, 1996; Clark, et al., 2006). Socioeconomic characteristics of households such as age, household size and composition, marital status, income, and race or ethnicity are important in mobility behavior because alterations in these factors define major changes in households needs for the consumption of the bundle of housing services (Quigley & Weinberg, 1977; Boehm & Ihlanfeld, 1986; Clark & Onaka, 1983; South & Crowder, 1997; Dieleman, 2001; Dieleman, et al., 2000; Simmons, 1968).

Lifecycle, Mobility, and Housing Consumption Behaviors

Most of the changes in socioeconomic characteristics of households are a function of changes in lifecycle stages, which make the transition between these stages the principal determinants of residential mobility. The basic principle is that as households move between life cycle stages, it is likely that they reevaluate the characteristics of their current consumption of the bundle of housing services based on new standards (Lee, et al., 1994). Households at different stages of their lifecycle have different housing consumptions (i.e. preferences, needs, requirements) and, on average, undergo multiple occurrences of transformations in their socioeconomic status.

Residential movements that correspond with lifecycle changes encompass a substantial share of intra-urban moves, independent of housing unit characteristics (Clark & Onaka, 1983). Dynamics of mobility and housing consumption behaviors are directly connected to lifecycle-induced changes in characteristics of households; "the triggers that generate disequilibrium and the resulting move." (Clark & Dieleman, 1996, p. 32) Other individual level socioeconomic

factors, in turn, act under the category of life cycle events. Therefore, many residential mobility studies have analyzed mobility triggers with regard to lifecycle (see (Quigley & Weinberg, 1977; Frey, 1978; Lee, et al., 1994; South & Crowder, 1998; Speare & Goldscheider, 1987; Speare, 1970; Clark, et al., 1984)).

Nonetheless, incidence of ambiguities and variations in defining lifecycle stages among scholars has caused difficulties in establishing a detailed relationship between lifecycle and housing consumption and mobility behaviors (Clark & Onaka, 1983; Quigley & Weinberg, 1977; Li & Tu, 2010; Clark, et al., 1984). In studies of the impact lifecycle on residential mobility and housing consumption behaviors (see Abou-Lughod and Foley (1960), Frey (1978), and Speare (1970)) a 5-stage classification of the *normal* lifecycle is prominent. Research has shown that mobility behaviors and rates differ between households (or non-family households) that are: 1) young but unmarried; 2) just married; 3) young married; 4) married with school-age children; and 5) older married or older unmarried (Abu-Lughod & Foely, 1960; Frey, 1978; Speare, 1970).¹

We use a modification of the 5-stage classification of household lifecycle to develop a hypothetical framework for households' residential mobility and housing consumption behaviors over lifecycle stages. In our modified taxonomy we have condensed the first 3 stages into a single component, thereby creating three phases of the lifecycle.

Lifecycle, Housing Consumption, and Metropolitan Redistribution Patterns

Households' residential mobility and housing consumption behaviors change through a dominant pattern over 3 phases of the lifecycle. Local jurisdictions' offering of the bundle of housing services often varies in accordance with regional metropolitan development patterns. Intra-metropolitan population redistribution patterns, accordingly, are shaped by intersections

¹ Here Married refers to all forms of domestic partnership.

between households' housing consumption patterns and metropolitan areas' offering of the bundle of housing related services at different locations.

Here the following assumptions are made:

1. There are two distinguishable patterns for residential mobility behaviors and consumption of the bundle of housing services through households' lifecycle stages (Figure 1). The basic principle in this assumption is that higher mobility rates are expected in early stages of household's lifecycle, where households and their corresponding housing consumption behaviors undergo several alterations. In later stages of households' lifecycle, in contrast, mobility rates decrease significantly due to a more stable socioeconomic status.

