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Measuring structural, location and environmental effects: A hedonic analysis of housing market in Wroclaw, Poland

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Abstract

This study aimed to investigate the home-buyers' preferences and assess marginal values of improvements in structural, location and environmental attributes for Wroclaw, Poland. The AMRON database of Polish Banks Association is used with observations between 2013-2014 years. The GIS technique is applied for implementation to the database location and environmental attributes. Results of the hedonic regression analysis for linear, semi-log and model with Box-Cox transformation give good explanatory power (adjusted R square more than 0,7). Most of structural and location attributes occurred statistically significant with expected signs of influence on prices, nevertheless analyzed environmental attributes occurred to be statistically insignificant.

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Keywords: hedonic pricing method, location effects, environmental effects

1. Introduction

Wroclaw is the fourth-largest city in Poland and the largest city in western Poland. It is on the River Oder in the Silesian Lowlands of Central Europe. Wroclaw is the historical capital of Silesia and Lower Silesia. Today, it is the capital of the Lower Silesian Voivodeship. The population of Wroclaw is 634 487. Wroclaw is historically subdivided

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into five boroughs: Fabryczna, Krzyki, Psie Pole, Stare Miasto, Srodmiescie (however the city is now divided into 48 districts). The city is one of the leading hubs of Polish administrative, academic, cultural, touristic and economic life.

Therefore housing prices in Wroclaw are one of the highest in Poland. Higher prices are observed only in the capital city Warsaw and Cracow. In 2015 year, according to Home Broker and Open Finance (2015), median housing prices were as high as 7423 zl/m^2 in Warsaw, 6132 zl/m^2 in Cracow and 5467 zl/m^2 in Wroclaw, while only 3863 zl/m^2 in Lodz – the third largest city in Poland in terms of population. Housing prices also vary greatly across the city of Wroclaw.

This paper discusses the results of a study which aimed to (1) investigate home-buyers' preferences in relation to structural, location and environmental characteristics of a residential property; (2) assess actual marginal monetary values attributed to separate characteristics by a hedonic pricing analysis; and (3) test the applicability of the hedonic pricing method in Poland as developing country, since the limitation in applicability of the method is developed private housing market requirement.

The paper is to investigate the structural, location-specific as much as environmental effects on the market value of a property using a hedonic model. Using GIS techniques, the paper analyzes a more precise determined set of attributes than is common for other studies. In this study structural characteristics are defined as housing attributes, such as total floor area of the apartment, number of rooms, age of the building, garage, floor level. There is one location characteristic as distance to the city center. Environmental characteristics analyzed in the study are as follows: the level of NO2 (nitrogen dioxide), particulate matter PM10, traffic noise, rail noise, tram noise and industrial noise.

This section has provided an introduction. The following elaborates on the methodology and data used in this study. Section 3 reports the results. The discussion and concluding remarks are given in Section 4.

2. Methodology and data

2.1. Study area and data collection

In this study, 1141 transaction records in Wroclaw City between 2013 and 2014 years were selected from the Polish Banks Association property transaction database, containing data regarding mainly structural characteristics and transaction prices of properties. The database is currently considered the best for property information mining and analysis in Poland. Figure 1 presents the division into the five city districts of Fabryczna, Krzyki, Psie Pole, Stare Miasto and Srodmiescie.

Fig. 1. Districts in Wroclaw.

Spatial data were obtained from the Department of Geodesy, Cartography and Cadastre in Wroclaw – registry of buildings with addresses and from Marshal Office of Lower Silesia – noise and pollution information. Spatial analysis