

## Are Cities the New Growth Escalator?

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<b>WHAT MAKES SOME CITIES MORE ECONOMICALLY SUCCESSFUL THAN OTHERS? .....</b>	<b>3</b>
UNDERSTANDING AGGLOMERATION OF ECONOMIC ACTIVITY .....	6
<b>IMPLICATIONS FOR REGIONAL ECONOMIC DEVELOPMENT POLICIES .....</b>	<b>13</b>
THE ECONOMICS OF BIG PUSHES .....	14
CLUSTER BUILDING .....	17
UNIVERSITIES AND LOCAL JOBS .....	18
WHO REALLY BENEFITS FROM PLACE-BASED POLICIES? .....	20
<b>CONCLUSIONS.....</b>	<b>20</b>

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In most countries, the geographical distribution of economic activity is highly uneven. Urban areas tend to have much more productive labor and higher salaries than rural areas, and there are vast differences across urban areas. In the United States, the hourly wage of workers in metropolitan areas with the highest average labor productivity is more than twice the hourly wage of workers with similar skills and experience in metropolitan areas with the lowest. In other words, the same worker can earn vastly different nominal salaries depending on where she locates. Even larger differences exist in many developing countries. Employers also differ across metropolitan areas. Areas with high salaries and high productivity tend to have employers that invest in much more research and development than areas with low salaries and low productivity.

This paper addresses two questions. First, it discusses the causes of these vast geographical differences in wages, human capital, and innovation. What makes some cities more economically successful than others in productivity and salaries? The question is important because the appropriate role of economic policy needs first to be based on what is driving spatial economic differences in the first place. Most productivity differences within a country are unlikely to be explained by exogenous factors, like natural resources endowments. Instead, a part of these productivity differences reflects endogenous factors: three forces of agglomeration economies, which ultimately determine the location of workers and companies and thus shape the futures of entire communities. The forces are thick labor, thick markets for specialized service providers, and knowledge spillovers. Understanding them is critical, because they are responsible for the vast economic differences across cities and regions in most countries. Understanding them also holds the key to designing policies that can make struggling areas more economically successful.

In a world with vast disparities in incomes across locales and with significant agglomeration externalities, what is the proper role of economic policy? Should national or local governments seek to redistribute economic activity from rich areas to poor? The second part of the paper discusses regional economic development policies. In the United States alone, states and the federal government spend about \$40–\$60 billion annually on these policies—more than is spent on unemployment compensation in a normal year. The European Union has an even more ambitious program transferring its development funds to regions with below average incomes. Asian countries, especially China, have a variety of special economic zones, designed to attract foreign investment to specific areas.<sup>1</sup>

Such regional development policies, often called place-based economic policies, are effectively a form of welfare, targeting cities or regions, not individuals. While such policies are widespread, the economic logic behind them is rarely discussed and even less frequently understood. This paper clarifies when these policies are wasteful, when they are efficient, and who the expected winners and losers are. Understanding when government intervention makes sense—and when it does not—is a crucial first step in setting sound economic development policies.

## What makes some cities more economically successful than others?

Good salaries, high productivity, and vibrant innovation are highly concentrated, not uniformly distributed over space.<sup>2</sup> To get a more precise sense of how large the geographical differences in the level of economic activity can be within a country, consider table 1. The table shows average salary levels among U.S. metropolitan areas with the highest percentage of local workers with a college degree.<sup>3</sup> The list includes such large metropolitan areas as Austin, Boston, Minneapolis-St. Paul, Raleigh-Durham, San Francisco, San Jose, Seattle, and Washington, DC—as well as smaller cities with large universities, such as Ann Arbor, Fort Collins-Loveland, Iowa City, Lincoln, and Madison. In these cities, almost half the labor force is college educated, and a significant fraction has a postgraduate degree. Table 2 shows the metropolitan areas with the smallest percentage of workers with a college degree. It includes Flint, Michigan; Vineland-Millville-Bridgeton, New Jersey; Visalia, California; and Yuma, Arizona. In these cities, only 1 in 10 workers has a college degree, and there is virtually no high-tech presence.

**Table 1. Metropolitan areas with the largest percentage of college graduates**

<b>Top metro areas</b>	<b>Rank</b>	<b>Percentage with college degree</b>	<b>Salary of college graduates (\$)</b>	<b>Salary of high school graduates (\$)</b>
Stamford, CT	1	56	133,479	107,301
Washington, DC/MD/VA	2	49	80,872	67,140
Boston, MA-NH	3	47	75,173	62,423
Madison, WI	4	47	61,888	52,542
San Jose, CA	5	47	87,033	68,009
Ann Arbor, MI	6	46	65,452	55,456
Raleigh-Durham, NC	7	44	63,745	50,853
San Francisco-Oakland, CA	8	44	77,381	60,546
Fort Collins-Loveland, CO	9	44	57,391	47,007
Seattle-Everett, WA	10	42	68,025	55,001
Trenton, NJ	11	42	81,914	64,299
Lexington-Fayette, KY	12	41	55,238	44,915
Austin, TX	13	41	62,289	48,809
Portland, ME	14	40	57,366	48,080
Minneapolis-St. Paul, MN	15	40	69,955	57,187
Denver-Boulder, CO	16	39	64,488	50,097
New York-Northeastern NJ	17	38	79,757	59,797
Lincoln, NE	18	38	50,401	41,837
Santa Cruz, CA	19	38	64,801	48,186
Tallahassee, FL	20	38	59,380	46,715
Worcester, MA	21	37	60,723	48,465

*Source:* Author's calculations based on U.S. Census Bureau (2008).

**Table 2. Metropolitan areas with the smallest percentage of college graduates**

<b>Bottom metro areas</b>	<b>Rank</b>	<b>Percentage with college degree</b>	<b>Salary of college graduates (\$)</b>	<b>Salary of high school graduates (\$)</b>
Mansfield, OH	286	17	53,047	35,815
Beaumont-Port Arthur-Orange, TX	287	17	58,234	38,352
Rocky Mount, NC	288	16	52,330	34,329
Stockton, CA	289	16	59,651	37,928
Fort Smith, AR/OK	290	16	50,937	33,187
Ocala, FL	291	16	47,361	32,725
Yuba City, CA	292	16	56,403	34,999
Modesto, CA	293	15	60,563	36,126
Waterbury, CT	294	15	54,651	37,280
Brownsville-Harlingen-San Benito, TX	295	15	43,800	22,450
McAllen-Edinburg-Pharr-Mission, TX	296	15	44,605	22,845
Anniston, AL	297	15	48,928	33,031
Yakima, WA	298	15	50,160	29,084
Bakersfield, CA	299	14	65,775	34,807
Danville, VA	300	14	42,665	28,868
Houma-Thibodaux, LA	301	14	56,044	37,395
Vineland-Millville-Bridgeton, NJ	302	13	57,668	35,375
Flint, MI	303	12	43,866	28,797
Visalia-Tulare-Porterville, CA	304	12	55,848	29,335
Yuma, AZ	305	11	52,800	28,049
Merced, CA	306	11	62,411	29,451

*Source:* Author's calculations based on U.S. Census Bureau (2008).

