URBAN POLICY

Shedding light on urban policy

Urban economic models should raise the quality of debate about planning at the metropolitan level. Now research shows how this can be done.

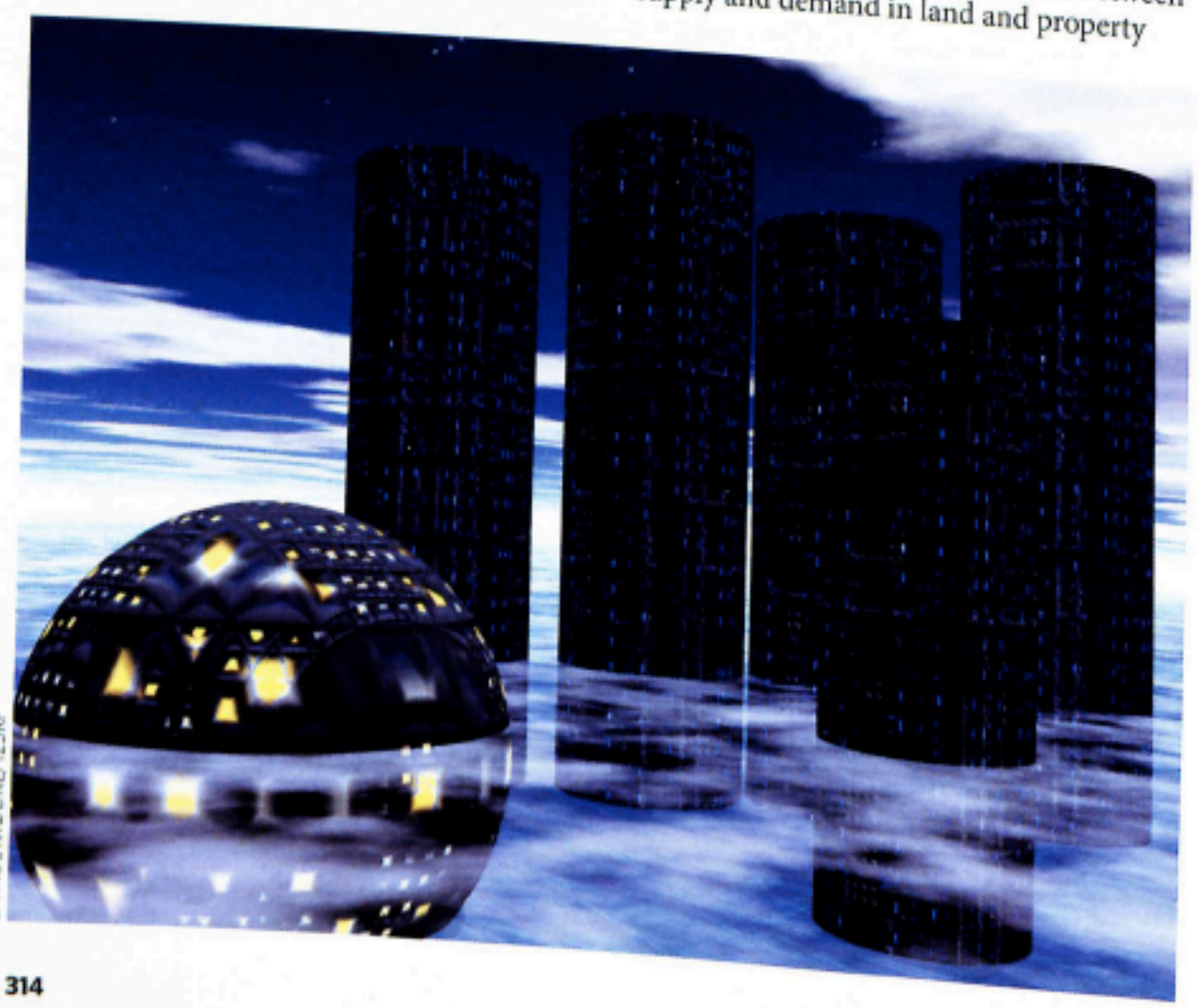
Richard J. Arnott

Most debate over urban public policy, especially land-use policy, is rudimentary and parochial. The majority of citizens who participate in such debates consider private rather than social interests, with concerns restricted to their neighborhood or, even more narrowly, to the market value of their properties. Local government planning agencies typically lack the expertise and resources to undertake sound analysis of land use, and must use data that are fragmentary, outdated and dirty. What expert advice is drawn on is often ideological; economists advocate pricing and market-based policies, and planners and other social scientists, distrusting market outcomes, argue for regulatory changes. In this dismal policy environment, metropolitan, regional and national planning agencies can do much to raise the level of policy debate. They can take a broader perspective, above the fray of local politics. They also have the funding to assemble metropolitan databases, as well as the analytical expertise that local governments lack. An increasing number of planning agencies are using urban simulation modelling, particularly for land-use planning. Now writing in *Nature Climate Change*, Vincent Viguié and Stéphane Hallegatte[1] offer a way forward for the design of urban climate policies. They examine the effects of different climate policies on metropolitan Paris with a simple economic urban simulation model, and show the superiority of a policy mix over single measures.

