Knowledge spillovers in cities: An auction approach

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Abstract

This paper proposes a micro-foundation for knowledge spillovers. I model a city in which free knowledge transfers are bids by experts to entrepreneurs who auction jobs. These knowledge bids resemble a consultant's pitch to a potential client. Two fundamental properties of knowledge underlie the model: First, it is often necessary to reveal some knowledge to demonstrate its value. Second, knowledge is freely reproducible. Larger cities generate more meetings between experts and entrepreneurs, resulting in more learning and better matches. Larger cities also foster competition for jobs, which motivates experts to raise their knowledge bids. These results demonstrate how competitive behavior can be a source of agglomeration economies, and contribute to explain the higher productivity of urban workers.
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1. Introduction

Urban environments have the potential to catalyze learning and networking activity. In Alfred Marshall's influential argument, chance encounters and imitation take place whenever individuals live in close proximity, and knowledge spillovers in cities happen quite inadvertently.[2] Intuitively, however, knowledge spillovers also result from deliberate individual decisions (Helsley and Strange [27]). The motivation behind these individual decisions remains little understood,[3] in the face of growing evidence on the crucial role that knowledge spillovers play in shaping the geography of production in modern economies.

The main objective of the paper is to explain why people sometimes let their knowledge 'spill', instead of selling it in markets. I model uncompensated knowledge transfers (knowledge spillovers) as bids by experts to entrepreneurs who auction jobs. An expert could be a consultant pitching an idea to a potential client, for instance a free advice on how to advertise a product. Unlike extant literature that focuses on imitation and reciprocity, this explanation for knowledge spillovers relies on competitive behavior and on the fundamental properties of knowledge as an input. I use such knowledge spillovers as a micro-foundation for agglomeration economies, to show how large cities improve knowledge diffusion and offer better job matches between experts and entrepreneurs. Interestingly, heightened competition for jobs enhances experts' willingness to transfer free knowledge, providing a new explanation for the higher productivity of workers in large and dense urban areas.[4]

Interest in urban knowledge diffusion stems from the presumption that density facilitates face-to-face transfers of productive ideas. Patent citations provide direct evidence that physical proximity favors knowledge diffusion, and Jaffe, Trajtenberg, and Henderson [32] find that a patent holder is more likely to cite other patents from inventors who are geographically close. The importance of face-to-face interactions is revealed in the very localized nature of production externalities.[5] Rosenthal and Strange [50] and Arzaghi and Henderson [4] find that the productivity gains from spatial proximity to other people decay sharply with distance. This decay suggests that face-to-face interactions, whose cost is especially sensitive to distance, are prominent among the factors making people in larger and denser cities more productive.

Wage regressions corroborate the importance of learning in cities. Workers in large cities earn on average 30% more than workers in rural areas (Glaeser [22]), but this premium does not immediately accrue to a worker upon moving to a bigger city. Much of these earning gains arise only as a worker accumulates experience in the city (Glaeser and Maré [25], De la Roca and

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[2] See Marshall [41]. Glaeser [21] provides a model formalizing this idea, in which knowledge flows through imitation of the old by the young, with the old getting a share from the young's returns to a successful skill transfer.

[3] Puga [46], in his review of the literature, argues that: "We have good models of agglomeration through sharing and matching, but not a deep enough understanding of learning in cities."

[4] A vast empirical literature in urban economics establishes that firms and individuals in larger agglomerations are more productive; see Puga [46] for a review of the literature. The classic explanations for this productivity advantage are so-called 'agglomeration economies'; processes through which interactions between firms or individuals are facilitated in cities, in a way that makes these units more productive.

[5] Few studies are able to directly assess the importance of knowledge spillovers relative to other agglomeration forces. Rosenthal and Strange [49] find evidence supporting all three sources of agglomeration identified by Marshall [41] – input sharing, labor pooling and knowledge spillovers – with labor pooling being the best predictor of industry agglomeration. Ellison, Glaeser, and Kerr [15] also find evidence for all three sources by looking at coagglomeration patterns for different industries, but conclude that input sharing (specifically, proximity to suppliers and customers) has the most explanatory power.