These two tables have several noteworthy features. First, the sheer size of the geographical differences is staggering, often exceeding the differences between countries. Stamford, Connecticut, the city with the highest percentage of college-educated workers in the United States, has five times the number of college graduates per capita as Merced, California, the city with the lowest. This difference is much larger than the difference in schooling between the United States as a whole and many developing countries, such as India (three times), Peru (three times), and South Africa (four times).

Second, differences in education are associated with huge differences in average nominal salary. College graduates in the top group make \$70,000–\$80,000 a year, or about 50 percent more than college graduates in the bottom group. Compare San Jose, fifth from the top, with Merced, at the very bottom. Both cities are in California, less than 100 miles apart, but their labor markets belong to different universes. San Jose, in the heart of Silicon Valley, has more than four times as many college graduates per capita as Merced—and salaries 40 percent higher for college graduates and 130 percent higher for workers with a high school diploma.

The geographical differences are so large that high school graduates in the top group often make more than college graduates in the bottom. The average worker with a high school education in Boston makes \$62,423, or 44 percent more than a college graduate in Flint. A high school graduate in San Jose earns an average of \$68,009, thousands more than college-educated workers in Merced, Yuma, Danville, and all the other cities at the bottom. In other words, the economic disparity between cities is so vast that it can dominate the disparity between levels of education.

These differences are not specific to the United States; they exist in countries the world over, including developing countries. For example, China exhibits significant spatial differences in schooling, labor productivity, and salaries across regions. Average salaries in Beijing and Shanghai are several times higher than those in Lhasa, Golmud, and Yumen because workers in Beijing and Shanghai are much more productive. Average schooling achievement also differs significantly across cities, with the labor markets of highly developed coastal cities having a higher share of college graduates and the labor markets of less developed western cities having a lower share. The gap in average salary and average schooling between Beijing and Shanghai and rural areas in western China is even larger.

Regional differences in India are equally striking. Metropolitan areas in poorer parts of India—like Pathna in Bihar—tend to have average incomes four to five times lower than metropolitan areas in richer parts of India, like Delhi and Bangalore. In European countries, spatial differences tend to be more contained, as in Italy, where salary differences between highly productive northern cities like Milano, Trento, and Verona and less productive southern cities like Agrigento and Cosenza are only 60–70 percent. The share of college graduates in the labor force is 50–70 percent higher in the northern group than in the southern group. France exhibits similar spatial differences in productivity, salaries, and human capital.

Throughout the world, the presence of many college-educated residents changes the local economy in profound ways, affecting both the kinds of jobs available to residents and the productivity of workers. Cities with many college-educated residents tend to have a local economy with a great deal of innovation. Table 1 includes some of the world's most important innovation clusters, including Austin, Raleigh-Durham (Research Triangle), San Francisco, San Jose (Silicon Valley), and Seattle. Compare Boston, third from the top, with Flint, fourth from the bottom. Both have a proud industrial past, but their economies are now at opposite ends of the spectrum. Boston, with four times the number of college graduates, depends heavily on innovation and finance. Flint, with one of the country's lowest concentrations of human capital, still focuses on traditional manufacturing, primarily of automobiles. A college graduate in Boston makes on average \$75,173, or 75 percent more than the salary of a similar worker in Flint.<sup>4</sup> This is no accident. Forty years ago, the rich areas in the United States and Europe were manufacturing hubs with abundant physical capital. Today, human capital is one of the best predictors of high salaries, both for individuals and for communities, and this is becoming increasingly true for developing economies.

### *Understanding agglomeration of economic activity*

The cost of living in cities in table 1 is higher than in cities in table 2, so salary differences adjusted for local prices are smaller than nominal differences. While this explains why people still live in Flint and Merced and why everyone has not moved to Austin, Raleigh-Durham, and San Jose, it does not explain why there are still employers in Austin, Raleigh-Durham, and San Jose. Why should employers, especially those who compete nationally and internationally, put up with such high labor costs to be in these locations? A crucial question, because it holds the key to understanding why some cities are more economically successful than others.

If you visit these cities, you will not find many visual clues to why salaries should be so high there. Take San Jose. Most of the iconic Silicon Valley companies are in anonymous office buildings or office parks. Like many other U.S. metropolitan areas, San Jose is made up mostly of parking lots, corporate campuses, and a few sterile-looking glass towers surrounded by an ocean of single-family homes. There is nothing distinctive about its urban form: freeways crisscross its vast expanse, and people drive everywhere. Local companies like eBay and Adobe must pay a skilled worker with a college education \$87,033 a year in San Jose, but a similar company in Merced would need to pay only \$62,411. In fact, if eBay and Adobe moved to Merced, they would end up paying less to hire a college graduate than they are paying now to hire a high school graduate, which is \$68,009.

The same puzzle arises in other countries. A large fraction of the Indian high-tech sector is in Bangalore, where real estate costs and salaries are higher than in other Indian cities. France, Japan, and the Republic of Korea exhibit even more geographical concentration, as cities like Paris, Tokyo, and Seoul absorb the lion's share of their nations' most innovative activities and talent. The same is true in China, where Beijing and Shanghai have become magnets for the country's highest achievers. With high wages and office rents, these cities are among the costliest places in China to operate a business. One would expect these cities to be unattractive for firms, especially those that compete globally. A comprehensive study by the Organisation for Economic Co-operation and Development finds that 57 percent of all patents in developed countries are generated by 10 percent of metropolitan areas, and this concentration has been increasing over time.

What is so special about cities like Bangalore, San Jose, Seoul, and Shanghai? In the past, firms established themselves near their customers because transportation costs were high. For example, during the Industrial Revolution, London companies could deliver their products at a cost advantage because most of their customers were in London. But today, transportation costs are low, and they do not explain a big part of the geographical distribution of economic activity. For high tech, the transportation costs are essentially zero, since one can ship software code instantly and cheaply through any modem. If all Bangalore software companies moved to the state of Bihar, where real estate and wages are much lower, no user would notice.

The answer to the puzzle is that workers in cities in table 1—together with their counterparts in other countries—are more productive. Employers are willing to pay higher wages because they get more in return for each hour worked. If workers were not more productive, firms in the traded sector would in the long run relocate away from high-cost locations.

This higher labor productivity does not reflect better endowments of natural resources. After all, there is no silicon in Bangalore or Silicon Valley. Nor is there oil in Shanghai. The higher labor productivity is due mostly to three important competitive advantages, which economists refer to collectively as the forces of agglomeration: thick labor, thick markets for specialized service providers, and knowledge spillovers.

