



Heterogeneous returns to knowledge exchange: Evidence from the urban wage premium[☆]



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ABSTRACT

We posit that some kinds of knowledge are harder to exchange remotely and thus certain types of workers trading in certain types of knowledge benefit more from close physical proximity to others. We first present a theoretical framework in which individuals randomly search for partners to exchange ideas, but that the returns to finding a partner are heterogeneous. In particular, some knowledge is more dependent on interpersonal exchange and most productive when shared with similar individuals. In this manner, we propose that agglomerative environments favor individuals with knowledge that is typically associated with “soft skills” where creativity and informal networking are important. We test this prediction using the most recent sample of the American Community Survey (ACS) in which college graduates are asked about their undergraduate major. Controlling for demographic and regional productivity effects, we find that the urban wage premium varies considerably across majors. In line with the predictions of our model, people with non-STEM majors appear to benefit more from locating within a city. In the spirit of our results for majors, we also find that terminal degrees associated with the mastery of any existing cannon of knowledge such as a J.D. or M.D. experience a smaller urban wage premium.

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1. Introduction

There has been great progress toward understanding the determinants of agglomeration economies in recent years. Through this research, spillovers of knowledge have emerged as one of the major forces behind agglomerative behavior. The role of information sharing in cities was first posited by Marshall (1890, p. 352), “Great are the advantages which people following the same skilled trade get from near neighborhood to one another.” The seminal work of Jacobs (1969) also emphasizes that information sharing plays a large role in urbanization and Lucas (1988) stresses that cities provide a highly

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fertile environment for the transmission of information between individuals. Kuznets (1962, p. 328) notes that “creative effort flourishes in a dense intellectual atmosphere . . .” suggesting that cities might be fonts for new ideas in particular.

Formal models of information sharing include Glaeser's (1999) construction of a theoretical framework in which cities promote the transmission of knowledge along the vertical dimension. That is, cities promote learning by younger, less skilled workers from older, skilled individuals. Berliant et al. (2006) develop a random matching model of spillovers between individuals with horizontally differentiated types of knowledge. In particular, they posit there is an optimal range of idea-diversity between people. Consequently, optimizing agents select a range of individuals with different types of knowledge to collaborate and share ideas.

Existing work on human capital and agglomeration economies recognizes that individuals are different – they either have different types of knowledge or different levels of knowledge. However, an important limitation was that knowledge was treated as symmetric and the external gains from human capital were identical. In this manner, existing theoretical models would predict that the tendency of firms to co-agglomerate would be the same across industries. However, a wide array of evidence demonstrates that there are differences in the potential to learn from others. For example, Bernstein and Nadiri (1989) find that there are substantial differences in R&D spillovers across industries.¹ In fact, Audretsch and Feldman (1996) point out that there are substantial differences in the tendency of innovations to cluster spatially across industries and this clustering increases with the number of skilled workers in the industry. Moreover, both Ellison and Glaeser (1997) and Ellison et al. (2010) show that there are sizable differences in the tendency of firms to co-agglomerate.

One might be inclined to believe that knowledge spillovers play the greatest role in promoting productivity in high technology sectors where formal measures of human capital are an obvious input to production. Yet, Glaeser and Kahn (2001) find that high human-capital industries such as finance have a strong tendency to agglomerate. Conversely, Lee (2010) finds a flat or even negative urban wage premium for medical workers. However, Lucas (1988, p. 538) conjectures “New York City's garment district, financial district, diamond district, advertising district, and many more are as much intellectual centers as is Columbia or New York University.” As fashion and advertising are highly reliant on creativity and collaboration, Lucas also considers that agglomeration economies are likely to emerge in areas based upon “soft” skills. Arzaghi and Henderson (2008) explicitly focus on information sharing in the advertising sector in New York City where networking and creative vision are important.

The objective of this paper is to investigate the role of agglomeration according to an individual's human capital. In contrast to previous theoretical research, we recognize that the benefits from information sharing are likely to vary across individuals with different types of human capital. As our primary focus is on horizontal differences in knowledge, we extend the framework of Berliant, Reed, and Wang by positing that the benefits of matching vary across individuals. In our framework, some individuals have types of knowledge with large potential gains from information sharing and others less so.

The heterogeneous returns to inter-person knowledge exchange could arise for a number of reasons. Some types of knowledge may only be acquired with diligent study or extensive laboratory work. Workers who specialize in this type of knowledge learn more from technical manuscripts and formal education than social interactions. An alternative but functionally equivalent hypothesis is that the type of knowledge exchanged may depreciate at different rates. For example, medical knowledge may exhibit slow and steady but permanent advance whereas the entire stock of fashion knowledge from three years ago may be effectively worthless. In either case, it may be more important for some types of knowledge workers to meet than others. Our model allows the benefits of agglomeration economies to vary across the types of knowledge.

Our hypothesis is intuitive and motivated, in part, by existing evidence. Notably, Berger (1988) studies earnings growth from experience across individuals with different college majors. The strongest gains from experience occur amongst business and liberal arts majors. The smallest gains occur in science and education. In fact, the gains from experience in business and liberal arts are more than twice as large as the other two fields of study. The implication is that some people learn more and become more productive from on the job training than do others. We posit that this learning occurs faster (and productivity and compensation increase more) in larger cities where match quality improves.

Following the equilibrium predictions of the model, we proceed to test it empirically. We build on the work of Glaeser and Mare (2001) and Bacolod et al. (2009) where productivity gains from agglomeration are manifest in the urban wage premium. If different types of human capital benefit more from good matches and match quality improves with city quality, then the urban wage premium should vary with an individual's type of knowledge. In this manner, our work complements recent contributions by Abel and Deitz (2015) who find that larger labor markets better align an individual's job requirements to their previous human capital investments. The key observation behind our work is that the desire for better information sharing in urban settings depends on an individual's type of human capital.

In order to examine how the urban wage premium varies across types of human capital, we study individuals in the American Community Survey (ACS). The ACS is particularly well-suited for our question as it contains college graduates' field of degree (major). The major serves as the empirical counterpart for an individual's type of knowledge in the model.

¹ In addition, Bernstein (1988) observes differences in intra-industry spillovers and inter-industry spillovers in Canadian data. Bernstein and Yan (1997) study differences in intra-national and international spillovers for manufacturing industries in Canada and Japan. Interestingly, they find that in some industries spillovers are more likely to occur from Canada to Japan than Japan to Canada. In this vein, Holod and Reed (2009) examine the role of asymmetric spillovers across countries in a Lucas-type human capital model of economic growth.

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