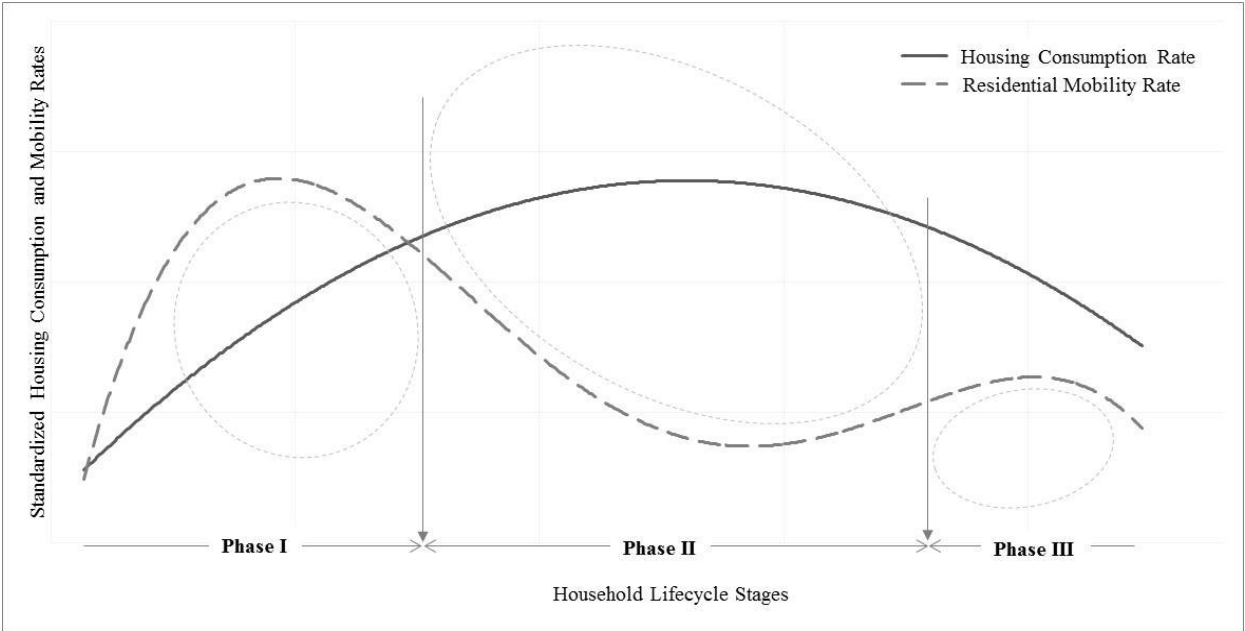


Figure 1: Housing consumption and residential mobility rates at household lifecycle stages

Elliptical shapes show changes in curvature of the mobility rates that define lifecycle-induced changes in housing consumption behaviors.

Three phases of transformations in mobility rates and consumption of housing services are clear in this trend (shown in Figure 1):

Phase I describes transitions from the young unmarried stage to just-married and young married household stages. In this phase, consumption of the bundle of housing services is expected to increase; correspondingly, mobility rate is likely to increase from the young unmarried stage to just married households. Moves that are caused by formation of new households encompass most of the lifecycle-induced moves (Clark & Onaka, 1983; Simmons, 1968). Mobility rates peak in early marriage years, when the new households are likely to reside in their temporary homes in proximity of employment or education centers. Subsequently, mobility rates start a gradual decline between the newly-formed households and the appearance of children under school age in the family, when households have become more established and are trying to improve their consumption of the bundle of housing services. Adjustments in housing size, tenure or structure type are the main motives for residential mobility at the early stages of family formation.

The second phase embraces transitions in mobility rates from early stages of household formation to households with school age children, where housing consumption is likely to peak. In this phase mobility rates are expected to continue a gentler decreasing trend from the prior stage of lifecycle, as households have acquired relatively high levels of consumption of housing services. Most of transitions into and within this phase are likely to be in tenure type, neighborhood's socioeconomic status, and size of the dwelling unit; homeownership and stable neighborhoods reduce chances of residential relocation (South & Crowder, 1997; Lee, et al., 1994; Speare & Goldscheider, 1987).

In phase III, location is the primary factor as households pass through their later stages of their lifecycle. The family expansion trend reduces over time and that lessens the pressure on the actual housing resources. Thus, for older households with children neighborhood

characteristics become more important than housing adjustments (Clark & Onaka, 1983). Simultaneously, since households in later stages of their lifecycle are more likely to have higher levels of housing consumption, mobility is more costly and is expected to reduce significantly. However, the possibility of moving in later lifecycle stages never becomes zero (Chevan, 1971). As children leave the household to begin their own housing career, older households are likely to downsize and change their neighborhoods. Neighborhood characteristics and preferences are also important as individual households enter latter stages of their lifecycle.

One should note that interconnections between other socioeconomic characteristics are also likely to create variations in mobility rates and housing consumption levels over lifecycle stages. The magnitude of such conceivable variations, however, is expected to be limited to specific alterations in rates of mobility and levels of housing consumption at specific lifecycle stages, and the overall pattern is likely to remain unaffected. For example, both mobility rate and housing consumption curves may shift down for a household from a racial minority group or may be delayed during times of economic downturns, but the overall housing career trend is still expected to reflect very similar characteristics in each of the three phases.

2. Local jurisdictions in their zoning designation and infrastructure investments often follow a 'pre-established' regional land use distribution pattern. For example, in a typical American metropolitan area the focus for downtown development is often on the revenues from commercial and business allocations, whereas municipalities on the periphery usually provide services to attract residential developments. As a result, in such a dominant pre-established regional suburbanization pattern, offering of the bundle of housing services follows three curvilinear patterns (Figure 2).