***Thick labor.*** A major advantage of cities for workers and firms is that urban labor markets are thicker. Economists have long understood that thick markets—those with many sellers and many buyers—are particularly attractive because they make it easier to match demand with supply. This matters more for highly skilled workers than unskilled ones, and it is a key reason for the existence of industrial clusters. If you are a software engineer specializing in a particular type of software design, it is really important to find the one biotech firm that uses that specific technology. If you move to a city like Bangalore, where many software firms are concentrated, you are more likely to find the firm that really wants—and will pay for—your unique skill set. If you move to a city like Calcutta, with fewer software firms, you might have to settle for a less ideal match and thus a lower salary. You will have a vastly different career trajectory depending on where you move. The advantages of a better match also accrue to employers. By locating in Bangalore, a software startup enjoys higher productivity and produces more patents, because it can find exactly the kind of molecular biologist that fits its needs. A thick market appears to be a win-win for workers and firms alike.

For workers in professional occupations, the economic return of being in a thick labor market, as measured by increased earnings, has been rising for the past 30 years. In the United States, the average wage in labor markets with more than a million workers is a third higher than the average wage in those with 250,000 or fewer. This remains true even after worker seniority, occupation, and demographics are held constant. Remarkably, this difference is now 50 percent larger than it was in the 1970s. Market size is especially important for workers with highly specialized skills, such as high-tech engineers, scientists, mathematicians, designers, and doctors. Among doctors, specialists in large cities perform a narrower set of activities than those in small ones.<sup>5</sup> But market size does not matter very much for unskilled workers; manual laborers and carpenters perform similar tasks in large cities and small.

The size of labor markets also affects how frequently people change jobs. One study that followed 12,000 workers over a 20-year period revealed that early in a career, when a worker is shopping around for a good match, she will change jobs more often in a large, diverse local market than in a smaller, specialized one. Later in a career, however, when stability presumably

becomes more appealing, people change jobs less often in large markets, because they are more satisfied with their matches.<sup>6</sup>

In addition, market thickness provides a form of partial insurance against unemployment. When a layoff is caused not by a recession but by problems specific to a firm, market thickness reduces the probability that the worker will remain unemployed, because there are more potential employers. And thick labor markets reduce the likelihood that a firm cannot fill a vacancy.

Market size is not just a curiosity. It has critical implications for the future of cities. The thick-market effect is one of the main reasons that the high-tech sector is concentrated in a small number of cities worldwide. Because thick labor markets are better at matching workers and employers, high-tech clusters have an enormous advantage in attracting even more high-tech employers and workers. The flip side, however, is that cities currently without a high-tech cluster find it hard to create one. This eventually adds to the economic differences across cities.

Size also matters for the marriage market, which in many countries is segregated along education lines, with well-educated professionals increasingly marrying other well-educated professionals. Economists call this assortative mating: people tend to marry people with similar socioeconomic characteristics. It is nothing new. Even in the 1980s, well-educated women were more likely to marry well-educated men than less educated men. This tendency has strengthened over the past 30 years, however, with a significant increase in the probability that a man with a master's degree will marry a woman with a master's degree, a man with a college degree will marry a woman with a college degree, and so on. This applies not just to education but also to job type, salary, and many other factors. As assortative mating increases, the need for a large marriage market also increases. If you are looking for a partner with very specific characteristics, a thick dating scene is better.

Even for married couples, the need for thick cities is increasing, because large labor markets are especially important for families in which both husband and wife have a professional career. This kind of "power couple" represents a small but growing number of households. In a study of changing family structure, Costa and Kahn (2000) found that in 1940, among U.S. couples in which both husband and wife had a college education, only 18 percent of wives worked. By 1970, that figure had more than doubled to 39 percent, but most of the women had majored in fields such as education and nursing and had been tracked into traditionally female jobs. Their experience was one of "first family, then jobs," and they often left the labor force when their first child was born.

By 1990, college-educated wives of college-educated men had begun to resemble men in their professional choices and aspired to "career, then family" or "career and family." By 2010, 74 percent of college-educated wives were in the labor force, with jobs in virtually all fields and sectors. As more married couples have two careers, more of them face a location problem, since wives are increasingly unwilling to be the ones who give up their careers to accommodate their

spouses' job changes. Today, half of companies list a spouse's employment as the biggest reason that employees turn down a job relocation offer. Thick labor markets—markets large enough to offer good professional matches for both partners—are the best way to solve this problem.

This matters tremendously for the future of cities. Costa and Kahn find that well-educated professionals are increasingly gathering in large cities and that more than half this increased agglomeration is due to the growing severity of the location problem of power couples. This is bad news for small cities, because it means that they are becoming less competitive, especially in the eyes of highly educated professional couples. In the long run, smaller cities are destined to experience a reduced inflow of well-educated professionals and will therefore miss out on economic growth, thus becoming poorer over time.

***Thick markets for specialized service providers.*** A second advantage of large metropolitan areas, especially those that develop large industrial clusters, is the presence of highly specialized intermediate service providers. These vendors supply specialized services important to companies, such as advertising, legal support, technical and management consulting, shipping and repair, and engineering support. These services enable firms to focus on what they are good at, without having to worry about secondary functions. By the mere act of moving into a large cluster of similar firms, a company in effect becomes larger overnight, because it can draw on specialized local expertise. The larger the cluster, the more specialized the service providers can be. As a result, firms within a large cluster become more productive and more successful. A small software developer in Seattle does not need an in-house lawyer, because there are already plenty of local law firms specializing in intellectual property, licensing, and incorporation of startups. A pharmaceutical company in Mumbai can buy specialized services for its labs from local vendors, and a hardware company can find specialized shipping services.

Many of these services are nontradable, which means that geographical proximity to clients is required to deliver the service (legal services, for example, require a lot of face-to-face interaction between client and attorney). And even when they are tradable, geographical proximity to clients helps deliver successful products, as providers often need to be close to potential clients to assess their needs and show how they can help. This matters less for mature products but is critical when a product is new.

