Verification and analysis of the Standard Urban Model in Manchester

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| *Word Count (excluding list of references):* | *972* |

# Introduction

This paper will briefly discuss whether Manchester is suitable for the Standard Urban Model (Hereinafter referred to as SUM) and explain it. First, this article’s conclusion is that Manchester is essentially in line with the concept of SUM, but in some specific details, its several phenomena are contrary to SUM. By the analysis of data from diverse cities, this article will demonstrate that Manchester generally suits SUM from three aspects and analyze the limitations of SUM from another three aspects.

# Relationship between SUM and the Alonso Bid-Rent Model

As the foundation of the urban economic model, Von Thunen Theory provides a solid Basic theory for the later Alonso Bid-rent model (Alonso, 1964). Thus, the Alonso Bid-rent model is also called SUM (Blackley and Follain, 1987; Brueckner, Thisse and Zenou, 1999).

# Methods of data collection and analysis

To show Manchester realistically and objectively, this article uses Data sources like the official website of the British government, Office for National Statistics, UK Data Service, Nomis, Centreforcities, and OSM, as well as data visualization tools, such as Plumplot, Mapbox, R language, and QGIS to form information maps in QGIS or R language after cleaning the CSV data files with R language. Therefore, and therefore conclude whether it is compatible with SUM.

# Analysis of Manchester and the applicability of SUM

The following three parts are utilized to explain why Manchester basically fits the Bid-rent model.

First of all, the prominent definition of The Bid-rent model is: the renting price of land declines gradually from the city center to the suburbs. Under the guidance of the definition, we separately extracted the average housing price data per square meter in Manchester and the average rent per calendar month in 2014 (Figure 1) from the date of the British government website and GM Real Estate Agency. And it can be seen that although the housing prices generally present a negative correlation as the distance from the city center gets longer and longer, the trend is not obvious. As housing prices are less sensitive to distance than retail businesses and industry(Ahlfeldt, 2011), or the influence of other factors, the renting prices of land in some southern areas of the city are higher than those in other areas. It partially violates the Bid-rent model which I will discuss in the section about its limitations.

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| *(a)* | *(b)* |
| *Figure1:Two average rent maps for Manchester. (a)* *House price per square metre map,* *Data Source: UK government website.(b)* *Average rent per calendar month 2014 map,* *Data Source: GM Estate Agents* | |

Secondly, the land use structure of the Bid-rent model shows that downtown is occupied by retail enterprises, the second ring by industries, and the third and fourth ring by housing and agriculture respectively (Alonso, 1964). Analysis of data on land use from the data source CDRC shows that retail businesses in Manchester lie in downtown, while industrial enterprises are the main ones next to CBD (Figure 2). In this way, the more location-sensitive and better-paying commercial businesses gain access to land in the city centre (Wheaton, 1977). In a word, the entire urban land use structure of Manchester is fundamentally consistent with the Bid-rent model.

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| *(a)* | *(b)* |
| *Figure2:Two land use distribution maps for the Manchester. (a)* *Land use map of Manchester,* *Data Source: UK government website. (b)* *Commercial Retail Distribution Map,* *Data Source: UK government website* | |

Thirdly, there is a social feature of the Bid-rent model, that is, the poor choose to live in city center closer to their workplaces because they cannot afford commuting costs, while the rich are insensitive to transport costs. They choose to live in Picturesque places on the outskirts of the city (Cuberes, Roberts and Sechel, 2019). In the GMCA Research 2020 report on Manchester's housing market(Schofield, 2020), the 2019 Manchester Median Household Income map(Figure 3) shows that the family income in the city centre is the lowest. And with the increasing distance from the city center, the family income presents a higher social model. Once again, this fits well with the concept in the Bid-rent Model.

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| *Figure 3: Manchester Median Household Income,2019 distribution map*  *Data Source: UK government website, GMCA Research* |

# limitations of the SUM

Firstly, the model structure is simple and its commuting structure does not take into account the impact of traffic congestion on land rents and values. Due to the overcrowding in CBD, it will inevitably impact its land rents in the long run (Cuberes, Roberts and Sechel, 2019; Liotta, Viguié and Lepetit, 2022).

Secondly, the model is too homogeneous when considering the factors affecting land rent, furthermore, variables other than accessibility are also proven to affect land values(Hamilton and Röell, 1982; Blackley and Follain, 1987). As can be seen in the previous analysis, some southern areas of the city have high renting prices of land, perhaps it’s the result of the convenient infrastructure around the area or the picturesque surroundings. Cheshire's study found opposite rent gradients in Reading and Darlington, UK as well (Cheshire and Sheppard, 1995). A large number of analyses have shown that amenities near close to residential areas play a key role in affecting land prices, even if they are far from the city centre (Glaeser, Kahn and Rappaport, 2008).

Thirdly, trying to figure out the attributes of households in the city is too homogeneous and idealistic, the real situation is much more complex than the model, and each household has different price and cost sensitivities, which leads to a phenomenon that some low-income groups are willing to spend high commuting costs to live in a better area far from the city centre (Brueckner, Thisse and Zenou, 1999), This affects the accuracy of the Bid-rent model to a certain extent.

# Conclusion

It’s fair to say that Manchester is generally consistent with the USM theory, but it’s found that the relationship between residential housing prices and distance to the city centre is at odds with the model's Bid-rent curve in some areas, a fact that suggests that the factors certainly affect land rents and land prices are complex and multifaceted at today's society(Blackley and Follain, 1987). However, the USM model can only partially explain the factors rather than fully adapt to the real world (Ahlfeldt, 2011), and the single-centre model cannot cope with complex multi-centre cities (Narvaez, Penn and Griffiths, 2013).

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