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Driving to opportunity: Local rents, wages, commuting, and sub-metropolitan quality of life ☆

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ABSTRACT

We examine variation in local rents, wage levels, commuting costs, household characteristics, and amenities within metropolitan areas, for 2071 areas covering the United States, by density and central-city status. We demonstrate the sensibility of estimating wage levels by workplace, not residence, and recover decentralized rent gradients that fall with commuting costs. We construct and map a willingness-to-pay index, which indicates the quality of life typical households receive from local amenities when households are similar, mobile, and informed. This index varies considerably within metros, and is typically high in areas that are dense, suburban, sunny, mild, safe, entertaining, and have elevated school-funding.

1. Introduction

Households face many trade-offs when they decide where to live, as areas close to high-paying jobs or with desirable amenities are often expensive. Below, we consider how local wage levels, housing costs (or "rents"), and commuting costs vary both within and across metropolitan areas, using the most detailed level of geography in public-use Census files.[1] We then use these measures to construct a local willingness-to-pay index for a typical household based on how high housing and commuting costs are relative to available wages. Under strong conditions, such as household mobility and homogeneity, this index provides the value households place on local amenities, otherwise known as local "quality of life" (QOL).

Given how households are imperfectly mobile and heterogeneous, this one-dimensional quality-of-life index can only provide a limited perspective on the relative desirability of neighborhoods. The index is transparent and provides an economically intuitive complement to other measures of neighborhood quality or "livability" that abound in popular literature. It ranks beautiful areas along the Pacific the highest and areas rife with urban decay the lowest, lending the index plausibility. It is also positively correlated with various neighborhood amenities such as mild climate, safety, entertainment, and well-funded schools – typically thought of as desirable. While regression methods may be used with this index to try to value specific amenities, these methods are subject to potentially important omitted variable and simultaneity problems, such as household sorting. Indeed, the residents of a neighborhood will not only influence the amenities it provides, but may also be considered an amenity themselves.

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[1] We often allude to "housing costs" which are either a rent or an imputed rent for housing. We find it important to distinguish land rents from housing rents because construction costs may vary across metro areas.

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Although this work focuses on constructing a single index of neighborhood quality, its elements are pertinent to more complex analyses of hedonic markets and household sorting, e.g. Bajari and Kahn (2005), Yinger (2014), which measure willingness-to-pay through rents alone. Our index makes it easier to compare neighborhoods across metropolitan areas. In particular, we make several adjustments beyond the last similar study of sub-metropolitan quality of life by Blomquist et al. (1988). First, following Albouy (2008) – who estimates willingness-to-pay across metro areas – we down-weight the benefit of wage levels to account for federal taxes, and up-weight rent levels to account for unobserved non-housing costs. Second, we add commuting costs to rents to provide a fuller measure of the "urban costs" faced by households. Third, we estimate local wage levels by place of work, rather than place of residence, to mitigate potential biases from unobserved skills. Fourth, we cover the entire United States, including non-metro areas, and areas within counties whenever possible.

To complement and contextualize the analysis on willingness to pay, we also describe patterns in local rents, wages, and commuting costs, as well as household characteristics and observable amenities. These patterns involve variation within and across metros, between suburbs and central cities, and across communities of varying densities. Using regression methods, we distinguish how much raw variation in wages, rents, and commutes are explained by the observed characteristics of workers or housing units, as opposed to the locations themselves. We find that rent and wage-predicting characteristics vary more strongly within metros than across them, indicating stronger household sorting. Meanwhile, rent and (especially) wage levels due to location vary much more across metro areas than within. Controlling for local wages, rents fall with commutes in a manner consistent with standard theories of rent gradients.

Section 2 motivates our analysis in the context of existing research on local amenities and commuting. We synthesize relevant theories in Section 3 to provide the basis for the quality-of-life index. Section 4 describes the data at the Public Use Microdata Area, or "PUMA," level of geography. We present our measure of quality of life in Section 5 using maps for the continental United States, as well as New York, San Francisco, Detroit, and Atlanta. These maps reveal as much disparity in willingness-to-pay within Manhattan as across the most and least desirable states. In Section 6, we document how a few amenities *predict* much of the variation in quality of life, and how their estimated values are consistent with existing research, while being subject to numerous caveats and limitations.

2. Motivation and related literature

Our methodology combines insights from two lines of research on how local wages and rents are determined: the first on local amenities, the second on commuting. Beginning with Oates (1969), the empirical literature on amenities (including local public services) builds off of the theory of Tiebout (1956) by assuming that workers are mobile, have access to the same labor market, and that commutes can be ignored or controlled for. In this framework, amenities may be valued by examining how they co-vary with rents inside a metro area, holding other factors constant.