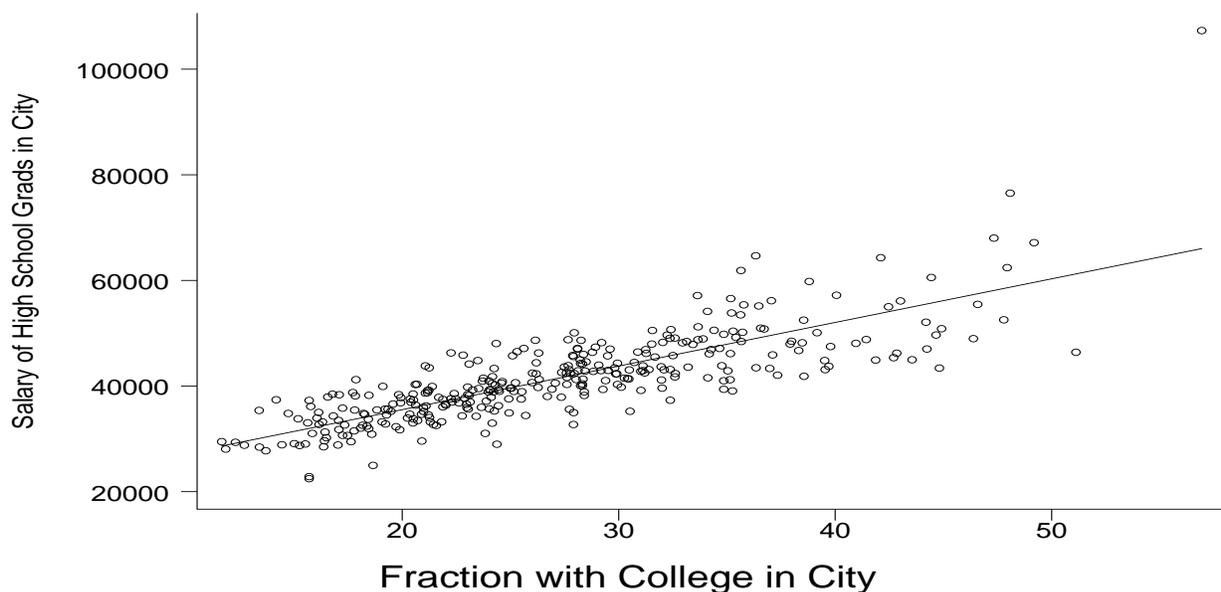
This is one important factor that keeps industrial clusters geographically together. Service providers are there because the clients are; the clients are there in part because the service providers are. This affects cities in two important ways. First, it increases the number of local jobs created by local companies: if a city attracts an IBM office, it gains not just the IBM jobs but also the jobs in the service sector. Second, it further strengthens the attractiveness of cities that have successful clusters at the expense of cities that do not: it makes IBM more likely to open an office in Silicon Valley.<sup>7</sup>

**Knowledge spillovers.** More educated countries tend to be richer. More important, countries whose citizens' education grows faster tend to see faster economic progress. The link between country education and economic growth is quantitatively strong. Krueger and Lindhal (2000) find that each additional year in the average education of a country results in a GDP increase of 5–14 percent, a substantial income gain. Of course, the direction of causality is not always clear. Economists have long recognized that “education is both the seed and the flower of economic development.”<sup>8</sup> For example, countries that improve their education systems could at once change other policies that enhance growth, thus complicating the causal interpretation of the relationship between education growth and economic growth.

The same correlation between education and economic growth across countries exists within countries across regions. Indian states with the highest level of literacy and highest level of college graduation also have the highest incomes. The same is true in countries as diverse as Brazil, Germany, and Indonesia.

Figure 1 shows the relationship between the average salaries of high school graduates in each U.S. metropolitan area and the fraction of workers with a college education in those areas. Tables 1 and 2 hinted at a positive relationship between local human capital and salaries across U.S. metropolitan areas. The figure shows that this link is robust, and it holds true for most U.S. cities. There appears to be a clear positive association, indicating that the more college graduates, the higher the salaries for high school graduates.<sup>9</sup> The economic effect is quite large. The earnings of a worker with a high school education rise about 7 percent as the share of college graduates in his city increases 10 percent.

**Figure 1. Fraction of college-educated workers and salary of high school graduates in the United States, by metropolitan area**



Source: Moretti 2012.

One may be concerned that the figure is comparing apples and oranges—that workers who pick cities with many college graduates, like Boston, might differ fundamentally from workers who pick cities with fewer college graduates, like Flint. If Boston attracts high school graduates who are smarter or more ambitious than those in Flint, it should be no surprise that they earn more. To account for this possibility, I relied on 14 years of data from the National Longitudinal Survey of Youth, which has tracked the lives of 12,000 people since 1979. This dataset is particularly useful because it ensures an apples-to-apples comparison by tracking how the salary of a given person changes over time as the number of college graduates in a city changes. The finding? Workers who live in cities where the number of college graduates increases experience faster salary gains than workers who live in cities where the number of college graduates stagnates. The same individual's salary can thus depend on how many skilled workers are nearby. This relationship holds for all sectors, but it is especially strong for workers with high-tech jobs.<sup>10</sup>

Three reasons explain the relationship between the number of skilled workers in a city and the wages of their unskilled neighbors. First, skilled and unskilled workers complement each other: an increase in the former raises the productivity of the latter. In the same way that working with better machines increases a worker's productivity, working with better educated colleagues increases the productivity of an unskilled worker. Second, a better educated labor force facilitates local employers' adoption of newer and better technologies. Third, an increase in a city's overall human capital generates human capital spillovers. This concept is at the heart of modern economic growth theory, the study of what determines a country's economic success.

Researchers have built sophisticated mathematical models showing that sharing knowledge and skills through formal and informal interaction generates significant knowledge spillovers. These spillovers are thought to be an important engine of economic growth for both cities and nations. Robert Lucas (1988), arguing that these spillovers may be large enough to explain long-run differences between rich and poor countries, showed that people learn from each other when they interact and that this process makes those who interact with better educated peers ultimately more productive and creative. More recent research has extended and articulated the concept.<sup>11</sup>

New ideas are rarely born in a vacuum. Social interactions among workers tend to generate learning opportunities that enhance innovation and productivity. So the fact that workers earn more in highly educated cities is not an accident but a reflection of the higher labor productivity that comes from working alongside highly educated colleagues and neighbors.

Jaffe, Trajtenberg, and Henderson (1993) used patent citations to understand how knowledge diffuses within a circle of friends, colleagues, or scientists in a city. When filing for a patent, inventors are required to list all the inventions that their invention builds on. These links offered the economists an innovative way to track the flow of knowledge among inventors. They found that knowledge is subject to a significant degree of "home bias," in the sense that inventors are significantly more likely to cite inventors living nearby than those living farther away. Because patents are freely available, citations should not necessarily display geographical favoritism. An

inventor in, say, Raleigh-Durham, should have the same awareness of products or ideas generated elsewhere as of those generated locally. And yet an inventor in Raleigh-Durham is much more likely to cite a previous invention patented by someone else in Raleigh-Durham than one patented in another city.

The home bias is substantial. Excluding citations that come from the same company, citations are twice as likely to come from the city of their citing patent than from other places. This means that scientists and inventors are more familiar with knowledge produced by those who work near them, presumably because they share ideas and information through informal conversations and interactions. These interactions take place both inside and outside the workplace, including casual settings like local cafés and social events.

Thus, geography matters for spreading knowledge, and knowledge quickly dies with distance. Citations are highest when the citing inventor is located 0–25 miles from the cited inventor. Citations are far lower when the citing inventor is more than 25 miles from the cited inventor, and the effect completely disappears beyond 100 miles.

