Deliverable 3.1

Comprehensive Theoretical Models
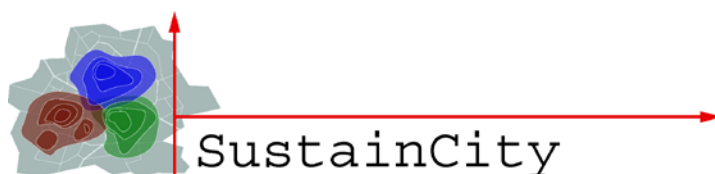
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Comprehensive Theoretical Models

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Deliverable 3.1 focuses on several improvements to the existing base modules of UrbanSimE under the project SustainCity (www.sustaincity.org). A total of seven theoretical models have been developed, which will relax restrictive assumptions in the current version of Urban-SimE. The theoretical models are presented in separate Working Papers. These Working Papers are assembled together to produce Deliverable 3.1. The major concerns of the developed models were to improve the assumptions behind real estate investments, location and real estate decisions within couples, equilibrium mechanisms, real estate stake holders and firmographics. These are all key ingredients of UrbanSim, and are used to develop UrbanSimE, the European version of UrbanSim.

Two Working Papers have been written in the context of real estate investments. In Working Paper 3.1, the portfolio choice and the investment on housing of an investor over his life span are analyzed when this household is facing exogenous random shocks. The investor has the flexibility to decide how much to invest on financial assets, on housing units owned as well as on perishable goods. The initial problem was formulated on the basis of simple portfolio optimization. Then, it was expanded to take into account independent and exogenous random shocks. Three basic cases were considered: the household totally ignores the random shocks and optimizes investments as if no shock can occur in the future (myopic behavior); the household is informed about the future consequences of the shock (perfect foresight); the household is rationally adjusting its behavior taking into account the distribution of shocks which may occur later on (rational expectation). The solution for each case is provided in the Working Paper 3.1. It is proved that the financial shares are not affected while the consumption ratios are reduced when the household is significantly risk averse (under the hypothesis of relative risk aversion).

Working Paper 3.2 deals with residential location choices of individuals in a dynamic context with perfect information. The paper addresses simultaneously economic choices of residential location, dwelling and tenure and their dynamics (in a two period model) while accounting for interaction with transportation market, with demand for local amenities, and with financial investment constraints. This simple model is then illustrated using real data collected in the large Paris area.

The current version of UrbanSimE does not distinguish between individuals and households. The theoretical model in Working Paper 3.3 considered the case of households with husband and wife. The bargaining power of the household members is considered as an important factor for the decision of selecting residential location. The spouse are both active and have different residential location, which explains that each spouse may prefer a specific residential location. This bargaining power has been neglected in previous transport and urban economics literature, which leads to biased measures of values of time. In the Working Paper 3.3 it is shown that it could have important consequences in economic analysis (for example, neglecting the bargaining power within couples may change significantly the value of time). A new method has been suggested to calculate values of time in the context of couples. It is shown that age of the women as well as nationality of men play a crucial role in determining bargaining power among the couples in the choice of residential locations.

In Working Paper 3.4, the role of the equilibrium mechanism has been studied. The paper investigates the role of anticipations in the housing market and the possible interplay with transport investments. The key agents in this model are the government, and the housing entrepreneurs (besides households, and firms). A simple two region model was used where one region is subject to an unanticipated productivity shock that increases the demand for labor in that region. The demand for labor can be met by additional commuting, by more housing or by additional investment in transport. The result depends on the expectations of the developers, when there is no transport investment. Transport investments involve longer construction periods and lifetimes than housing investments. In case of both transport and housing investments, the steady state equilibrium mainly depends on the anticipation of the transport agency. Depending on the specific expectation of the agents (myopic, perfect foresight, imperfect) over- or under investments in transport infrastructure has been observed.

Regime switching models has been developed and applied on real estate market in Working Paper 3.5. This technique allows taking into account the existence of different regime which explain housing prices. The regime and the switching probabilities have been determined endogenously. The study was based on data from Paris region. This Working Paper concludes that real estate markets exhibit regime switching. The authors have twin their model with a standard hedonic regressions model. The proposed technique allow for better prediction of the distribution of the future housing prices.

Working Paper 3.6 is about the qualitative study of real estate developers in the canton Zurich. This paper tests the hypothesis that developer types do have an influence on the development events that eventually occur. The study was based on a survey where 11 real estate developers are interviewed. The interviews are semi structured following a guideline with 5 sections on the developer's characteristics, the decision process, the projects, the project locations and the assessment of market conditions. The authors found that the behaviour of developers varies in terms of decision criteria, considered information base, search space and fulfilled tasks.

Working Paper 3.7 focuses mainly on modeling firmographic events in Ile-de-France including the differences by activity sectors. A clear understanding of behavior of establishments over time is crucial in forecasting the development of the region, and related land use and transportation issues. The changes in business units affect the spatial distribution of jobs and economic activities in the urban areas. To describe the life cycle of the establishments, the authors propose a threefold firmographic model which explains the disappearance, evolution and location choice of the business units. They also compute the creation rates across various activity sectors and all counties of Paris Region to get possibly the most detailed overview of changes of the business units. Firmographic models, which were built in Working Paper 3.7 provide a potentially very useful tool to develop policies aiming to encourage sustainable economic growth and preserve social systems.

Working Papers that belong to this Deliverable are:

Working Paper 3.1:   Optimal housing consumption and portfolio choice with exogenous random shocks
André de Palma and Jean-Luc Prigent

Working Paper 3.2:   Household location, dwelling and tenure types in a dynamic context
Matthieu de Lapparent, André de Palma and Nathalie Picard

Working Paper 3.3:   Couple Residential Location and Spouses workplaces
Pierre-André Chiappori, André de Palma and Nathalie Picard

Working Paper 3.4:   A small model for equilibrium mechanisms in an agglomeration
André de Palma, Stef Proost and Saskia van der Loo

Working Paper 3.5:   Regime Switching Models: An application to the Real Estate Market in Ile-de-France
Charles Maurin, André de Palma and Nathalie Picard

Working Paper 3.6:   Uncovering the heterogeneity of real estate developers in the canton Zurich
Christof Zöllig and Kay W. Axhausen

Working Paper 3.7:   Firmographics: Guideline for implementation in UrbanSim and for estimation
Sabina Buczkowska, André de Palma, Kiarash Motamedi and Nathalie Picard

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