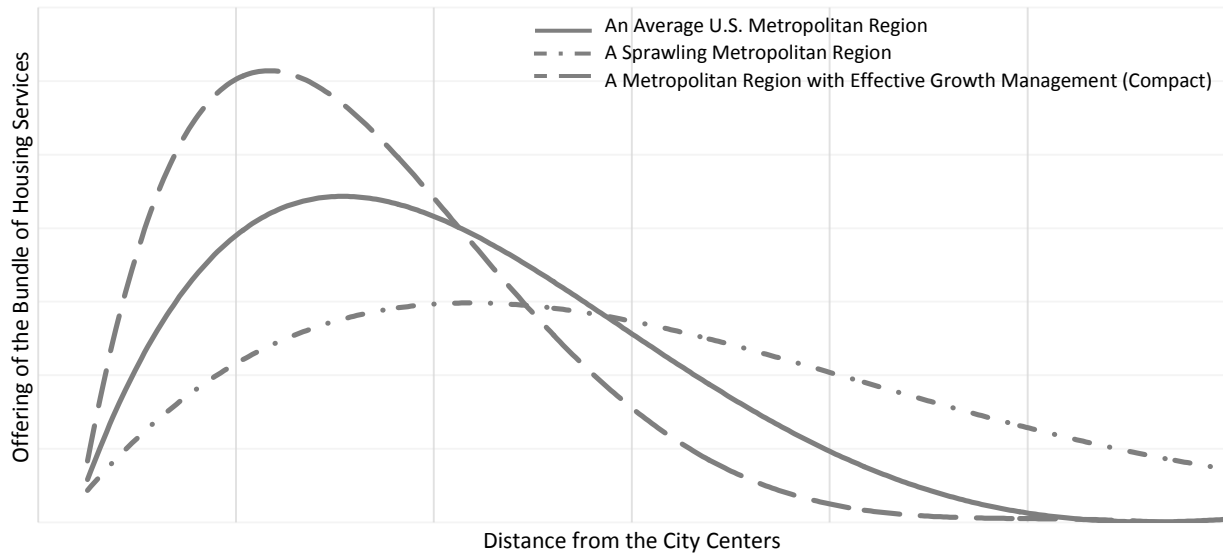


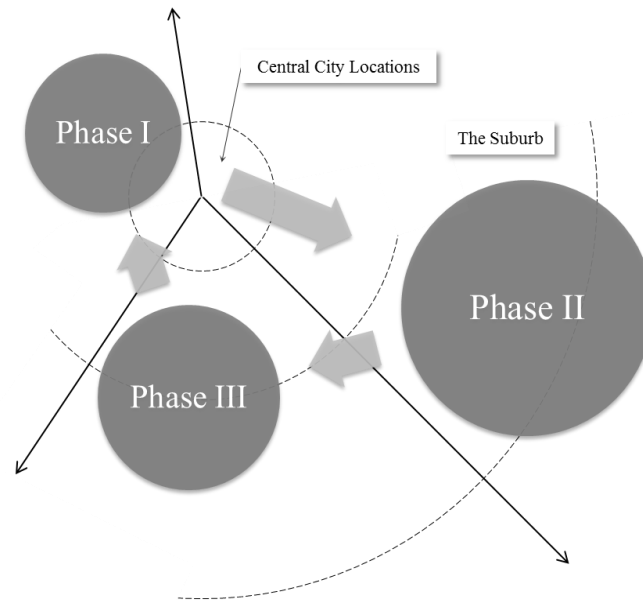
Figure 2: The distribution pattern of the bundle of public services for residential areas in US metropolitan regions

The model that is illustrated in Figure 2 represents three gradient patterns for the offering of the bundle of housing services in metropolitan areas with different degrees of sprawling growth. As illustrated in the figure, the dominant suburbanization pattern in American metropolitan areas has led to agglomeration of higher levels of the bundle of public services for residential areas in farther distance from the central city location/s. The higher the sprawling growth, the more dispersed the bundle of housing services from central city location/s, and vice versa.

The Conceptual Model

In the previous sections, we calibrated theoretical patterns for the consumption of housing services (and mobility rates) across three lifecycle phases and distribution the bundle of housing services across metropolitan regions. While each of the individual patterns we posited may not be conceived as particularly novel contributions, the intersection of the two patterns provides more interesting insights for the theory of population distribution patterns across metropolitan

regions. Figure 3 illustrates a graphical representation for the distribution (and mobility) of households within metropolitan regions over the course of their lifecycle, drawn from the intersection of the two theoretical patterns (Figure 3).



* The size of circles represents approximate housing consumption rates at each lifecycle phase

Figure 3: Distribution patterns for household at three lifecycle stage across metropolitan areas

According to the diagram, the phase-I householders, who should have the lowest rate of housing consumption, are more likely to reside in central city locations (or inner-suburbs) that provide lower levels of the bundle of housing services. Such a distribution may diverge due to the variations in the rates of consumption of housing services for households in early stages of formation and stabilization, and the spatial distribution of housing services in metropolitan regions.