Geographical distance seems to impede the flow of ideas, even within a firm. This alone should discourage companies from outsourcing any part of the innovation phase to low-cost countries. Take the high-tech company Cadence, with about 2,000 employees in San Jose, 1,000 in India, and another 1,000 scattered around the world. An Indian software engineer at level T4 makes about a third of what a similarly qualified software engineer in San Jose makes. When I asked Cadence’s executive senior vice president, Nimish Modi, why the company does not move more research and development to India, given the potential savings, he told me that proximity and personal interaction matter to the creativity of its engineers. “We have sophisticated videoconferencing facilities, and we use them all the time to communicate with India,” he said. “But it is not the same as face-to-face interaction. Nothing replaces a group of engineers sitting together and arguing in front of the whiteboard.”

Being around smart people tends to make us smarter, more creative, and ultimately more productive. And the smarter the people, the stronger the effect. Azoulay, Zivin, and Wang (2011) focus on what happens to medical researchers when they work with an academic superstar. It is difficult to establish the causal relationship here because of self-selection: superstars tend to work with strong researchers, so the fact that their collaborators are especially prolific may just happen because they are better, not because they are benefiting from knowledge spillovers. To control for this, the three economists focused on what happens to the productivity of a superstar’s collaborators when the superstar dies unexpectedly (they identified 112 such deaths). Although nothing changed in the collaborators’ own circumstances following the superstars’ deaths, they experienced “a lasting 5 to 8 percent decline in their quality-adjusted publication rates.”<sup>12</sup>

It is not just that people publish more when they are close, the quality of their research is better. When a team of Harvard Medical School doctors analyzed all medical research articles published

at Harvard and correlated their data with the distance between the authors' offices, they found that being less than one kilometer away raised the quality of research, as defined by how many other researchers cited the article. The effect was even larger if the authors were in the same building.

Innovative firms thus have an incentive to locate near other innovative firms. In the same way that having a good colleague next door affects my creativity, having good neighbors—even competitors—improves the creativity of companies and workers. This in turn helps explain why workers in cities with many well-educated residents earn higher salaries than identical workers in other areas. By clustering near each other, innovators foster each other's creative spirit and become more successful. These effects have not faded over time. While many people think that e-mail, cell phones, and the Internet have made physical proximity less important to the creative process, in reality the opposite is true. Location is more important than ever, in part because knowledge spillovers are more important than ever.

A large number of highly educated workers in a city is also associated with more creativity and a better ability to invent new ways of working. One way to see this is to look at what Jane Jacobs called “new work,” novel occupations that did not exist before. The economist Jeffrey Lin (2011) has studied which cities are the most creative, in the sense that they generate the most new work as measured by jobs that did not exist 10 years earlier. Between 5 percent and 8 percent of workers are engaged in new work at any time in the United States, but this number is much higher in cities that have a high density of college graduates—the ones in table 1—and a diverse set of industries. Lin also found that creativity pays off: for the first few years after a new kind of job is created, workers in those positions earn significantly higher wages than identical workers in old jobs.

### **Implications for regional economic development policies**

The discussion here has important implications for the future of cities and for the policy makers interested in shaping it.

There is something phenomenal about the forces of agglomeration just uncovered. They are responsible for turning a collection of individual workers and firms into something much larger than the sum of its parts. This generates what economists call localized economies of scale. The term economies of scale usually refers to the ability of companies to become more efficient as they grow. For example, large car manufacturers are more efficient than small ones. But instead of applying to a single company, these economies of scale apply to all the companies in a geographical area. Larger cities, and cities with larger industrial clusters, tend to be more efficient because they have a thicker labor market, a more specialized supply of business services, and more opportunities for knowledge spillovers.

While individual companies in a cluster do not necessarily become more efficient as they grow, all companies taken together become more efficient as the cluster grows. A surprising

implication is that countries are more productive—and thus richer—when a significant fraction of their economic activity is concentrated in some cities, rather than spread out evenly across space.

Another implication is that cities that are initially similar can grow apart economically over time.<sup>13</sup> These differences are no accident—they are the predictable result of the three forces of agglomeration. Cities with the right sectors and with workers who have the right skills are likely to strengthen their position over time, while others, trapped by their pasts, are likely to keep losing ground. It is a tipping-point dynamic: once a city attracts some innovative workers and companies, its economy changes in ways that make it even more attractive to other innovative workers and companies. This tends to generate a self-sustaining equilibrium, with many skilled individuals looking for innovative jobs and innovative companies looking for skilled workers.<sup>14</sup>

This is a case where the future of a city depends on its past. Social scientists call it path dependency. This presents a significant challenge for policy makers, as it means that cities without a strong local economy might find it difficult to start one. It is a classic chicken-and-egg problem. Specialized workers will not move to a city that does not have a cluster because it will be hard to find an employer that values their unique skills. Innovative companies will not move there because finding specialized labor will be difficult. This presents a terrible challenge for communities that have fallen on hard times and are struggling to reinvent themselves.

### *The economics of big pushes*

A successful city's economy is based on a remarkable equilibrium between labor supply and demand: innovative companies (the labor demand) want to be there because they know they will find workers with the skills they need, and skilled workers (the labor supply) want to be there because they know they will find the jobs they are looking for.<sup>15</sup> The economy of a struggling city is the opposite. Even if real estate is dirt cheap, skilled workers do not want to be there, because they know there are no jobs; innovative companies do not want to be there either, because they know there are no skilled workers. It would be in the interest of one group to move if the other did, but neither wants to go first. It is a catch-22.<sup>16</sup>

One way to move a city from a bad equilibrium to a good one is with a big push: a coordinated policy that breaks the impasse and simultaneously brings skilled workers, employers, and specialized business services to a new location. Only the government can initiate these big-push policies, because only the government has the ability to coordinate the individual actors—the workers and employers—to get the agglomeration process going. The idea is to provide public subsidies for those willing to move first but then stop the subsidies after the process becomes self-sustaining.

The first and most important big push in U.S. history was the Tennessee Valley Authority (TVA), created amid the Great Depression to lift a desperately poor region out of poverty. In practice, this meant investing in large infrastructure programs, particularly electricity-generating

dams, whose power was used to electrify the region and boost local productivity; an extensive network of new roads; a 650-mile navigation canal; schools; and flood control systems. A smaller portion of the funds was devoted to malaria prevention, reforestation, education programs, and health clinics. The program's enormous scale went far beyond anything attempted before or since. Over 1933–58, \$30 billion from U.S. taxpayers poured into the region. At the program's peak, in 1950, the annual federal subsidy to the region was \$625 per household. After 1958, the federal government began to scale back its investment, and the TVA became a largely self-sustaining entity.

