

Labor Matching in Cities and Technological Revolution

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"It is difficult to understand why some countries are poor and others rich without first understanding why some cities within a country are poor and others rich"

- Enrico Moretti

What are the mechanisms behind urban agglomeration in the knowledge economy? To answer this question, it is fundamental to understand why densely populated areas are so much more productive. More than ever before, the traditional "bricks-and-mortar" drivers of economic growth are giving way to an economy based on "brains and creativity." Competitive differentiation today is more likely to be based on the ability of the workforce to create and absorb skills and innovation than on traditional drivers such as available natural resources, physical labor or manufacturing prowess. As a result, the skills, aptitude, knowledge, creativity and innovation of a workforce – which collectively can be viewed as the talent pool in the economy – have become increasingly important drivers of economic growth and activity. Cities, as hubs of the global economy, are the focal points for this transformation.

Urban economists generally accept the existence of agglomeration economies, i.e, the phenomena that productivity rises with urban density, where one well established result is that wages increase faster in dense urban centers (Glaeser & Mare 2001). Moretti (2013) notes that workers in dense labor markets earn ~30% more than workers in markets of smaller size, and that this difference continues to rise. There is a thriving discussion regarding what explains this wage premium in urban environments. Among the mechanisms proposed are that cities reduce transportation costs, facilitate transmission of tacit knowledge, and generate thick labor markets that are better at matching skills to occupations. This study aims to examine these different mechanisms that could account for the agglomeration externalities we see in the data and put forth that technological revolution

together with features of cities as matching platforms can shape the divergence in talent pool across cities.

The purpose of our study is two-folds. First, we hope to make an empirical contribution to the urban wage premium phenomenon with a unique data that allows us to characterize the mismatch between skills required by occupations and inherent skills possessed by workers. We assess how well skills match to different types of occupations by city and evaluate the importance of skill mismatch in explaining the urban wage gap. Second, we seek to understand how features of occupations, including those that relate to technological revolution, interact with features of the local labor markets to generate agglomeration economies, and more broadly, divergence across regions.

While measuring different types of unobserved workers skills is difficult and it is even harder to discern when a worker is more efficient matched to one's occupation, we tackle this problem with a unique survey that provides innate cognitive ability measures for a selected group of 30,000 individuals. Relative to prior studies that use the National Longitudinal Survey of Youth 1979, our data provides more dimensions of cognitive skills beyond math and verbal skills, including memory, perception speed, and information processing abilities. More importantly, our data includes a larger sample across geographic regions enabling us to conduct analyses based on city-occupation pairs as the unit of analysis. We show that our cognitive measures meaningfully explain worker productivity at the aggregate and also that they matter differently for different types of occupation. We further complement our data with occupation skill requirement measures created by the U.S. department of labor to assess how well cities match workers into their respective jobs.

The empirical analysis of the paper is structured as follows. We first situate our study in the urban economics literature, by identifying the existence of an urban wage premium in our data. Then using our measures of cognitive skills, in addition to what has been used in prior studies, we evaluate whether adding more dimensions of unobserved ability accounts for the urban wage premium. Our results suggest that unobserved ability does not explain the urban wage premium. Furthermore, the fact that we observe a similar distribution of unobserved

cognitive skills across dense and less dense regions suggest that selection on unobservable is unlikely to be generating the urban wage premium.

We then turn to the argument that thick labor markets that cities generate facilitate more efficient allocation of skills to the appropriate jobs and evaluate the implications of being in a less urban area. We establish that dense regions allocate talent more efficiently by showing that, given same levels of regional talent, workers in thick labor markets are more qualified for their jobs. We quantify the cost of this mismatch for a worker in a less dense city; preliminary results suggest that being in an urban environment that is one standard deviation denser increases the productivity of workers by [$\sim 0.9\%$]. Our estimate suggest that being in a dense urban area could make workers more productive by better catering to their skills.

Finally, we assess what implications technological revolution might have on the dynamics of local labor markets. We posit that efficient allocation of talent would matter more for jobs that require soft skills or tacit knowledge but matter less for jobs that are highly automated or easily codifiable. This suggests that misallocation would be relatively more costly for high skilled workers, who are less likely to work in routine tasks, than for low skilled workers. This would, in turn, contribute to the composition of human capital to diverge across regions. In other words, features of occupation affected by technological revolution can interact with local labor markets to change the human capital composition in urban centers. In line with this intuition, our preliminary results suggest that talent is less likely to be efficiently allocated in codifiable jobs in less dense areas and that the urban wage premium is indeed higher among jobs that perform nonroutine and less automated tasks.

We further plan to identify the effect of labor market matching on wages, using a game theoretic two-sided matching model to recover how preferences for skills and occupations vary across cities. This exercise will allow us to characterize the driving factors behind differences in matching quality and further evaluate the importance of matching in explaining wage differentials and allocation of human capital across labor markets.

Reference

Glaeser, E. and Mare, D. (2001) "Cities and Skills" *Journal of Labor Economics* 19(2): 316 – 342

Moretti, E. (2012) "The New Geography of Jobs" Boston: Houghton Mifflin Harcourt.