Lidia Diappi *Editor*

Emergent Phenomena in Housing Markets

Gentrification, Housing Search, Polarization

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Contents

List of Figures

List of Tables

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Introduction

1

Lidia Diappi

Abstract

Here a preliminary presentation of the book is provided. Its aim and specific point of view on housing market dynamics are presented together with some fundamental concepts underpinning all the chapters in the book. An initial explanation of the concept of emergence and an overview of its application in urban studies is followed by a presentation of the Multi Agent Systems approach and its potentialities in modeling emerging phenomena. Then a survey of the state of the art in housing market modeling allows to introduce the subjects more developed in this book: housing search, price dynamics and relocation processes, gentrification, social polarization and segregation. A synthetic description of the content of the book concludes the chapter.

The Potentialities of a Micro View in the Housing Market

Housing market dynamics have been widely explored by many studies in economics, appraisal, planning and sociology. Nevertheless, some new approaches focusing on the micro behavior of the agents involved (landlords, tenants, developers, investors) may yield unexpected insights into the evolution of this market. At present, phenomena such as gentrification, social polarization, or market cycles do not find sufficiently clear and convincing explanations if analyzed at the aggregate level characterizing many current real estate scientific approaches. But if considered as bottom-up phenomena arising from the interaction among, and the collective learning of, people searching for a home or an investment opportunity

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may be approached as emergent systems exhibiting unexpected properties generated by a new organization.

This micro view is in synergy with a new concept of planning based on the belief that any policy or plan is viable and effective if it is developed with the direct involvement of local stakeholders, and if it promotes cooperation rather than enforcement.

In this respect, the approach proposed in this book may aid understanding of the extent to which urban space and local interaction among a myriad of actors should change the dynamics and the organization of the city. This may furnish important knowledge to support planning authorities and market agents involved in revitalization or redevelopment plans.

Indeed, the success of an urban renewal policy is increasingly founded on incentives for private investors or property owners to improve dwellings and buildings. This concerns creating the most suitable conditions, in terms of the quality of urban space and accessibility, for the real estate market to improve its values. In so doing, the public policy triggers improvements in urban fabrics instead of deciding and controlling every relevant outcome in detail as the past comprehensive view of planning used to entail. Hence the various logics and interests involved are essential knowledge components for every agent intending to operate in this market.

This book is about emergence in the housing market. This means that the focus is on novelties, on the new organizations which may arise from the dynamics of the market.

Urban space is constantly changing with respect to three fundamental variables:

1. Social composition (household size, age, educational level, ethnic group)
2. Physical status (maintenance status, which determines rehabilitation or degradation dynamics)
3. Economic features (tenure, prices and rents).

Phases of revitalization or deterioration, accompanied by social filtering up or down, alternate to a greater or lesser extent in every neighbourhood of a city according to the specific role that each of them assumes within the urban real estate market as a whole. In general, this periodic oscillatory behavior stabilizes around an equilibrium, because the local housing market system is able to recover and maintain its identity. Nevertheless, at a certain time, some neighbourhoods may undergo a structural change which consists in an abrupt shift to a new stable equilibrium. They acquire a new identity differently characterized with respect to three basic dimensions: society, urban space, and economy.

This book gives insight into these dynamics by presenting theoretical and experimental analyses of three phenomena: the home-search process, gentrification, and social polarization. It is a first attempt to demonstrate the potential of this approach; it makes no claim to cover all the situations in which emergence in the housing market may appear. Instead, the aim of this book is to open new directions for research.

This brief introduction clarifies the concept of emergence in light of current developments in the study and modeling of housing market dynamics.

What Is Emergence?

At an intuitive level, the concept of 'emergence' can be considered synonymous with qualitative novelty which is unpredictable and non deducible on the basis of the previous properties. This concerns the various components in isolation or as a whole, and the properties of the system as a unit. Emergence is a 'pattern formation' characterized by a self-organizing process driven by non-linear dynamics. The non-linearity of the process makes the 'emergent pattern' unpredictable: different possibilities are open, without one being able to predict which one of them will be realized.

As Rosen pointed out (Rosen 1978, 1991, 2000), the concept of emergence is closely bound up with complexity. This is contrary to the simplicity of aggregative systems, which can be described on the basis of the behavior of their isolate parts, and it is apparent in the appearance of new properties not deducible from the model adopted.

A system's emergence may exhibit the following characteristics:

1. Changes in the micro-structure may alter macro-phenomena;
2. New and surprising forms may emerge from simple rules. As John Holland puts it, "much comes from little";
3. Their parts all begin to achieve global order simultaneously;
4. Dynamics have become significantly more important than structure in acting as the essential driver of change.

The general theory of emergence is not a unique, field-independent and scale-independent phenomenon with general disciplinary validity. Rather, it has different dynamic and interacting levels of description in order to introduce multilevel hierarchical modeling as a general approach to be used in principle.

The study of emergence processes implies the need to model and distinguish, in different disciplinary contexts, the establishment of structures, systems and systemic properties. On analyzing an emergent system, the observer detects the properties different from those of the component parts.