Having the highest rates of housing consumption, phase-II householders are more likely to distribute in locations with superior offerings of the bundle of housing services. Therefore, in suburbanized metropolitan contexts (such as most U.S. metro areas), where suburban areas offer

higher levels of the bundle of housing services, phase II households often locate in the peripheral areas. Consequently, suburbs encompass neighborhoods with family-oriented characteristics. The two distribution patterns suggest that the dominant direction for residential mobility due to transition from the phase I to phase II is most likely to be from city to suburb.

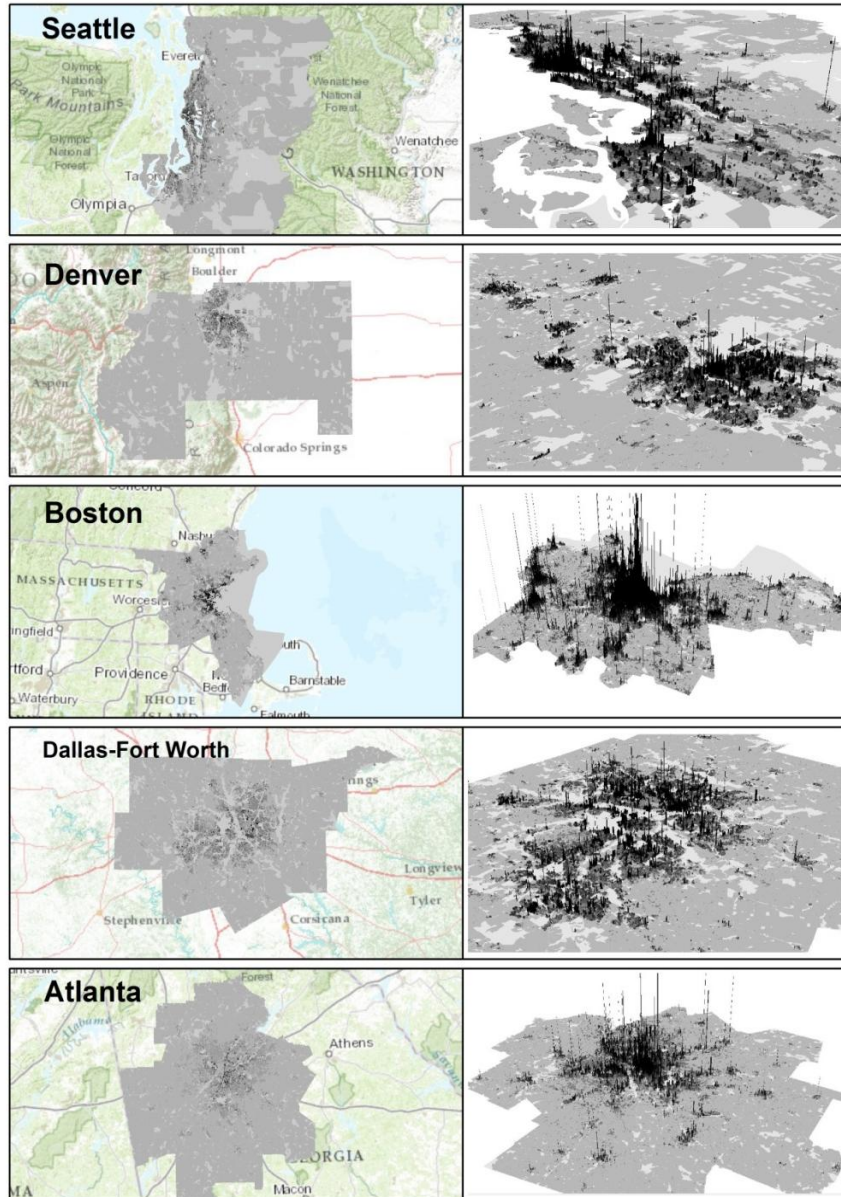
Phase III households are also more likely to locate in suburbs with some preferences to central city areas that still provide high levels of housing services. Since in phase III household size is expected to shrink, households are likely to downsize their housing consumption. However, as socioeconomic characteristics and social bonds remain of high importance for older households, phase-III householders are more reluctant to undergo significant neighborhood changes (age in place). This pattern suggests that residential mobility due to households' transition from phase II to phase III, is more likely to occur within suburban areas, or from suburban areas to central city locations with high socioeconomic status.

