



Modeling urban housing market dynamics: Can the socio-spatial segregation preserve some social diversity?



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ABSTRACT

Addressing issues of social diversity, we introduce a model of housing transactions between agents who are heterogeneous in their willingness to pay. A key assumption is that agents' preferences for a location depend on both an intrinsic attractiveness and on the social characteristics of the neighborhood. The stationary space distribution of income is analytically and numerically characterized. The main results are that socio-spatial segregation occurs if – and only if – the social influence is strong enough, but even so, some social diversity is preserved at most locations. Comparison with data on the Paris housing market shows that the results reproduce general trends of price distribution and spatial income segregation.

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Don't buy the house, buy the neighborhood (Russian proverb)

1. Introduction

People's choice of residential location and the way they are distributed across cities matter, from both social and economic points of view. This paper seeks to explain, from the dynamics of price formation in an urban housing market, how individuals who are heterogeneous in their willingness to pay are distributed over a city. It shows that, under certain conditions on social interactions, housing price formation can entail income segregation, even if a space of social diversity remains.

A large literature is concerned with evaluating the extent and impact of housing price discrimination in education, housing and the labor market. While Brueckner et al. (1999) explain that the relative location of different income social groups depends on the spatial pattern of amenities in a city, Gobillon et al. (2007) highlight the adverse labor-market outcomes due to spatial mismatch, with low-skilled inhabitants of the inner-city suffering a greater distance to jobs and consequently a higher level of unemployment. Understanding the formation of prices in the real estate market and the way

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that prices are distributed over space is clearly an important issue. Following the path opened by Rosen (1974), most studies have focused on explaining prices through hedonic estimations, showing how the price per square meter can be influenced both by variables intrinsic to the apartment or house and by extrinsic variables concerning the surrounding area and its amenities. The role of these extrinsic variables has been particularly explored. Baltagi and Bresson (2011) underline how much the location influences the price of a dwelling. Ioannides and Zabel (2003), Figlio and Lucas (2004), Bono et al. (2007) or Seo and Simons (2009) emphasize the importance of the quality and density of the neighborhood, the reputation of nearby schools and the level of security. Following Tiebout (1956), these authors point out that the decision of where to live is based on families' preferences for the quality of public services and amenities, particularly education. Thus, prices on the real estate market vary with the quality of a bundle of public services which are capitalized into housing prices.

One question underlined by the studies cited above is that of people's preferences. As shown by Kirman et al. (2007), agents associate payoffs to links with their neighbors. The importance of neighbors is also emphasized by Fagiolo (2005). But do people prefer to live with people who are richer than they are, or poorer? In other words, what determines the social component of the attractiveness of a location? The literature on well-being tends to argue that people feel better when those around them are poorer—for a detailed survey see Luttmer (2005). Clark and Oswald (1994) show empirically that unemployed people are less unhappy when they live with other unemployed people. Goyal and Ghigino (2010) explore the role of shifting social interactions: they use examples to illustrate how poorer individuals lose while richer ones gain as we move from an economically segregated society towards an integrated society. In line with the literature on hedonic prices which highlights the importance of the environment, we explore here the consequences of the alternative hypothesis that individuals prefer to live with people who are at least as rich as themselves. Indeed, some preliminary studies suggest that the interplay between social preferences and the preference for a high quality of local amenities has more striking effects when the social preference is to live with richer neighbors.

When the prices depend not only on the intrinsic characteristics of the goods but also on the level of surrounding amenities, as well as on some social preferences, the space is differentiated and a social mismatch may result. Different measures of segregation have been proposed. Alesina and Zhuravskaya (2011) measure segregation of different ethnic, religious and linguistic groups within the same country from quite an exhaustive data set covering several different countries. Cutler et al. (1999) show the influence of legal barriers on social segregation, while Jenks and Meyer (1990) or Cutler et al. (2008) evaluate the effect of segregation on the socioeconomic performance of minorities. Echenique and Fryer (2007) develop a spectral index of segregation related to the characteristics of social interactions. This index is defined at the individual level and is higher when the considered individual interacts with segregated individuals. Ballester and Vorsatz (2010) propose a random-walk-based segregation measure. For the present work, interesting results are obtained by considering simple measures of multigroup segregation, which compare, for a population in a given local neighborhood, the observed distribution of a given feature (here income) with the uniform distribution. A basic segregation index in the line of Reardon and Firebaugh (2002) and Alesina and Zhuravskaya (2011) is proposed and compared to the information-theoretic measure of Theil (1967), which was introduced into economics for measuring income heterogeneity.

The pioneering modeling work of Schelling (1971) describes residential segregation as emerging from social preferences alone. Since then, extensions have been proposed by several authors in order to integrate a housing market. In Bernard and Willer (2007), the price of a house depends on an intrinsic component of the location, randomly allocated, and on the composition of the neighborhood. In Fossett and Senft (2003), the price only depends on an intrinsic component of the location uniformly distributed over the city. However, the level of quality of locations does not directly impact the choice made by individuals. In Zhang (2004), the price varies according to the density of occupation of the neighborhood, but does not take into account any measure of house quality. In Bernard and Willer (2007), the choice of a location depends on the mean status of the neighborhood, the status being a wealth-related quantity randomly allocated to the individuals. The present work goes further, dealing with the individual attractiveness of a location and its influence on prices: in our model, the individuals choose a location according to its attractiveness, which is a dynamic quantity depending on both the intrinsic characteristic of the location and the (time-dependent) social composition (measured by the levels of income) of the neighborhood. The prices then depend on the attractiveness through the market dynamics. The framework introduced here can easily be adapted to make the attractiveness reflect different characteristics of the locations and different types of social preferences. It also has the advantage of allowing for detailed mathematical analysis.

The present paper focuses on spatial income segregation, leaving aside all other features (such as ethnic characteristics) that may also cause segregation. The model proposed here takes some inspiration from Short et al. (2008) and Berestycki and Nadal (2010), who model the evolution of the spatial distribution of crime in a city, attributing to each location an attractiveness for illegal activity. The originality here is that each agent attributes to each location a specific level of attractiveness. This attractiveness results from a combination of an intrinsic or objective part, and a subjective part. The endogenous (subjective) attractiveness results from the individuals' intrinsic social preferences (for neighbors with similar or higher incomes). The main assumptions are: (i) people make decisions according to both their willingness to pay (WTP) and their individual evaluation of the level of attractiveness of the different locations, (ii) buyers, who are heterogeneous in their WTP, base their search for housing on the level of attractiveness of the location of the dwelling, (iii) agents are both buyers and sellers, and (iv) the intrinsic attractiveness is spatially heterogeneous.

The results are demonstrated through mathematical analysis and then empirically confirmed in the simulations and in the empirical analysis using data on the Paris housing market. The analysis of the stationary regime reached by the market

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