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Social networks and interactions in cities ☆

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Abstract

We examine how interaction choices depend on the interplay of social and physical distance, and show that agents who are more central in the social network, or are located closer to the geographic center of interaction, choose higher levels of interactions in equilibrium. As a result, the level of interactivity in the economy as a whole will rise with the density of links in the social network and with the degree to which agents are clustered in physical space. When agents can choose geographic locations, there is a tendency for those who are more central in the social network to locate closer to the interaction center, leading to a form of endogenous geographic separation based on social distance. We also show that the market equilibrium is not optimal because of social externalities. We determine the value of the subsidy to interactions that could support the first-best allocation as an equilibrium. Finally, we interpret our model in terms of labor-market networks and show that the lack of good job contacts would be here a structural consequence of the social isolation of inner-city neighborhoods.

JEL classification: D85; R14; Z13

Keywords: Social networks; Urban-land use; Spatial mismatch; Network centrality

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1. Introduction

Cities exist because proximity facilitates interactions between economic agents. There are few, if any, fundamental issues in urban economics that do not hinge in some way on reciprocal action or influence between or among workers and firms. Thus, the localization of industry arises from intra-industry knowledge spillovers in Marshall [61], while the transmission of ideas through local inter-industry interaction fosters innovation in Jacobs [50]. In fact, the face-to-face interactions that Jacobs emphasizes are believed to be so critical to cities that Gaspar and Glaeser [29] (and others) have asked whether advances in communication and information technology might make cities obsolete. As Glaeser and Scheinkman [34, p. 90] note: "Cities themselves are networks and the existence, growth, and decline of urban agglomerations depend to a large extent on these interactions".

The interactions that underlie the formation of urban areas are also important in other contexts. Following Romer [71,72], Lucas [59] views the local interactions that lead to knowledge spillovers as an important component of the process of endogenous economic growth. Non-market interactions also figure prominently in contemporary studies of urban crime (Glaeser et al. [33], Verdier and Zenou [79]), earnings and unemployment (Topa [77], Calvó-Armengol and Jackson [19], Moretti [63], Bayer et al. [5], Zenou [84]), peer effects in education (De Bartolome [22], Benabou [7], Epple and Romano [24]), local human capital externalities and the persistence of inequality (Benabou [8], Durlauf [23]) and civic engagement and prosperity (Putnam [70]).

While there is broad agreement that non-market interactions are essential to cities and important for economic performance more broadly, the mechanisms through which local interactions generate external effects are not well understood. The dominant paradigm lies in models of spatial interaction, which assume that knowledge, or some other source of increasing returns, arises as a by-product of the production of marketable goods. The level of the externality that is available to a particular firm or worker depends on its location relative to the source of the external effect – the spillover is assumed to attenuate with distance – and on the spatial arrangement of economic activity. There is a rich literature (whose keystones include Beckmann [6], Fujita and Ogawa [28], and Lucas and Rossi-Hansberg [60]) that examines how such spatial externalities influence the location of firms and households, urban density patterns, and productivity. There is also a substantial empirical literature (including Jaffe et al. [51], Rosenthal and Strange [74,75], and Argazi and Henderson [2]) demonstrating that knowledge spillovers do in fact attenuate with distance. Finally, there are more specific models that treat part of the interaction process as endogenous. For example, Glaeser [32] examines a model in which random contacts influence skill acquisition, while Helsley and Strange [40] consider a model in which randomly matched agents choose whether and how to exchange knowledge.

This paper uses recent results from the theory of social networks to open the black box of local non-market interactions. We consider a population of agents who have positions within a social network and locations in a geographic space. As in Goyal [35], Jackson [47] and Jackson and Zenou [49], we use the tools of graph theory to model the social network. In this model the value of interaction effort increases with the efforts of others with whom one has direct links in the social network. As in Helsley and Strange [41] and Zenou [85], all interactions take place at a point in space, the interaction center.

To be more precise, we consider a geographical model with two locations, the center, where all interactions occur, and the periphery. All agents are located in either the center or the periphery (geographical space). Each agent is also located in a social network (social space). We