An urban simulation model describes how a highly simplified representation of the metropolis under study functions, and solves for how it will respond to proposed policies. There are two broad classes of urban simulation models — economic and non-economic. Economic models incorporate the stabilizing effect of prices. For example, if a resource is running low, its price will increase and economic agents — firms and households — will cut back on its use. The first urban simulation models were non-economic. In Lowry[2], and its descendents, including Waddell[3], disequilibrium between supply and demand in land and property markets is dealt with through arbitrary quantity adjustments. In Forrester[4], owing to the absence of a stabilizing feedback through prices, the city almost always goes off the rails in some doomsday scenario or another. (See Nordhaus[5] for an economist's critique of Forrester's similar *World Dynamics*[6].)

Most economic urban simulation models are computational general equilibrium (CGE) models. CGE models contain three groups of agents, households, firms and governments, and comprise three modules — ones that specify demands and supplies as functions of prices, and a market-clearing module that solves simultaneously for the prices that equate demand and supply in all markets. CGE models are now routinely used in analysing trade, tax and environmental policies, which impact the economy through multiple markets. Urban CGE models differ from other CGE models in that they include location-specific land and property markets.

Viguié and Hallegatte[1] provide an excellent example of how even simple economic urban simulation modelling can inform land-use planning and policy debate, and shed some light in the policy gloom. The researchers apply a carefully constructed and calibrated urban CGE model, developed within planning agencies, to examine the individual and combined effects of three illustrative climate policies — a greenbelt policy, public transport subsidization and zoning to reduce flooding risk — on metropolitan Paris. To understand the economic logic of their model, consider their public transport subsidization policy, which entails a reduction in the average fare and a switch from a zonal-fare to a single-fare system, so that fares fall proportionally more at locations further from central Paris. Near major transit routes the demand for housing increases — by more at more distant locations — which causes housing rent to rise, housing unit size to fall and the metropolitan area to expand outwards. The opposite occurs at other locations, which become less attractive than before the policy. Compared with the status quo, the policy does well in mitigating climate change (by reducing car travel) and improving housing affordability (by reducing



central Paris rents), but poorly in terms of biodiversity protection (by expanding the developed area). The researchers come to the sensible conclusion that a judicious mix of policies works best, by significantly improving on the status quo according to all the specified objectives.

Relative to many simulation models in the sciences and in other branches of economics, and relative to urban CGE models at the research frontier[7], Viguié and Hallegatte's model is unsophisticated. It solves only for long-run policy effects, which because of the durability of buildings and infrastructure can take a very long time to occur; it treats Paris as having a single centre for non-local employment[8–10], but suburban employment subcentres are becoming increasingly important; it contains no economic forces accounting for the spatial concentration of economic activity that is the defining characteristic of cities; it ignores the heterogeneity of firms and households; it takes land-use restrictions as given rather than as determined by economic forces working through political channels; and it provides only a crude treatment of uncertainty. The reader should therefore receive the paper's numerical results with some scepticism.

These criticisms notwithstanding, Viguié and Hallegatte's model[1] does capture well, both qualitatively and quantitatively, the long-run effects of the various climate policies that operate through metropolitan land and property markets. Furthermore, owing to a combination of the model's simplicity and its well-understood microeconomic foundations, its results are easy to understand. The study has didactic value too, in getting the journal's readers, as well as participants in urban policy debate, to think about policy issues from a broad, metropolitan perspective and helping them to gain intuition for how markets, especially land and property markets, allocate scarce resources at the metropolitan level. Finally, the paper provides a concrete subject for discussion. Debating over how different policy objectives should be weighted and how the metropolitan economy should be modelled is far more conducive to enlightened policy choice than exchanging shibboleths or taking policy stands based on parochial self-interest. ❐

Richard J. Arnott is in the Department of Economics, University of California, Riverside, 900 University Avenue, Riverside, California 92521, USA.
e-mail: richard.arnott@ucr.edu

References

1. Viguié, V. & Hallegatte, S. *Nature Clim. Change* **2**, 334–337 (2012).
2. Lowry, I. *A Model of Metropolis* (RAND Corporation, 1964).
3. Waddell, P. *J. Am. Plann. Assoc.* **68**, 297–314 (2002).
4. Forrester, J. *Urban Dynamics* (Pegasus Communications, 1969).
5. Nordhaus, W. *Econ. J.* **83**, 1156–1183 (1973).
6. Forrester, J. *World Dynamics* (Pegasus Communications, 1973).
7. Anas, A. & Liu, Y. *J. Regional Sci.* **47**, 415–455 (2007).
8. Alonso, W. *Location and Land Use* (Harvard Univ. Press, 1964).
9. Mills, E. *Studies in the Structure of the Urban Economy* (Johns Hopkins Univ. Press, 1972).
10. Muth, R. *Cities and Housing* (Univ. Chicago Press, 1969).