This program is not unlike regional economic development policies that many developing countries currently adopt. This approach to economic development is based on the intuitive notion that public monies can jump-start a local economy trapped in poverty. But critics on both the right and the left have lambasted such initiatives, either as big government overreach or top-down control of local communities. In an influential 1984 article in the *New York Review of Books*, the progressive urban thinker Jane Jacobs wrote a scathing critique of big-push policies, including the TVA, arguing that it is an unnatural way to foster local economies and concluding that they work miserably in practice.

How can we rigorously assess these place-based policies? The real test is not whether they create jobs during the push. The fact that an inflow of money temporarily increases economic activity in an area is hardly a sign that the money was well spent. We need to look instead at whether the publicly financed seed can eventually generate a privately supported cluster large enough to sustain itself. The idea is that government investment carries the local economy past the tipping point but no further. At that point, the forces of agglomeration take over, continuing to attract businesses and workers well after the subsidies end.

A recent study of the TVA found that the program succeeded in generating an industrial revolution in an area that had to that point been largely rural.<sup>17</sup> During the big-push years of 1933 to 1958, manufacturing jobs in the region grew much faster than they did in the rest of the country—companies found the cheap electricity and easy transportation attractive—and manufacturing jobs kept growing faster after the federal subsidies dried up. Even in 2000, more than 40 years after the end of the federal transfers, manufacturing jobs in the region were growing faster than those in comparable parts of the south, though the effect is now slowing and will probably soon disappear. While the program succeeded in moving the region from a low-productivity sector (agriculture) to a high-productivity sector (manufacturing), it did not succeed in raising local wages in any significant way. The reason is simple: as more and more jobs were created, more and more workers moved there from the rest of the south to take advantage of improved economic conditions. This increase in the supply of labor effectively offset the increase in demand.

The fundamental challenge with this type of place-based policies is that for them to be successful, local policy makers must be able to pick promising companies to invest in. They need

to be a little like venture capitalists. In this sense, President Franklin Roosevelt had it easy. When manufacturing was the engine of job growth and prosperity depended on infrastructure and cheap energy, the recipe for development was obvious. The level of industrial development in the Tennessee Valley was so low that it hardly mattered whether an aluminum smelter, a steel factory, or a chemical factory opened its doors. But today, the most important determinant of success for local communities is human capital, and making the right call is much harder. Should a county spend all its money attracting a new nanotech lab, or should it go for Amazon's latest computer farm? A solar-panel research and development facility or a biotech lab? Even professional venture capitalists have a hard time predicting which industries and companies will succeed. For mayors of struggling municipalities, this challenge can prove insurmountable.

Overall, the track record on industrial public subsidies in the United States and Europe is not great. It is simply too difficult for policy makers, even the brightest and best intentioned, to identify winning industries before they become winners. Even if it were clear which industries would drive future growth, it would still be difficult to pick winning companies within those industries.

Indeed, looking at the United States's most successful industrial clusters, it is hard to find one spawned by a big push. No local politician set out to create Silicon Valley. In Austin, San Diego, and Seattle, the success of an original anchor company was typically the seed that grew into a high-tech or life-science cluster. The same is true for smaller, more specialized clusters, arguably a more realistic goal for struggling communities. Consider Boise, Idaho; Kansas City, Kansas-Missouri; and Portland, Oregon, three small high-tech hubs anchored by semiconductors, general high tech, and animal health and nutrition sciences, respectively. Although small, these centers are dynamic: Boise and Portland produce almost as many patents per capita as Boston. None of these hubs was planned. The opening of Intel's semiconductor facility in 1976 jump-started Portland's high-tech sector. The seed for Boise was planted in 1973, when Hewlett-Packard moved its printer division there. Life science research and development in Kansas City can be traced back to the 1950s, when Ewing Marion Kauffman started his pharmaceutical lab. Little of the high-tech presence in these cities resulted from aggressive recruitment of companies by local governments.<sup>18</sup>

Other parts of the world have seen some success. Ireland used a deliberate big-push policy to build up new human capital-intensive sectors. Through aggressive tax incentives and other enticements, it created clusters in high tech and finance, though the country's recent financial crisis throws the sustainability of such policies into question. Israel's high-tech cluster, one of the world's most dynamic, depends highly on the country's military. Although the Israeli government did not set out to create a local high-tech sector, its need for innovative defense technologies and specialized human capital indirectly fostered a private sector that later became globally competitive.

Perhaps the best example of big-push success is Taiwan, China, which in the 1960s and 1970s transformed its rural economy into an advanced one with a dynamic innovation sector through a large-scale policy of government-sponsored research. The program brought top Chinese scientists back from the United States and established a cluster of publicly supported research and development that eventually became thick enough to sustain private companies. This is one of the rare instances in which policy makers turned out to be good venture capitalists. While they did bet on several failed technologies, they also bet on semiconductors very early on. Semiconductors quickly became the core of Taiwan, China's, high-tech sector and arguably one of its engines of prosperity. More recently, Taiwan, China's, high-tech cluster has embraced newer technologies, including life sciences. But Taiwan, China, might just be the exception that proves the rule.

### *Cluster building*

Ever since Harvard scholar Michael Porter popularized the catchy concept of cluster building in the early 1990s, cities and states have been trying to engineer economic clusters through a variety of public policy measures.<sup>19</sup> A widespread example of place-based industrial policies is the use of economic subsidies to attract large companies to struggling communities in order to seed a cluster. Virtually every time a company announces plans for a new headquarters, a lab, or a large production facility somewhere in the United States, the bidding begins. States compete aggressively by offering larger and larger enticements in the form of tax breaks, subsidized loans, local infrastructure, export assistance and financing, workforce training, and area marketing. These subsidies can be incredibly large. Panasonic recently received more than \$100 million (\$125,000 per job) to move its North American headquarters to Newark, New Jersey, while Electrolux was given \$180 million (\$150,000 per job) in tax abatements for its new establishment in Memphis, Tennessee. Mercedes received a \$250 million incentive package (\$165,000 per job) for locating in Vance, Alabama. Total state spending on local economic development amounts to \$40 billion a year, far more than the cumulative federal spending for the TVA over its 30 years of government subsidies.

While politicians and the companies they subsidize usually extol the benefits of these deals, critics complain that they are a huge waste of public money. Is spending \$150,000 per job really the best way to help the residents of Memphis? What if we just wrote checks to those residents instead? Greenstone, Hornbeck, and Moretti (2011) have studied what happens to local communities when their bid to attract a large employer by offering subsidies succeeds. When firms are considering where to open a large plant, they typically begin by looking at dozens of locations. They narrow the list to roughly 10 sites, from which two or three finalists are selected. The study compared the experience of the counties that the company ultimately chose (the winner) with the runner-up counties (the losers). For example, when BMW decided to open a new plant in the United States in the 1990s, the decision of where to locate it came down to two finalists: Greenville-Spartanburg, South Carolina, and Omaha, Nebraska. BMW chose Greenville-Spartanburg, partly because of an incentives package worth \$115 million. In this case

and others, the losers were counties that had survived a long selection process but narrowly lost the competition. These cases can therefore tell us how the winner county would have fared if it had decided not to bid.

