

Big Cities and the Highly Educated: What's the Connection?

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Large American cities have disproportionately large shares of highly educated workers, a growing trend in recent decades.¹ What's the draw? Money for one thing, naturally. Not only do big-city firms generally pay higher wages; there is also evidence that the differential is greater for those with more education. These higher wages raise interesting questions: Why do firms in big cities find it profitable to pay more? That is, what makes a well-educated city worker more valuable than a comparably educated worker in a small town? And it's not just about money: Evidence suggests that amenities are increasingly important factors in where people choose to live, and big cities appear to provide greater amenities for higher-income workers than small cities do. But which is the bigger draw — higher wages or better amenities? As this article will show, cities may have a stake in the answer.

This article will focus on two channels through which relative advantages can arise for highly skilled or educated workers in big cities.² First, there may be gains in productivity in the sense that people with similar skill levels doing the same job produce more in big cities relative to smaller ones. Additionally, direct relative advantages for college-educated individuals in cities arise through what are known as *skill-biased technological advantages*. Put another way, while cities generally improve productivity for all workers, the production advantages of large cities may benefit different skill groups to different degrees. Furthermore, certain industries may be more productive than others in large cities, and these industries may be more likely to employ highly skilled workers. Disentangling these effects is not simple. Second, big cities may offer some advantages through consumption amenities. These consumption amenities may be innate, such as good weather or natural beauty, or may arise from access to a greater variety of goods and services available only in large urban areas.

Finally, note that characteristics of cities that improve production or consumption need not be mutually exclusive. Access to the ocean, for example, may improve the quality of life but is also important for industries that export goods. Likewise, transportation infrastructure improves both the efficiency of businesses as well as mobility and access for residents.

It is important for policymakers to understand why highly educated people concentrate in cities. A wide range of policies — including the provision of infrastructure, public services, and tax policy — can affect where different groups of people live and work. Given the evidence that different skill groups may not benefit equally from locating in big cities, these policies could have unintended consequences for both economic efficiency and equality.

WHAT DRAWS EDUCATED WORKERS TO BIG CITIES?

Production advantages. It has long been established that productivity increases in large cities. This increased productivity is often attributed to *agglomeration externalities* — that is, efficiency gains stemming from the concentration of workers, customers, suppliers, and even competing firms — which can arise for various reasons. A *Business Review* article by Gerald Carlino in 2011 details many of the key production advantages cities provide. However, there is still the question of why these agglomeration benefits might accrue to highly educated workers more than others.

One reason that high-skilled workers might locate in large cities is that a disproportionate share of innovation takes place in large cities. Gerald Carlino, Jake Carr, Robert Hunt, and Tony Smith show that research labs are more spatially

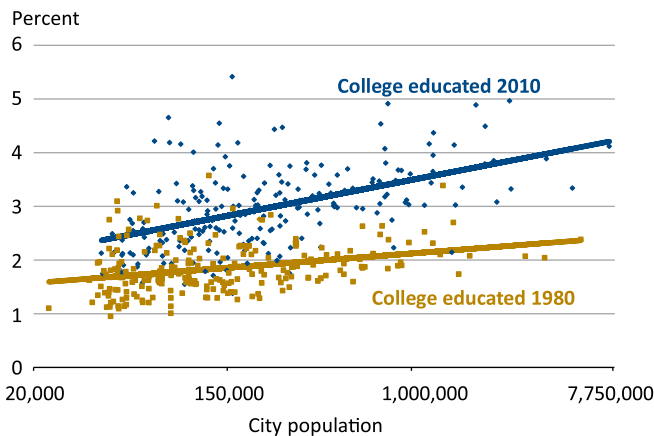
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concentrated than other measures of economic activity. Furthermore, using patent citation data, they are able to link innovative activity from lab to lab to provide evidence that knowledge spillovers depend on geographic concentration and therefore lead to increased production. Given that research and development often involves highly educated individuals, this is one potential reason for the increased productivity of educated workers in large cities.

The primary way to measure productivity among cities is to measure how much similar individuals are paid in different cities. In general, we would expect that if firms are willing to pay similar workers different wages in different cities, this provides evidence of productivity differences among cities. First, however, let us consider where workers with different levels of education tend to locate, a process that economists call *sorting*. In Figure 1, notice that in both 1980 and 2010, the share of college-educated workers increases with city size. In addition, this correlation has strengthened over the last 30 years, as evidenced by the steeper slope for 2010. These sorting patterns imply that highly skilled workers are better off in big cities. If we consider the relative wages earned by workers in different cities, then evidence suggests that a good part of the advantage for highly skilled workers comes through productivity.