Rosen (1979) adapts this framework to examine amenity differences across metro areas with separate labor markets, arguing that low wages as well as high rents signal amenity values. He and his student, Roback (1982), use several measures of individual amenities as independent variables in wage and rent regressions. The quality-of-life index is then given by the annualized difference in rents to wages predicted by those amenities. One concern with such an index is that it is sensitive to which amenities the researcher considers relevant.[2] Gabriel et al. (2003) factor in non-housing costs-of-living in addition to rents, albeit only at the state level. Not taking a stand on what amenities belong in the quality-of-life index, Beeson and Eberts (1989), Gabriel and Rosenthal (2004), and Chen and Rosenthal (2008) construct indices at the metro level based on how high wages are compared to rents, controlling only for worker and housing characteristics. This "agnostic" index implicitly includes the value of observed and unobserved amenities together.[3] Albouy (2008) incorporates federal taxes and missing non-housing costs into a similar index to infer that willingness-to-pay in high-rent, high-wage (typically large) metro areas is much higher than previous research implied. He regresses the agnostic quality-of-life index in a second-stage regression to infer how much quality of life is predicted by observed amenities.[4] We use a similar methodology, refining it for sub-metropolitan analysis.

Most recent estimates of individual amenity values follow a more quasi-experimental or structural approach. The quasi-experimental approach helps to eliminate problems with unobserved variables, but may still be confounded by household sorting behavior.[5] Furthermore, quasi-experiments are unavailable for many amenities making this approach too limited to provide an overall index of neighborhood desirability. Structural approaches offer a wealth of methods to account for household sorting according to preferences and income, as well as how this sorting may generate local amenities, such as the provision of local public goods. Despite their strengths and flexibility, these models often require strong parametric identifying assumptions and computationally-intensive estimation procedures which make their validity difficult to assess.[6]

Research on how commuting impacts local prices is focused on intra-urban gradients. Alonso (1964), Mills (1967), and Muth (1969) predict rent gradients that fall with distance to a central business district, as lower rents compensate households for higher commuting costs. Hoehn et al. (1987) consider how a *city-wide*

[2] A more artificial approach is seen in various popular scores of quality of life, often termed "livability." Detailed scores, often at the neighborhood level, are available on websites such as Areavibes.com and Streetadvisor.com. Nate Silver (2010), of election polling fame, provides quality-of-life rankings for neighborhoods in New York City. Streetadvisor.com relies on crowd-sourced user reviews for streets, neighborhoods, and cities. Areavibes.com and Silver (2010) apply weighting algorithms to various observable amenities. For further details see Appendix E.

[3] Beyond amenity indices, the essential insight of equal indirect utility across areas has also been used by McDuff (2011) to predict migration flows and Kim et al. (2009) to explain intra-city wage differentials.

[4] A recent unpublished working paper by Bieri et al. (2013) performs an analysis similar to Blomquist et al. (1988) at the county-level. They incorporate many of the features new in Albouy (2008) regarding taxes and non-housing costs, and correct for selection from inter-state migration using techniques adapted from Dahl (2002). While they find the Dahl correction important, we find it to be negligible, perhaps as we used a larger set of worker controls in our wage equation. Bieri et al. use a set of amenities larger than any similar study to determine relative amenity expenditures. Since many amenities as well as worker and housing characteristics remain unobserved, this technique does not guarantee reduced omitted variable bias. We prefer to use a more agnostic quality-of-life measure and explore how it is *predicted* by a parsimonious set of amenities.

[5] For examples, see Davis (2004) for health, Chay and Greenstone (2005) for air quality, and Cellini et al. (2010) for school facilities. Crime has also been valued using housing prices, see Linden and Rockoff (2008), Pope (2008), or Gautier et al. (2009). Crime has even been examined as a cause of misallocation of time at work, see Hamermesh (1999). Over time, residents may re-sort across neighborhoods, causing issues with the estimates, see Kuminoff and Pope (2013) and Banzhaf (2013). Studies that use spatial discontinuities, such as district borders (Black, 1999), may be subject to sorting effects (Bayer et al., 2007). Many amenities, like climate or geography, change over long time frames, and so it is sensible to model sorting explicitly. Albouy et al. Albouy (2008) do just that using the QOL measures here with the method of Bajari and Benkard (2005) to examine climate amenities.

[6] See Kuminoff et al. (2013) for a review of this literature. Notable examples include Epple and Sieg (1999) on levels of school funding, and Bayer and Timmins (2005) on equilibrium properties of sorting models. Angrist and Pischke (2010) and Nevo and Whinston (2010) provide debate on the pros and cons of structural modeling and credible inference.