Regional Science and Urban Economics 40 (2010) 440–452

Contents lists available at ScienceDirect

Regional Science and Urban Economics

journal homepage: www.elsevier.com/locate/regec

Recent spatial growth dynamics in wages and housing costs: Proximity to urban production externalities and consumer amenities☆

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ARTICLE INFO

Article history:
Received 7 June 2009
Received in revised form 20 May 2010
Accepted 28 May 2010
Available online 4 June 2010

JEL classification:
R110
R120
R230

Keywords:
Agglomeration
Consumer amenities
Urban hierarchy
Remoteness

ABSTRACT

Despite numerous technological advances, remoteness within the United States has been increasingly associated with relatively slower economic growth. Using a spatial hedonic pricing approach, this paper assesses the relative importance of proximity to urban consumer amenities and production spillovers in explaining growth differentials in wages and housing costs across the U.S. urban hierarchy. We find that the dominant force for lower wage growth in remote nonmetropolitan and small metropolitan-area counties is increasing relative productivity disadvantages. Yet, for medium-to-large metropolitan areas, increased attractiveness to households of remoteness from even larger metropolitan areas generally contributed the most to relatively slower wage growth.

1. Introduction

Recent advances in information and communications technology, deconcentration of manufacturing, globalization, and improved transportation might have been expected to reduce the advantages associated with density of economic activity and the economic penalty for remoteness. Yet, during the 1990s, large U.S. metropolitan areas continued to prosper while remote areas continued to stagnate. Metropolitan area (MA) population growth significantly exceeded that in the rest of the nation during this period, in which growth was strongest in MAs with population between 1 and 2.5 million and weakest in those with less than 100,000 people (U.S. Census Bureau, 2005). Using an urban hierarchy approach, Partridge et al. (2008a,b) found lower growth in areas positioned at greater distances from larger (higher-tier) urban areas. This continued a U.S. core-periphery population growth pattern established in earlier decades (Barkley et al., 1996; Partridge et al., 2008b). The continued importance of core-periphery interactions for regional growth has been similarly reported for other developed countries (e.g., Polèse and Shearmur, 2004; Rietveld and Vickerman, 2004).

Explanations that have been offered for the continued growing economic prominence and broader geographic influence of large MAs can be classified into those stressing the role of labor demand versus those more focused on labor supply. Productivity advantages for firms locating in or near large MAs may have increased due to, for example, face-to-face contacts complementing technology instead of serving as a substitute, in which there is an urban bias in the provision of information technology (Forman et al., 2005; Sinai and Waldfogel, 2004). Large cities would be further advantaged if modern commerce requires a higher frequency of interaction and face-to-face contact (McCann, 2007). For example, access to higher-order legal, accounting and management services more likely require face-to-face interaction. Time-sensitive and low-cost access to thick labor markets and material inputs may increase in importance as idea generation and

☆ We thank Jordan Rappaport for generously providing Stata code for the estimation of the GMM models and his related advice. Earlier versions of this paper were presented at the North American Regional Science Association Meetings in San Francisco, Southern Regional Science Association Meetings in San Antonio, Regional Science Association of the American Meetings Cartagena, Columbia, United States Department of Agriculture, Economic Research Service, Federal Reserve Bank of Chicago, University of Groningen, University of Bocconi, The Ohio State University and the Federal Reserve Bank of Kansas City.

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doi:10.1016/j.regsciurbeco.2010.05.003

knowledge fetch ever higher premiums (Glaeser and Ponzetto, 2007). Thus, even as "spatial transmission" costs may have decreased, "spatial transactions" costs may have increased (McCann, 2008).

In terms of labor supply, increased household sensitivity to disamenities such as environmental pollution, congestion and higher crime rates in larger cities would translate into augmentation of population in smaller metro and non-metro areas. Such a positive re-evaluation of remoteness from large dense agglomerations would offset, or outweigh, falling labor demand in remote areas. Potentially offsetting this tendency though is that large cities also offer a number of unique consumer amenities (Glaeser et al., 2001) such as exotic restaurants, nationally-renowned museums, and specialized health-care facilities. As for natural amenities (Graves and Mueser, 1993), the demand for urban amenities may have grown with the rise in real U.S. income and wealth. The balance of urban amenity and disamenity influences determines whether remoteness became increasingly attractive or unattractive to households.