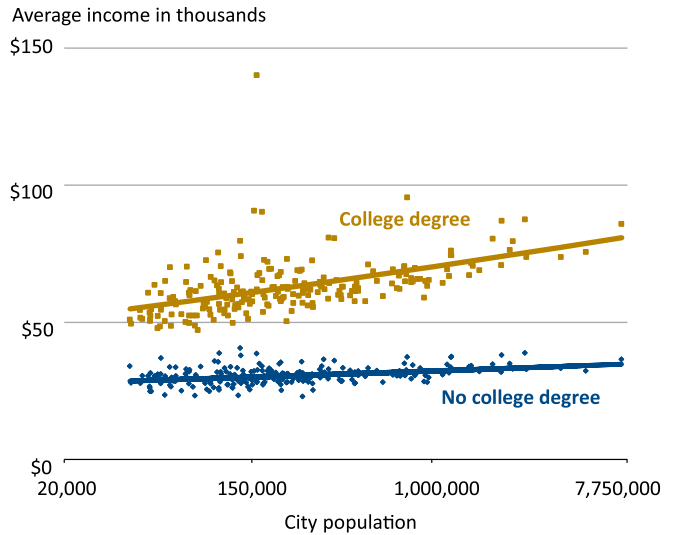
Figure 2 shows wages paid to low- and high-skilled workers by city size. Note that workers with and without college degrees tend to earn higher wages in larger cities, as evidenced by the positive slope for both groups. However, wages of college graduates grow faster with city size

FIGURE 1
Well-Educated Workers Increasingly Choosing Big Cities
Percentage of college-educated workers by city size, 1980 versus 2010.



Source: IPUMS-USA, University of Minnesota, www.ipums.org.
Note: Log scale along with least-squared fitted lines.

FIGURE 2
Big-City Wage Premium Greater for College Educated
Annual average wages of workers with different education levels by city size.



Source: IPUMS-USA, University of Minnesota, www.ipums.org.
Note: 2010 data on a log scale with least-squared fitted lines.

compared with wages of workers without college degrees. Research by Marigee Bacolod, Bernardo Blum, and William Strange supports this notion by showing that workers with different skill sets receive different wage premiums across cities of different sizes. Other researchers have shed light on why highly educated workers might have higher productivity in cities. For example, Jeffrey Lin shows that highly educated workers are more able to adapt to new technologies and therefore might thrive in cities, where new technologies are more available.

While some research has focused on skill-specific productivity returns to city size, there is also significant research that suggests that economic agglomeration and the production advantages of cities are related to specific industries. If certain industries employ larger shares of highly skilled workers, and if these industries are also more likely to be located in larger cities than small ones, then this could explain the sorting patterns of different education groups. For example, research by Nathaniel Baum-Snow and Ronni Pavan also shows that there is a skill premium in larger cities, given that the larger the city, the greater the degree of wage inequality. However, they note that while much of the inequality arises from skill-specific productivity differences, industry composition also plays a role.

It is quite clear that the production advantages of cities vary significantly across industries. Vernon Henderson

and Ronald L. Moomaw, in separate papers, showed that agglomeration externalities are stronger for high-tech and high-skilled manufacturing industries, respectively. These results would predict that industry composition would change with city size. Figure 3, which plots the percentage of employment in durable goods manufacturing and the finance industry for each city, confirms that this is indeed the case. In larger cities, the percentage of employment in the finance industry grows significantly, while the percentage of employment in durables manufacturing actually declines with city size.

In addition, certain industries hire mostly highly skilled workers, while other industries use less-skilled labor. Table 1 shows the percentage of workers with different education levels by industry. There is clearly wide variation in the education composition of the work force across industries. Also, note that the finance industry, which is heavily concentrated in large cities, has a relatively educated labor force, while durable goods manufacturing employs fewer college graduates. It is possible that the differences in skill composition across cities may be due to differences in industry composition instead of to productivity differences directly related to skill levels. The importance of these separate effects is still an open question, but initial research suggests that both are important. The role of industry linkages is particularly relevant given that the U.S. economy has experienced a major structural transformation over recent decades, moving away from goods

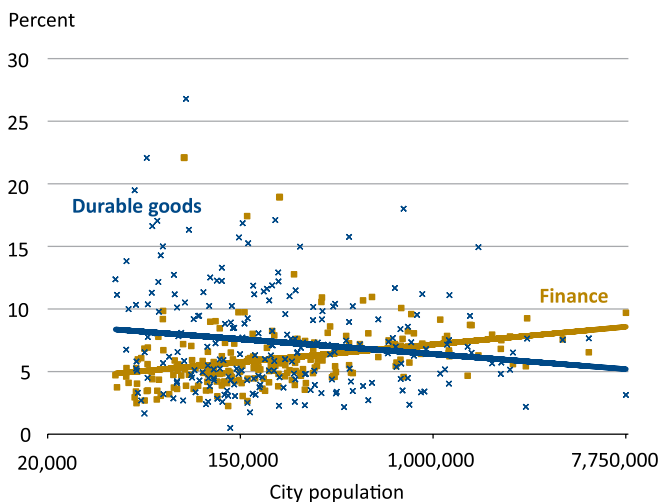
manufacturing toward more service-oriented industries.