Evidence from 5 U.S. Metropolitan Statistical Areas (MSAs)

To assess validity of the conceptual model, we used 2010 Census data and examined the distribution patterns for householders at the three stages and housing units across the U.S. metropolitan areas. Using block-level Census data (the finest available resolution), we developed a series of GIS models on selected Metropolitan Statistical Areas (MSAs) that enabled us to analyze spatial distribution of population and housing units based on distance from urban centers. To account for possible variations in household distribution patterns across metropolitan regions with different suburbanization extents, we selected two² MSAs at low, one MSA at medium, and two MSAs at high sprawl scores (Figure 4), based on a report from Smart Growth America (Ewing, et al., 2002). According to the sprawl score, the two low-sprawl MSAs are

² Choice of a 2nd MSA from the low and high sprawl scores was to cross-validate the accuracy of our analysis in MSAs at both ends of the spectrum.

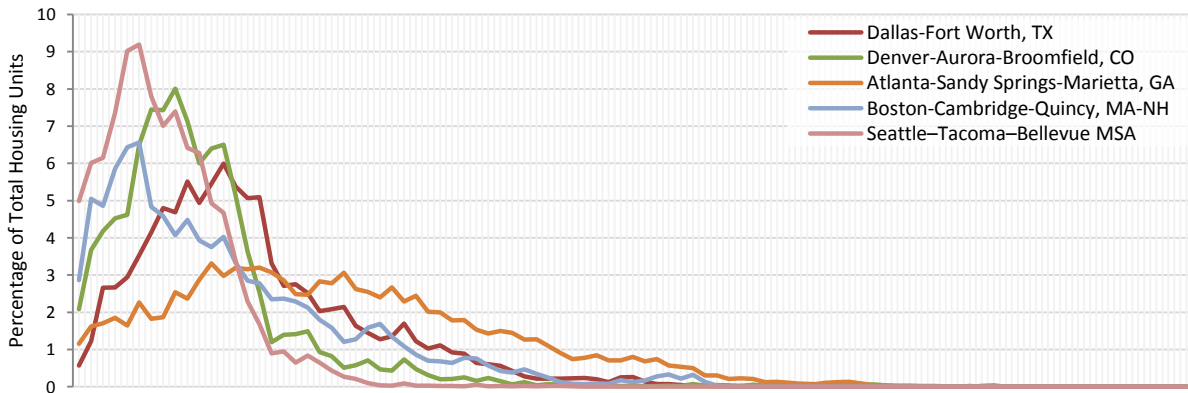
Boston-Cambridge-Quincy, MA-NH, and Denver-Aurora-Broomfield, CO; the medium-sprawl MSA is Seattle–Tacoma–Bellevue, WA; and the high-sprawl MSAs are Atlanta-Sandy Springs-Marietta, GA, Dallas-Fort Worth, TX.

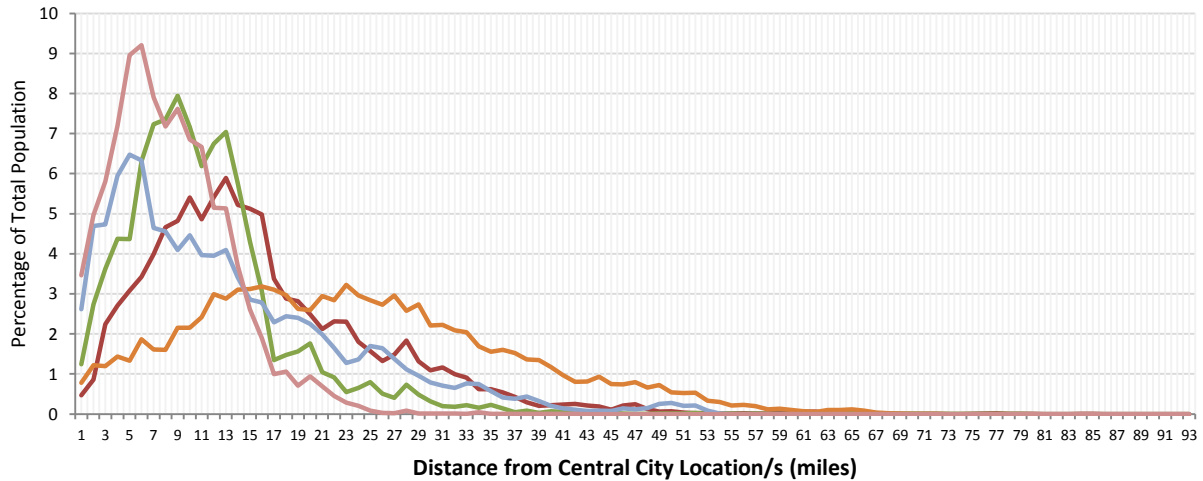


* Maps illustrate the distribution of housing density in each MSA. Black spots in the maps show housing density more than 10 units per acre. Maps have the same scale and direction. The three-dimensional pictures are provided to facilitate understanding of the distribution of housing density.