The study finds that in the years leading up to such a bidding war, winners and losers were similar in terms of employment, salaries, and productivity. But after, the winners' productivity surged. These productivity gains, which appeared to reflect knowledge spillovers, were particularly large for existing plants that shared similar labor and technology pools with the new plant. Thus, by making existing producers more productive, a new plant generated an important benefit—a positive externality—for the rest of the country's establishments. This higher productivity led to more jobs and higher wages. So, the provision of subsidies might be seen as a way to internalize this externality.

To be efficient, however, the provision of the subsidy should be commensurate with the magnitude of the social benefit. When dozens of similar counties are desperate to attract outside investment, their bids sometimes become so generous that they exceed the social benefits to the community. Mayors and governors have an incentive to bring the new company to town, no matter what the cost. When they succeed, front-page stories in local newspapers tend to focus on the hundreds of future local jobs, not on the fine print of the financial packages offered. When they do not succeed, local politicians are lambasted for not doing enough for the local economy. All this can lead local governments to overbid. In such a case, the only winners are the owners of the company being courted, because state and local governments end up stuck with the bill.

At a more fundamental level, one has to wonder about the aggregate impact of place-based policies for the entire country. Even when these subsidies make economic sense for a particular community, they do not always make sense for the country as a whole, as competition among municipalities for a given company can turn out to be a zero-sum game for the nation.<sup>20</sup> It is even possible that these policies have a negative impact on aggregate economic activity. Just like any other example of government intervention, place-based policies redistribute economic activity from one part of the economy to another. If the economic cost to communities that pay for the transfer is larger than the economic benefit to communities that receive it, these policies may end up hurting the country as a whole. More economic research is needed to establish whether this possibility is empirically relevant.

### *Universities and local jobs*

Given the importance of human capital for local economic development, many local governments seek to raise the education of their residents by supporting local colleges and universities. But do universities really change a community's economy? The role of colleges and universities in local development is complex. As seen, the number of college-educated workers is the key factor driving cities' economic success. But college graduates are a very mobile group, and they do not necessarily stay in the city where they went to school unless market conditions are attractive.

Research shows that the presence of a college or university in a city increases both the supply of college graduates, by educating some and attracting others from outside, and the demand for college graduates, by making them more productive.<sup>21</sup> The demand effect comes through three channels. First, some businesses are created directly as a result of academic research. Recent research indicates that the passing of the Bayh-Dole Act in 1980, which encouraged universities to exploit their innovations commercially, resulted in job growth for communities near universities. Since 1980, the Massachusetts Institute of Technology has generated 3,673 patents; companies started by graduates and faculty generate \$2 trillion in sales each year. Stanford University and the University of California (Berkeley) can make similar claims.

A second important benefit of universities is that academic research generates the kind of knowledge spillovers discussed earlier, and this further fosters a local innovation sector. Jaffe (1989) found that this spillover effect is particularly relevant in pharmaceuticals, medical technology, electronics, optics, and nuclear technology. While some of the spillover accrues to companies everywhere, a significant part is local.

A third channel is through a university's medical school and its associated hospital. Because hospitals are open 24 hours a day and provide one of the most labor-intensive and skill-intensive products, they generate hundreds or even thousands of high-paid local jobs. Much health care is a local service, following local prosperity rather than causing it. But sometimes hospitals become regional or national providers. Rochester, Minnesota (home to the Mayo Clinic), Pittsburgh, and Houston attract patients from all over the country and beyond. These hospitals are effectively producing a tradable service that is exported outside the local economy—not unlike Microsoft and Apple—and therefore their presence is an important driver of local wealth.

Overall, research suggests that the presence of a university is on average associated with a better educated labor force and higher local wages.<sup>22</sup> But mayors and local policy makers should realize that a university—even a good one—is no guarantee of economic success. While most large cities have universities, only a small fraction of metropolitan areas have large concentrations of innovative industries. Washington University in St. Louis is a better academic institution than the University of Washington in Seattle, but St. Louis has few high-tech jobs to show for it. In fact, its population has been declining for 50 years, while Seattle is now one of the world's most dynamic innovation hubs. Arizona State University and the University of Florida are among the largest U.S. institutions of higher education, but Phoenix and Gainesville rank low on the list of innovation hubs. Cornell and Yale dominate global academic rankings, but other than employers directly connected to these universities, there is little in Ithaca and New Haven to suggest a world-class high-tech cluster.

So, proximity to a research university is important, but it alone is not enough to form a sustainable cluster of innovative companies. This is a key distinction, one ignored by countless local governments—from Las Vegas to Detroit, from Italy to China—that invest scarce resources in creating research centers. Universities are most effective at shaping a local economy when

they are part of a larger ecosystem of innovative activity, one that includes a thick market for specialized labor and specialized intermediate services. Once a cluster is established, colleges and universities play an important role in fostering its growth, often becoming a key part of the ecosystem that supports it and makes it successful.

### *Who really benefits from place-based policies?*

Government policies can be justified on grounds of either efficiency or equity. This paper has discussed under what conditions place-based policies are an efficient use of taxpayer money. It now turns to the question of who benefits from these policies. This is not easy to answer in practice, because the beneficiaries of place-based industrial policies are not necessarily those directly targeted by policy makers. This has to do with the tight link between a city's labor market and its housing market.

An increase in a city's labor demand has two effects. It raises employment and local wages. And the increase in employment raises the local cost of housing. Cities where labor demand is strong tend to have higher housing costs than those where it is weak, so that differences in salaries adjusted for cost of living (real salaries) are smaller than differences in unadjusted salaries (nominal salaries). An interesting implication is that a significant part of the wealth created by the dynamism of cities with a strong labor market accrues not just to workers through the labor market but to homeowners through the housing market, in the form of capital gains. These capital gains are an important channel for some residents of an area to benefit from the strength of their local economy. For renters, however, the effect of a strong labor market is tempered by the increase in their monthly housing costs.

The economic benefit created by regional development policies designed to increase a city's employment is ultimately split between local workers (in higher wages) and local homeowners (in higher housing values). The change in real estate prices effectively redistributes the wealth created by job growth from one group to another. The split depends on how accommodating the supply of housing is and how mobile workers are.<sup>23</sup> It is important to recognize that local governments can affect the split. Policies that allow for increases in local housing stock following increases in local employment tend to keep housing prices in check, thus favoring workers who do not own a house. By contrast, policies that limit growth in the housing stock tend to result in housing cost increases, thus favoring homeowners.<sup>24</sup> Land use regulations, then, are an important mechanism that local governments can use to redistribute the wealth created by job growth from homeowners to renters.