The role of big-city amenities. As mentioned above, production is only part of the story when it comes to where firms and workers decide to locate and where educated workers tend to be concentrated. Amenities also vary among locations, and some of these amenities may be more important for the well educated than for the less well educated. The amenities that cities provide can come from various sources but generally fall into two categories. City amenities may be natural, such good weather, beaches, or mountains. Or city amenities might arise *endogenously*, in the sense that as cities get larger, their scale allows for access to a larger variety of goods and services. For example, large cities provide residents with a greater quantity and variety of restaurants, stores, or public services such as transit, parks, and cultural institutions.

The way economists determine the amenity value of a city is to measure the willingness of people to pay for those amenities. This boils down to comparing incomes in a given location with its cost of living, most importantly housing prices. If two people with similar education levels and occupations get the same salary in different locations, but one location has a very high cost of living, this is evidence that it has a high level of amenities. Using this method, David Albouy finds that there is a slightly positive correlation between city size and amenity value. In addition, Edward Glaeser, Jed Kolko, and Albert Saiz argue that consumption amenities are becoming increasingly important for attracting firms and skilled workers to a city by showing that high-amenity cities have grown faster over recent decades.

However, the question then arises: How are big-city amenities valued by people in different income groups? In separate papers, Sanghoon Lee and Jessie Handbury have suggested that higher-income people place a higher amenity value on the greater variety and quality of products available in big cities versus small cities. The intuition is that as people's income rises, they will demand more variety and better quality in the products they buy. Because the market is larger, big cities can supply a larger variety of goods, which attracts more high-income workers — in economic terms, these workers therefore self-sort according to income or skill levels.

FIGURE 3
Industry Composition Changes Along with City Size
Percent of total employment in manufacturing and finance by city size.



Source: IPUMS-USA, University of Minnesota, www.ipums.org.
Note: 2010 data on a log scale with least-squares fitted line.

GENERAL EQUILIBRIUM: PUTTING IT ALL TOGETHER

Up to this point, we have discussed the roles of production and consumption in cities separately and in isolation. However, it is important to consider the location decisions of all businesses and workers together. That requires ac-

Workers' Education Levels Vary Widely Among Industries

Industry work force education levels, highest to lowest, 2010.

	Less than high school diploma	High school diploma	Some college	College degree	Graduate degree
Professional services	1.6%	14.1%	19.2%	41.1%	24.0%
Education	2.4	15.5	17.2	28.7	36.2
Legal services	0.9	15.9	21.2	17.1	44.9
Finance, insurance and real estate	2.3	24.0	27.0	34.7	12.0
Public administration	1.7	23.7	31.0	27.2	16.4
Communications	1.8	24.0	31.4	32.0	10.8
Social services	6.5	26.5	26.1	25.0	15.7
Health care	3.7	24.1	32.9	21.5	17.8
Business and repair services	10.1	32.0	24.0	24.9	9.0
Nondurable goods	12.3	36.2	20.3	21.9	9.3
Durable goods	9.0	36.9	22.9	21.0	10.2
Wholesale durable goods	7.1	36.2	26.9	23.9	5.9
Wholesale nondurable goods	11.3	35.5	23.7	23.6	6.0
Utilities and sanitary services	6.6	38.0	27.4	19.8	8.2
Entertainment and recreation	10.8	32.4	30.5	21.6	4.7
Transportation	7.7	44.3	29.3	15.3	3.3
Personal services	15.8	40.5	26.3	14.0	3.3
Agriculture, forestry, and fisheries	33.4	32.9	17.1	11.1	5.5
Retail trade	13.9	41.1	28.9	13.4	2.7
Construction	20.0	45.1	21.6	10.8	2.5

Source: IPUMS-USA, University of Minnesota, www.ipums.org.

counting for supply and demand in labor markets, as well as housing and land markets, in all cities simultaneously.