Figure 4: The five US MSA case studies

Figures 5a and 5b, respectively illustrate the distribution of population and housing units across the five metropolitan regions. The horizontal axes show Euclidean distance for Census block from central city location/s, and the vertical axes show percentages of population (5a) and housing units (5b). While both graphs show similar patterns, we use distribution of housing units (5b) as a component of the housing services. According to our proposed model, presented in Figure 2, distribution of housing units varies between metropolitan regions based on their suburbanization degree. Based on the graph 5b, housing units in the Atlanta-Sandy Springs-Marietta, MSA GA is the most dispersed pattern among the five MSAs. As the MSAs get more compact or development becomes more restricted due to natural or regulatory barriers (e.g. growth management, etc.), the peaks of the respective distributions move back toward central city locations. That is in more compact (or constrained) metropolitan regions housing units (and other components of the bundle of housing services) are more likely to reside closer to the central city locations.





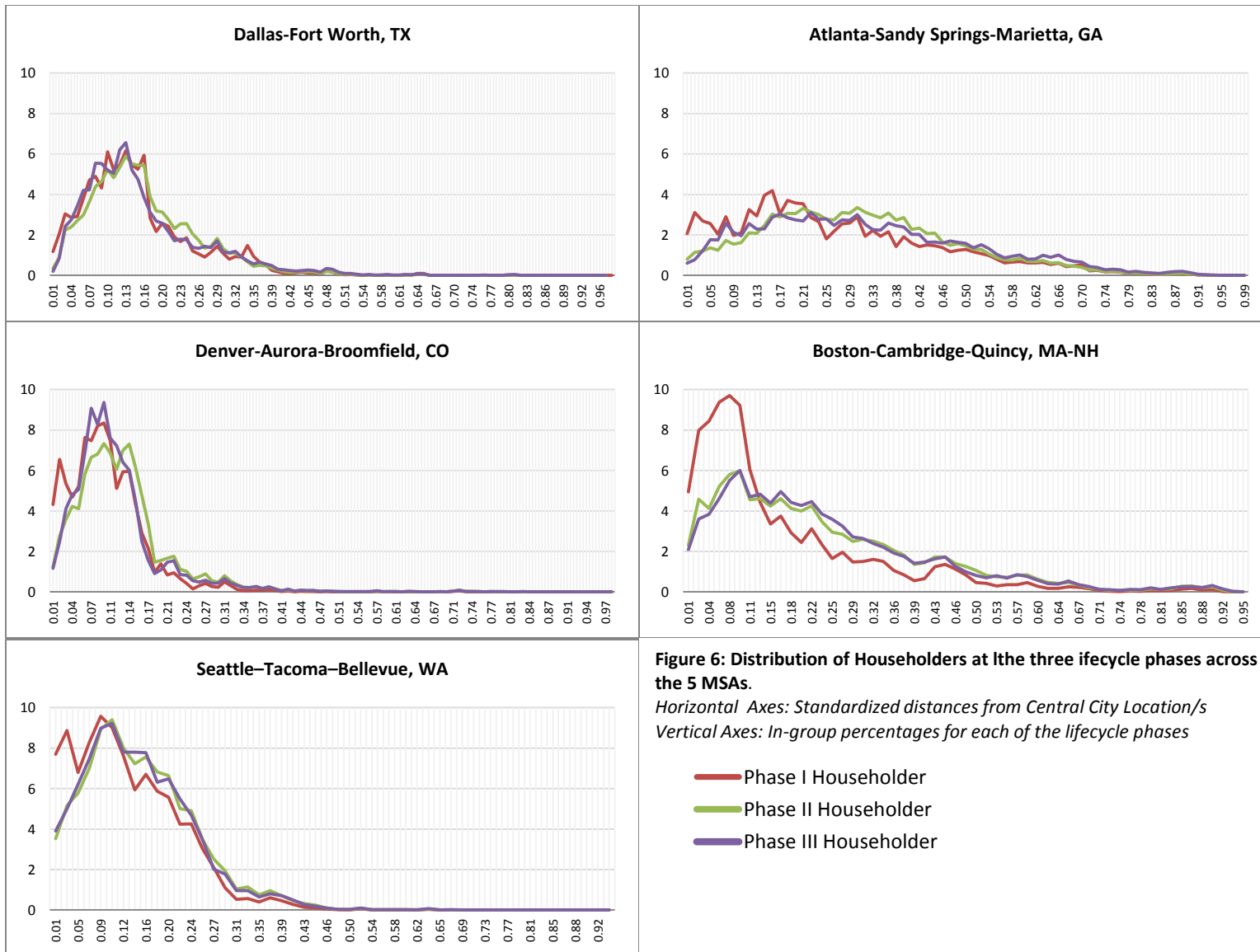
Figures 5a and 5b: Distribution of housing units and population across the 5 MSAs

Among the selected five MSAs, the distribution of housing units in Seattle–Tacoma–Bellevue MSA is the least dispersed, which is not expected based on the sprawl scores from Ewing, Pendall, and Chen’s report. This result, however, may be a function of the strict topographic limitations to growth in Seattle both to the east (Cascade Mountains) and the west (the Puget Sound).