The relative roles of household amenity or productivity effects, represented by the above discussion, in the spatial re-alignment of population have important policy implications, as well as implications for how regional and urban economists model spatial redistribution. Therefore, this paper ascertains whether the strong economic performance of larger MAs and weaker performance of counties in lower-tiers of the urban hierarchy during the 1990s was derived more from firm location (productivity) or household location (amenity) considerations. Using Census and Geographic Information System (GIS) data, we use a Roback (1982) spatial equilibrium approach to examine patterns of factor price changes for all counties in the continental U.S. We first assess whether unanticipated shocks have altered the core-periphery spatial equilibrium, leading to differential changes in factor prices. The factor price changes then are decomposed to reveal whether they are due to changes in firm productivity or household amenity effects. A novel contribution is the consideration of small MAs and nonmetropolitan areas in an explicit mapped-out urban system, in contrast to related studies that examined large cities (Gabriel and Rosenthal, 2004) or states and broad regions (Chen and Rosenthal, 2008).[4]

The next section lays out the hedonic pricing framework as it applies in our setting and shows how household amenity effects can be identified separately from firm productivity effects. The section also presents our conceptualization of the urban hierarchy. Section 3 contains the empirical model and describes its implementation. The results are presented and discussed in Section 4. Among our findings, the poorer economic performance of lower-tiered areas in the 1990s was primarily due to increasing productivity disadvantages of remoteness. Conversely, remoteness from large metropolitan areas appears to be increasingly household amenity attractive. The final section briefly summarizes the results and concludes the paper.

2. Theoretical framework

Spatial patterns in employment and population growth do not reveal the relative contributions of consumer amenities versus firm productivity advantages because employment and population are outcomes of the interaction of labor demand and supply. Instead, to sort out household and firm location influences on regional economic activity, our model follows the hedonic pricing technique using the spatial general equilibrium approach described below.

[4] A complementary study is Partridge et al. (2009). They use an urban hierarchy framework to find that productivity disadvantages as primarily underlying lower household earnings and housing prices in remote areas. Yet, that study relates to the spatial equilibrium distribution of *levels* of economic activity at a point in time, not to spatial differentials in *growth* as stressed in the current study.

2.1. Hedonic model

The spatial general equilibrium approach has been used extensively to examine both regional quality-of-life and regional quality of business environment issues (Beeson and Eberts, 1989; Blomquist et al., 1988; Chen and Rosenthal, 2008; Gabriel and Rosenthal, 2004; Roback, 1982; and Winters, 2009). Ottaviano and Pinelli (2006) similarly use this approach in examining whether New Economic Geography agglomeration economies in Finland are primarily derived from household or firm location considerations. In this approach, increased consumer preferences for an area are revealed by the lower real wages workers are willing to accept. Increased productivity advantages are revealed by the increased input costs firms are willing to pay. The framework is sufficiently general to capture a wide variety of business environment and quality-of-life factors (Partridge et al., 2009; Tabuchi and Thisse, 2006, p. 1299).

The model assumes an economy comprised of two maximizing representative agents: the household and the firm. The household (h) earns income from selling one unit of labor and chooses amounts of a composite traded good (X), residential land (T^h), and site characteristics (s) so as to maximize utility subject to a budget constraint:

$$\max U_i(X_i, T_i^h \mid s_i) \quad \text{subject to } w_i = X_i + r_i T_i^h \tag{1}$$

where i denotes region, w and r represent the wage and land rental rates, respectively; and the price of the traded good is normalized to unity assuming an absence of transportation frictions. Included in s is a vector of area household amenities ($\mathbf{A}^h$) which could include both natural (e.g., weather) and man-made amenities (e.g., those related to urban agglomeration), and a vector $\mathbf{D}^h$, representing exogenous distance-based household costs to access consumer goods and services in higher tiers of the urban hierarchy. Consumer access costs are influenced by the distances to higher-tiered areas, costs to traverse the distances, and the array of available consumer goods and services in the higher-tiered areas (Partridge et al., 2009). The above can be solved to obtain the indirect utility function, which because of perfect mobility of households is assumed equal to $\underline{V}$ across regions in spatial equilibrium:

$$\underline{V} = V_i\left(w_i, r_i \mid \mathbf{A}_i^h, \mathbf{D}_i^h\right). \tag{2}$$

A representative firm (f) produces the composite good X according to a constant-returns-to-scale production function in terms of labor and land: $X(T_i^f, L_i|s_i)$, where T^f is land used in production of the traded good, L is the number of units of labor, and s operates as a profit shifter. Site characteristics include a vector of firm amenities in the area $\mathbf{A}_i^f$ (e.g., topography or proximity to a harbor), and $\mathbf{D}_i^f$, a vector of distance-based costs to access firm amenities in higher tiers of the urban hierarchy, which is influenced by the distances to higher-tiered areas, costs to traverse the distances, and the extent of firm agglomeration economies (amenities) in these higher-tiered areas (Partridge et al., 2009). Assuming perfectly mobile firms, indirect profits are equalized to $\underline{\Pi}$ across locations:

$$\underline{\Pi} = \Pi_i\left(w_i, r_i \mid \mathbf{A}_i^f, \mathbf{D}_i^f\right), \tag{3}$$

where the returns to land are equalized across uses in housing and production of the traded good in the region. A final equilibrium condition is that the populations across all spatial locations add up to the national population.

As shown in Fig. 1, this framework implies upward sloping iso-utility curves and downward sloping iso-profit curves in wage (w) and rent (r) space, in which a given vector of site characteristics (s) implies a unique equilibrium combination of w and r (Roback, 1982). Higher land rents require higher wages to keep utility constant, while