To What Extent Does the Standard Urban Model Apply to Liverpool

Word Count (excluding list of references):	*979*

Introduction of Standard Urban Model and Liverpool

The standard urban model is an essential basic model in regional economics. This model explores the relationship between land use rent price and the distance from each city area to the central area. A hierarchical pattern of market areas cantered around central locations emerges when transportation costs are explicitly considered (Alonso 1960).

Liverpool is a city and metropolitan borough in Merseyside, England, with a population of 498,042 in 2019. The city is considered a European capital of culture and the beginning of an economic renaissance (O'Brien 2011).

This study will design an analysis process of the bid-rent curve covered by the standard urban model. Then the applicability of the standard urban model (in an Alonso sense) to Liverpool will be discussed.

The Data and Method

Data

Five types of data were required for spatial analysis in order to determine the degree of centrality within Liverpool and the corresponding bidding rent gradient:

1. Workplace locations for retail workers over the age of 16.
2. Workplace locations for office workers over the age of 16.
3. Residential locations.
4. The median contract rent for retail, office, and residential places.
5. Shapefiles for the geography of Liverpool.

The median contractual rent corresponds only to the monthly cost of accommodation.

Method

Assumptions

Alonso (1960) states model includes three major assumptions:

1. A flat-defined city formed by a central business district (CBD) with a fixed population and income level.
2. Transportation reliability throughout the city.
3. A city with objective residents and perfect competition.

Liverpool is presumed to meet the above conditions.

Identify Central Business District

This study defines *Liverpool City Centre* as the central business district.

Structing Alonso's Model Framework

In order to improve the robustness of the analysis process, first construct the model framework. Alonso (1960) shows that consumers search for an equilibrium point of land and transportation costs to maximize individual utility. Therefore, the rent value is the function of distance to the market. For visual aid, designing a simple curve demonstrates the original rent-bid theory to compare the actual distribution of urban rent.

Considering the Liverpool average rent as £776 per month, at the cost of £1000, the theoretical curve begins at a distance "0" and decreases as distance increases. As a result, the price will be £500 at a distance of "1," £333.33 at a distance of "2," and so on.

Constructing bid-rent curves

For obtaining specific location and data, this study needs to construct a city concentric zone model, which considers CBD the center. Referring to a previous study by Yinger (1979), setting the interval between each zone to one mile. Then, map the collected job

or residence locations and their bound contract rents onto the corresponding block group shape file. After this, calculating thresholds based on the place density and total places amount data. The relatively high-density places are centroids in the concentric zone model. Furthermore, mapping their specific geographic locations to the concentric zone model. Different datasets correspond to centroid types, including retail, office, and residential.

What is more, if multiple congeneric centroids exist in a zone, the geographical location and rent of the final centroid will be defined by the largest density centroid and the average of all centroids. In this case, the method ensures only one homogeneous centroid in each zone. Then, the final centroid and rent data are mapped on the previously designed framework to obtain the final bid-rent model result. Location to the center refers to the zone the centroid belongs to; rent refers to the calculated average rent. Figure 1 demonstrates this process.