Using Census 2010 data, and based on the theoretical discussion in this paper (Figure 1), we created three phases of lifecycle with overlapping thresholds to better capture variations in spatial distribution of households across metropolitan regions. Included in phase I are householders of ages between 15 and 34 from family households and non-family household, as defined in Census data. Phase II encompasses householders at ages 35 to 59, and phase III is made up from householders of age 60 and more.

Figure 6 demonstrates distribution of householders at the three lifecycle phases across the selected MSAs. Horizontal axes in each graph show a normalized distance measure to facilitate cross-comparison, and the vertical axes, in turn, represent in-group percentages of householders’ population. For example, the red lines illustrate the percentage of phase-I householders at (normalized) distances from the central city location/s.

In general, graphs show that in more compact metropolitan regions higher percentages of all three lifecycle phases are concentrated at closer distances to central city location/s. In contrast, in the more suburbanized regions the percentage of householders' population hardly passes 6% at any particular distance from central city location/s. This trend is more evident in Atlanta metropolitan region, where households are dispersed almost evenly at longer horizontal extents. Nevertheless, in 4 of the 5 MSAs (Dallas – Fort Worth excluded) the conceptual model presented in this paper remains valid. Specially the distribution shift from the phase-I householder to the phase-II and phase-III householders is significant.



To provide a better picture of the distribution variations between the three phases of lifecycle we created separate graphs for each lifecycle phase across all five MSAs (Figure 7). The dark-gray lines demonstrate the average for percentage of householders' population at normalized distances from central city locations. Comparing the three graphs shows that, while there are high variations between MSAs, one can still see the general pattern suggested by the conceptual model.

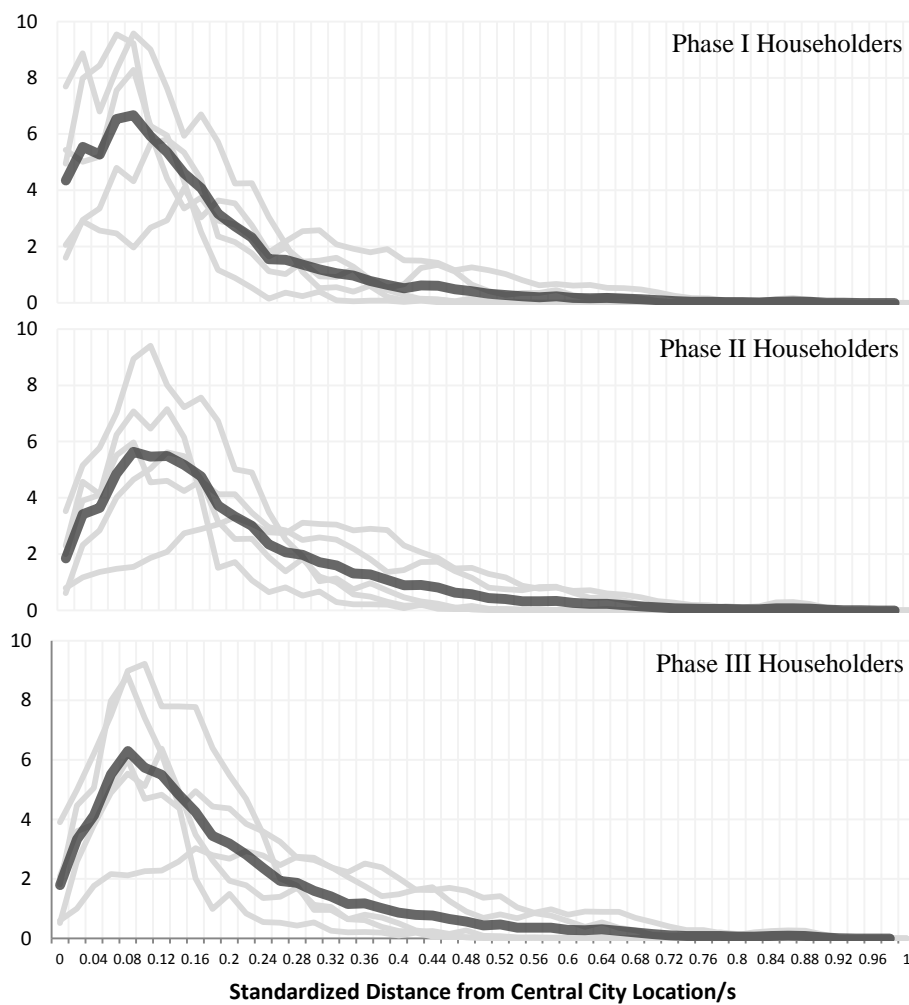


Figure 7: Variations and averages of distribution of households by lifecycle phase and distance from central city location/s