Systems do not only possess properties; they are also able, in their turn, to produce new emergences. Examples of the emergence of systemic properties are the cognitive abilities of natural and artificial systems, collective learning abilities in social systems like flocks, swarms, markets, or the functionalities in networks of computers.

The models of the processes introduced thus far are based on the theories of phase transition, bifurcation, dissipative structures, and multiple systems (collective beings).

In the 1980s and 1990s the concept of emergence was widely investigated in the field of urban geography in order to understand and model the formation of an urban hierarchy. Under the influence of Prigogine's paradigm of dissipative structures, his group at the Université Libre de Bruxelles (Allen and Sanglier 1981) investigated the idea of self-organizing systems as providing a new basis for understanding the dynamics of urban growth based on the fundamentals of central place theory. The Paris school then applied the model to French

agglomerations (Saint-Julien et al. 1989), while Wilson (1981) and Lombardo and Rabino (1984) developed a central place model based on disequilibrium between labour demand and supply. Camagni et al. (1986) developed an urban hierarchical model based on the driving force of innovation.

All these studies made a remarkable effort to explain the rise of new structures by using new modeling techniques which explicitly introduced the interaction between the micro level, represented by citizens freely deciding to move or to stay in the city and entrepreneurs undertaking urban activities and functions, and the macro level of the system given by the size and functional rank of each center.

Multi-agent Systems (MAS)

Since then, many improvements have been made to both conception of the model and the formalization of processes. The most important improvement has been to consider agents as intelligent entities able to learn and to interact with the environment.

Intelligence, like science (Latour 1987), is not an individual characteristic which can be separated from the social context in which it finds expression. A human being cannot develop properly if he or she is not surrounded by fellow human beings. In other words, other people are indispensable for our intellectual development.

Two main objectives are pursued by focusing on individual interaction with other agents: the first important area is the theoretical and experimental analysis of the self-organization mechanism, which comes into play when several autonomous entities interact. The second is the creation of distributed artifacts capable of performing complex tasks through cooperation and interaction.

MAS lie at the crossroads of several disciplines. The two most important of them are:

1. Parallel Distributed Processing (PDP) (Rumelhart and McClelland 1986), among them, Cellular Automata, or Neural Networks, the purpose of which is to create organizations of systems able to learn by means of the recursive processing of input; and
2. Artificial life (AL) analysis, which seeks to understand and model systems possessing life, that is, able to survive, adapt and reproduce in sometimes hostile surroundings.

As shown by the overview in Batty (2005), the MAS approach is becoming a highly popular technique with which to develop urban simulation models owing to the anthropomorphic character of agents. In fact, "*Agent-based modelling is especially powerful in representing spatially distributed systems of heterogeneous autonomous actors with bounded information and computing capacity who interact locally*." (Epstein 1997. pp. 42).

The distinctive features of Multi-Agent Systems may be summarized as follows:

- They model (spatial) behaviour at the level of individual decision-makers pursuing their own goals,
- Exhibiting a unique lifestyle and life-course,

- With personal cognitive representations of their environment,
- Perceiving and learning this environment on the basis of their experiences,
- Being part of a self-selected social network, and
- Interacting with other agents according to their own standards.

All these features have made this approach the most useful one in recent efforts to model the real estate and housing market.

Agents are able to act, and not just to reason as in traditional AI systems. They act within an environment, and their knowledge is limited and conditioned by the context. They communicate with each other.

MAS bring a radically new solution with respect to the more frequent forms of modeling used, such as differential equations or transition matrices, by enabling the direct representation of individuals, their behaviors and their interactions. Multi-agent simulation is based on the idea that it is possible to represent in computerized form the behavior of entities which are active in the world. It is thus possible to represent a phenomenon as an outcome of interactions arising from an assembly of agents with their own operational autonomy.

The micro-analytical models used to simulate the agent-based environment are able to control the agent's characteristics and to reproduce a series of experiments, as we were dealing with laboratory situations, moving individuals around, changing their behaviors and modifying the environmental conditions. Integration and flexibility are the principal advantage of MAS modeling, which partially off-sets the difficulty of validating the research outcomes, since the traditional rules of parsimony and the independence of validation do not easily apply to models of this kind, as Devish et al. point out in this book.

The micro-scale description which characterizes the MAS approach, with agents representing individual decision units, is suitable for articulating micro-spatial, socio-economic assumptions and other well-formed behavioural theories of urban processes, including land-use change. This is because many simulation tools use parallel distributed computing, which is particularly suited to describing interactions between subjects. This permits the generation of new, socially-based types of knowledge which can greatly increase the effectiveness of analysis, simulation and planning.

The State of the Art in Housing Market Modelling

Housing Search, Price Dynamics and Relocation Processes

Numerous contributions to the housing market literature have used theories of search and matching to explain vacancies, mobility and prices (Arnott et al. 1999; Martinez and Roy 2004). This approach, which Anas has termed "New Housing Economics", typically treats some aspects related to idiosyncratic differentiation in housing units and tastes, but ignores the causes of residential mobility and assumes that the supply is exogenously given (Arnott et al 1999; Anas 1997; Igarashi and Arnott 2000).