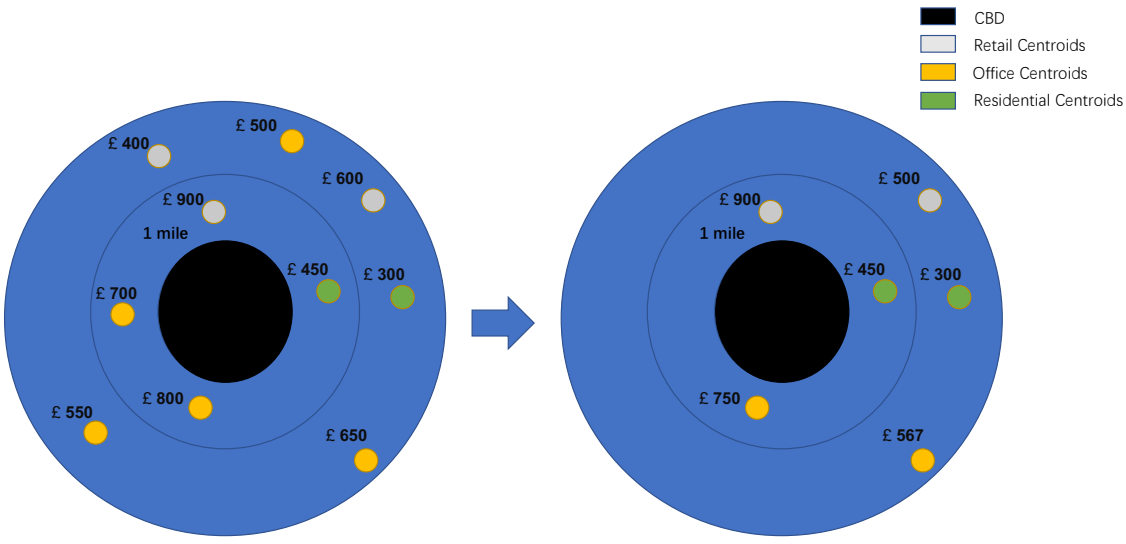

Figure 1: Illustration of bid-rent construction

Applicability and Limitation

Applicability

Rent distribution data was derived from the CDRC dataset (ESRC Consumer Data Research Centre 2019). The data demonstrates the median house prices (quarterly) for 1995-2018 in Liverpool. This study made a strong assumption of assuming rent is equal to house price to investigate the rent distribution pattern of Liverpool. To decrease observation bias caused by potential historical factors, only the years 2016-2018 house prices were extracted, and calculated their average as the observational data. Figure 2 shows the defined rent distribution of Liverpool. According to the rent distribution map, three patterns were captured. First, the rents remain the same distance from CBD., mainly in the city's northern part. Secondly, rent rises in urban nodes close to inland city boundaries. The third pattern demonstrates the distribution difference between the city's north and south. Based on observation results, this study states that the standard urban model does not apply to Liverpool.

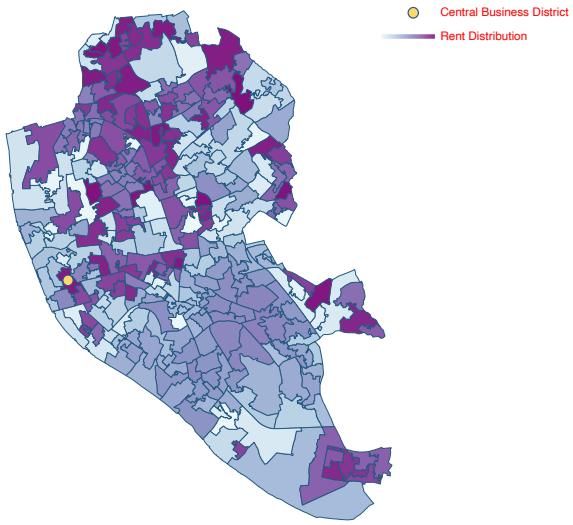

Figure 2: Rent Distribution Map in Liverpool

Limitation

This model is limited in several important ways. The model's assumptions cause the first limitation. The assumptions state that the city is formulated by reliable transportation throughout the city and objective residents under perfect competition. Therefore, the actual city conditions and irrational factors are ignored, including traffic patterns, advertising, etc. As a result, extraneous factors like these have a heavy impact on land users' decisions about where to live.

Secondly, the standard urban model states city is monocentric is overly theoretical. Academics have argued that the bid-rent model was not entirely applicable to polycentric cities, even though its fundamentals have remained the same. Such as China's polycentric Hangzhou. According to Wen and Tao (2015), in terms of housing prices, the landscape center's price gradient and influence degree were significantly higher than the traditional CBDs.

Moreover, the uncertainty of urban regeneration has questioned Alonso's model's applicability (Huston et al. 2015). The primary motivations for urban regeneration are no more extended accessibility or location because urban regeneration is a complicated process involving a wide range of interactions from various stakeholders. According to He and Wu (2005), bargaining among stakeholders and the tradeoff between their advantages is the most crucial factor. In determining redevelopment, the power relationship can precede the location (Gao et al. 2018).

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