For more clarity, we compared the averages in a single graph (Figure 8). According to our conceptual model, and as illustrated in Figure 8, phase-II and phase-III householders are more likely to locate in farther distances from city centers, compared with the phase-I householders. That is, households at younger stages are more inclined toward living in central city locations, where they can find smaller dwelling units and better accommodate their mobility demands. Although the trend between householders at phases II and III are closer and may overlap at some points, we can still see the steeper slope for the phase-III householders. This shows that, from the two suburbanite householders, phase-III householders are more inclined toward central city location/s, as compared with the phase-II householders.

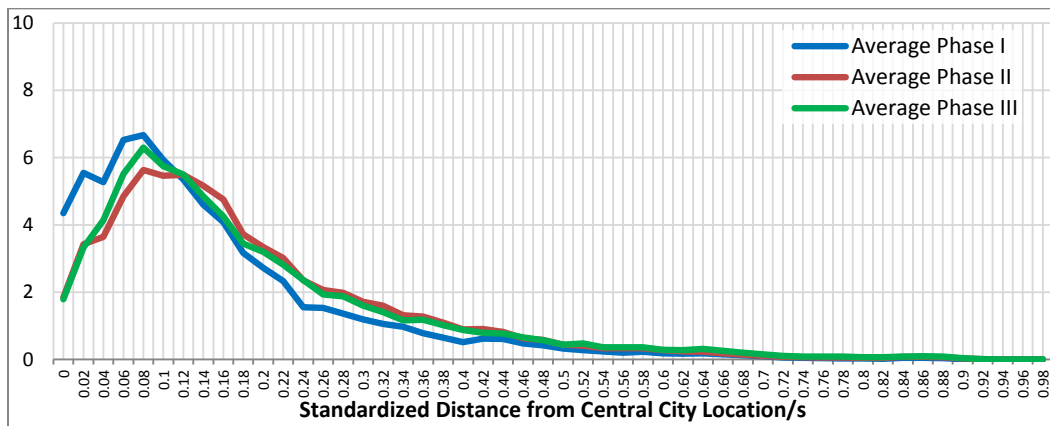


Figure 8: Averages of distribution of households by lifecycle phase and distance from central city location/s

Conclusion

Existing theory on lifecycles and mobility suggests that intra-regional mobility decision are likely as much of a demographic/lifecycle decision as a strictly economic one. In light of these considerations, we have developed a conceptual theory that suggests that householder age (as a proxy for household's lifecycle stage) is a prime determinant of household location patterns.

Our proposed theory clarifies that households do not relocate to solely maximize their locational utility, but rather residential mobility across metropolitan areas is an outcome of continuous adjustments in consumption of housing services and location of residence. Although there are uncertainties in predicting such changes and wide variations between individual household decisions, our assumptions on changes of housing consumption within the three lifecycles phases enabled us to approximate the distribution of households across metropolitan areas. The empirical evidence presented here suggests that while there are variations between metropolitan areas in the shape of the distribution curves, averaging out these regional idiosyncrasies produces location-by-phase patterns in line with the theory we have developed.

As discussed in the conceptual model, current population arrangements in American metropolitan areas (i.e. the ‘Ozzie-and-Harriet-style’ suburban families (Frey, 2002)), provide evidence in support of the functionality of this theory in predicting metropolitan population redistribution patterns. Adding several patterns of housing consumption over lifecycle for households from other socioeconomic groups can reproduce distribution patterns that are likely to be very close to reality.

This study present a novel approach to examine the geographic dispersion of households based on lifecycle stages using a combination of Census and GIS data. As always, limitations do exist. One general caveat of this research is that the block-level Census data does not fully reflect household-level behaviors. As a result, graphical demonstrations of household distribution patterns do not entirely follow our hypothesized trends. This is because the block-level data provide aggregated information on households and housing units, whereas our conceptual models build upon individual households and housing units. Further, the distance measure in the chart presented here is based on straight-line distances from the centroids of census blocks to

urban centers. This simplified measure hides impacts due to network accessibility. It may also distort comparison between mono-centric regions (Atlanta) and those with a poly-nucleic urban form (Seattle/Dallas-Fort Worth). Second, this study does not consider actual household size in the analysis. We leave further expansions of household dimensions (such as across household size, race, ethnicity, income, socioeconomic classes) as well as consideration of additional metropolitan regions and changes over time to future research in this direction.

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