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Cities, matching and the productivity gains of agglomeration

Fredrik Andersson [a], Simon Burgess [b], Julia I. Lane [c,*]

[a] *Cornell University, Cornell Institute for Social and Economic Research, 391 Pine Tree Road, Ithaca, NY 14850, USA*
[b] *University of Bristol, CMPO and CEPR, Department of Economics, University of Bristol, 8 Woodland Road, Bristol BS8 1TN, UK*
[c] *NORC/University of Chicago, 55 E Monroe St, Suite 4800, Chicago, IL 60603, USA*

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Abstract

The striking geographical concentration of economic activities suggests that there are substantial benefits to agglomeration. However, the nature of those benefits remains unclear. In this paper we take advantage of a new data set to quantify the role of one of the main contenders—the matching of workers and jobs. We show that thicker urban labor markets are associated with more assortative matching in terms of worker and firm quality. When we estimate establishment-level production functions we also find evidence of complementarities between worker and firm quality. Putting together the production and matching relationships, we show that production complementarity and assortative matching is an important source of the urban productivity premium.

JEL classification: R23; R12; J24

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1. Introduction

Cities are home to 75% of Americans, yet occupy less than 2% of the land area of the lower 48 states.[1] This striking geographical concentration of economic activities, evident in both de-

* Corresponding author.
E-mail address: Lane-Julia@norc.uchicago.edu (J.I. Lane).

[1] These facts are from Rosenthal and Strange [14].

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veloped and developing countries, suggests that there are substantial benefits to agglomeration Yet it has been difficult to econometrically identify the major sources of these benefits, primarily due to data deficiencies (Rosenthal and Strange [14]). The contribution of this paper is to use a unique data set to examine the role of one potential source: the improved matching between firms and workers made possible by dense urban labor markets.

The underlying idea is straightforward. Suppose that both workers and firms differ in quality. If production is characterized by complementarity between worker and firm quality, productivity will be higher when workers and firms are assortatively matched. Urban areas will be more productive than rural if they are characterized by a greater degree of assortative matching, which would arise if dense markets have lower search frictions.

In order to empirically test this idea, we need to quantify the strength of two relationships: the presence of complementarity between worker and firm quality in production, and the degree of spatial variation in assortative matching. Our data, which are universal and longitudinal in both firms and workers, are uniquely suited to address the issue. We can test the first relationship because we have direct measures of "worker quality" (or the labor-market value of human capital that is independent of the identify of the employer) and "firm quality" (or the firm-specific wage mark-up) and we can use these to estimate the complementarity between the two in firm level production functions. We can test the second relationship because we also have information on the spatial coordinates of each worker and each firm. These data allow us to characterize the joint distribution of worker and firm quality and to describe how it varies over different labor market densities.

Our data show that there is a significant urban productivity premium. The raw average productivity differential between firms located in counties with employment per square mile in the upper decile and those located in counties with employment per square mile below the median is between 0.09 and 0.18 log points across the states in our sample, in favor of the urban firms. These raw productivity differentials cannot be accounted for by differences in industry structure between urban and rural areas—in fact the urban productivity premium is larger within industry. We show that the two conditions for matching to matter are met: there is complementarity in production, and workers and firms are more assortatively matched in dense labor markets. Putting the matching and the production function results together, we calculate how important the effect of location is for firm productivity and show that labor market matching is an important source of the urban productivity premium.

The theoretical background for this idea originates from the assortative matching observed in labor and marriage markets [6]. This argument was extended to a production framework by Kremer and Maskin [12], and Shimer and Smith [15] provided general results on the existence and characterization of equilibrium in a context with search frictions, and established restrictions on the production function that ensure positive assortative matching (PAM).[2]

The analysis in this paper derives most directly from work by Burdett and Coles [7] and Delacroix [9]. Burdett and Coles [7] set out a model with heterogeneity on both sides of the market, Nash bargained utilities, and an exogenous arrival rate of offers. They show that five types of pure strategy equilibria[3] will occur for different specifications of the joint production function. In particular sufficient complementarity in production yields PAM (the 'elite' equilibrium in their description). The most important result of their work from the point of view of this paper is that

[2] These are supermodularity of the production function, but also of its log first- and cross-derivatives (see p. 344).

[3] They note that mixed strategy equilibria can occur but they ignore them.