To understand how these location decisions might work, consider a hypothetical situation in which your employer offers you two choices. You can move to Philadelphia or San Diego. In addition, your employer offers a salary that is 5 percent higher in Philadelphia. This suggests that employers believe that productivity might be higher in Philadelphia; otherwise they would not offer a higher salary. Nonetheless, you have visited San Diego and, in your opinion, Southern California's lifestyle and weather are worth a 5 percent salary cut. Then you look at houses in San Diego and realize that prices are at least twice as high as they are in Philadelphia. The obvious reason is that everyone else thinks San Diego is nicer, too, and so house prices have been driven up to match the value of the amenities that the city provides, a dynamic that economists refer to as the *capitalization* of amenities into house prices. With this, you decide that you might as well just flip a coin.

This example illustrates the key insight in urban eco-

nomics that was provided by Jennifer Roback: On average, people and firms are indifferent about location because all of the differences between productivity and amenity values in different locations are already capitalized into wages and prices, at least in the long run. This is a powerful idea, but the implications become less clear when preferences for amenities might differ among workers in a way that is correlated with their productivity. Further complications arise when one considers that both productivity and amenities are endogenous in the sense that they depend on the educational composition of the work force or the size of the city.

Only recently have researchers begun to study the importance of heterogeneous workers and firms for amenities and production across cities in a way that considers the economy as a whole. In economics, when we consider all the agents and markets in an economy as a whole, this is referred to as general equilibrium analysis. Results derived from *general equilibrium* studies often provide very different insights than studies that

consider only one aspect of the economy in isolation.

One example is work by Rebecca Diamond, who estimates production and amenity values by considering the importance of spillovers due to concentrations of highly skilled workers. Diamond measures how the supply of and demand for workers with different education levels change with respect to city characteristics, taking into account house prices and wages. She finds that productivity changes in cities have been the primary source of the concentration of highly skilled individuals but that amenities have also adjusted to reinforce this effect. Put another way, increases in productivity in cities that have high concentrations of educated workers lead to increases in wage inequality between high- and low-skilled workers. Moreover, the inequality is actually even greater, given that highly skilled workers benefit more from the amenities these cities offer than low-skilled workers do.

Using similar methods, my own research also shows that production advantages are the primary reason that highly educated workers gravitate to large cities, while ame-

nity advantages also increase more with city size for college graduates than for other workers.

To quantify the primacy of productivity advantages relative to amenity advantages, consider how the supply of and demand for different types of workers change as city population increases. First, for every 1 percent increase in city population, the supply of college-educated workers, which is driven by consumption amenities, increases 1.07 percent, while the supply of workers with only high school diplomas increases only 0.95 percent. (These results hold house prices and wages constant.) Next, the demand for college-educated workers, which is driven by productivity, increases 1.14 percent for every 1 percent increase in total population, while the demand for workers with high school educations increases only 0.88 percent. Notice that the gap in demand between skill groups is twice as wide as the gap in supply. In other words, as city size increases, both supply and demand increase more for highly skilled workers than they do for less-skilled workers. However, the gap in demand widens faster, which leads to increased inequality in large cities when wages and house prices adjust to meet this supply and demand.

Furthermore, while it is true that the demand for highly skilled workers in all industries is higher in large cities, a disproportionate share of this demand comes from just a few industries. Finance, real estate, and insurance alone accounted for 35 percent of the change in demand for college-educated workers in cities between 1980 and 2010 despite representing less than 10 percent of total employment in the U.S. This disparity suggests that industry characteristics play an important role in attracting educated workers to large cities.

CONCLUSION

Overall, research suggests that cities exist to provide both production and consumption advantages for people. Economists have long known about the production advantages of cities, but recent evidence suggests that cities are increasingly being valued for consumption amenities arising from easier access to a larger variety of goods and services. Furthermore, the consumption and production roles of cities are different for people with different skill levels, and these roles have been changing over time. This means that how skills or education vary from city to city is an important consideration for policymakers who are trying to provide the right public goods and services or for firms that are deciding where to locate and want to remain competitive in the labor market. For example, public investment in parks or museums may make cities more attractive to firms in certain industries that want to attract educated workers despite having no direct effect on production. In other words, people may accept lower wages to live in a location that has more consumption amenities, and this will, in turn, make locations more attractive to firms.

Clearly, there is more work to be done in order to understand the relative importance of cities for consumption and production. Although we have made progress measuring and documenting some of these patterns, we are still learning about the underlying mechanisms that lead to amenity and productivity advantages in cities. ■

NOTES

¹ For the purposes of this article, *city* refers to geographically separated labor markets. In the U.S., they are usually defined by metropolitan statistical area (MSA).

² In this article, *skilled* and *educated* will be used interchangeably. While their meaning is obviously not precisely the same, education is easier to measure and therefore often used as a proxy for skill level.

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