## **Conclusions**

Despite all the hype about exploding connectivity and the death of distance, location matters now more than ever. Our best ideas still reflect the daily, unpredictable stimuli that we receive from the people we come across and from our immediate social environment. Most of our crucial interactions are still face to face, and most of what we learn that is valuable comes from the

people we know, not from Wikipedia. The number of telecommuters as a fraction of the total labor force is still incredibly small. Video conferencing, e-mail, and Skype have not made a dent in the need for innovative people to work side by side. In fact, that need is more important than ever. Even as goods and information travel faster and faster to all corners of the globe, there is an inverse gravitational pull toward key urban centers. Globalization and localization seem to be two sides of the same coin.<sup>25</sup>

It was not supposed to be this way. At the peak of the dot-com frenzy in 2000, observers of all stripes almost unanimously concluded that “the new economy gives both companies and workers more locational freedom.” In *The World Is Flat*, one of the most influential books about globalization, Thomas Friedman famously argued that cell phones, e-mail, and the Internet lowered communication barriers so much that location was irrelevant. Distance was dead. Geography did not matter. This argument continues to resonate. The idea is that no matter where people live, they can share knowledge and move products at virtually no cost.

According to this view, the good jobs, now concentrated in high-cost locations such as Bangalore and Silicon Valley, will quickly disperse to low-cost locations. This process of dispersion, the argument goes, will be faster than the dispersion of manufacturing jobs, because moving software codes by DSL is easier than moving bulky goods across borders. In this vision of the future, the great innovation hubs of the globe will disappear, and innovation jobs will disperse evenly across the country. The key prediction is economic convergence. Low-cost areas will attract more and more of the new, high-paying jobs. Cities that have been lagging—the Clevelands, the Mobiles, the Topekas—will grow much faster. Bogged down by their high costs, New York, San Francisco, Seattle, and similar cities will decline.

But the data do not support this view. In fact, the opposite has been happening. For innovation, a company’s success depends on more than just the quality of its workers—it also depends on the surrounding ecosystem. This is important, because it makes innovation harder to delocalize than traditional manufacturing. A textile factory is a standalone entity that can be put pretty much anywhere labor is abundant. By contrast, a biotech lab is harder to export, because you would have to move not just one company but an entire ecosystem.

A growing body of research suggests that cities are not just a collection of individuals but are complex, interrelated environments that foster the generation of new ideas and new ways of doing business. For example, social interactions among workers tend to generate learning opportunities that enhance innovation and productivity. Being around smart people makes us smarter and more innovative. By clustering near each other, innovators foster each other’s creative spirit and become more successful. Thus, once a city attracts some innovative workers and innovative companies, its economy becomes even more attractive to other innovators. In the end, this is what is causing an increased concentration of good jobs, talent, and investment.

This does not mean there is no merit to the view that low-cost areas are destined to catch up. At a global level, the most important economic development of the past decade is the incredible improvement in the living standards of low- and middle-income countries, such as Brazil, China, India, and Turkey, and even some African countries. Their strong economic performance has greatly narrowed their gap with rich countries, thus contributing to a marked convergence in incomes. The catch-up experienced by the southern United States over the past 50 years is another example of convergence. Many southern states were much poorer than the rest of the country in the 1960s but grew more rapidly in the following decades.

Yet in both cases, the process of catching up was geographically uneven. Some southern cities—Atlanta, Austin, Dallas, Houston, and Raleigh-Durham, for example—grew much faster than others, thus increasing the disparity among communities in the south. Developing countries exhibit similar regional differences. In China, Shanghai has reached a per capita income close to that of a rich nation. Its students outperform American and European students in standardized tests by a wide margin. Its public infrastructure is better than that of most U.S. cities. But agricultural communities in western China have made much less progress. The regional differences in China have clearly grown, even if the difference between China and richer countries has shrunk.

The implications for economic policy are complex. Visionaries have been trying to build thriving cities from the time people started living in them. Utopian communities have always ignited imaginations, with their promise of curing social ills through enlightened planning and strong values. In most cases, these communities have not lasted. People often have unrealistic expectations of their governments. The role that local governments can play in revitalizing struggling communities is less extensive than most voters realize and most mayors would like to admit. The reality is that a city's economic fate is determined largely by historical factors. Path dependency and strong forces of agglomeration present serious challenges for communities without a well-educated labor force and an established innovation sector.

Local governments can certainly lay a foundation for economic development and create all the conditions necessary for a city's rebirth, including a business climate friendly to job creation, but there is no magic formula for redevelopment. Like politics, all innovation is local: each community has its own comparative advantage. Local governments must build on their existing capabilities by leveraging local strengths and expertise. The use of public funds to create jobs must be reserved for when there are important market failures and a community has a credible chance of building a self-sustaining economic cluster. Ultimately, though, local policy makers should realize that when it comes to local development, there is no free lunch.

## Notes

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<sup>1</sup> A recent version of special economic zones is represented by “charter cities,” an idea originally promoted by economist Paul Romer. Honduras is seeking to develop a new major economic cluster from scratch. The idea of a charter city is an extension of the idea of special economic zones. But unlike the typical special economic zone, the political and legal institutions in Romer’s charter cities are not those of the host country, which is often corrupt and inefficient. They are instead the institutions of some external, well-functioning country.

<sup>2</sup> This section is based largely on Moretti (2012).

<sup>3</sup> To obtain a precise measure of the differences among metropolitan areas, I used data on 15.4 million workers ages 25–60 living in 306 metropolitan areas from the American Community Survey, collected every year by the U.S. Census Bureau. The Census Bureau defines metropolitan areas to include not just the political boundaries of a city but also its neighboring communities, to the extent that commuting patterns suggest that they are part of the same local labor market. Metropolitan areas are thus economically integrated regions that include places where people live and work. The New York metro area, for example, includes New York City and its suburbs in Long Island, New Jersey, Connecticut, and Westchester County. I focus on metro areas with employment of greater than 200,000. (In this paper, I use the terms city and metropolitan area interchangeably.)

<sup>4</sup> Of course, the relationship with innovation is not perfect. Stamford has a thriving financial sector but not many high-tech startups.

<sup>5</sup> Baumgardner 1988.

<sup>6</sup> Wheller 2010; Bleakly and Lin 2010.

<sup>7</sup> An important example of specialized service providers for innovative companies is venture capital. People have remarked for decades that one of the secrets of Silicon Valley’s success is its deep and articulated venture capital base. But what does proximity have to do with funding? Why, in a world of fast communication and cheap plane tickets, should venture capitalists on Sand Hill Road favor startups near them? The answer is that venture capitalists do not simply write a check and then disappear. An increasingly important part of their job involves monitoring, nurturing, and mentoring new businesses. This is why location matters. Nurturing and monitoring are clearly easier if the startup is nearby. In the end, geographical proximity to venture capitalists still matters. Skype and cell phones have not changed this simple fact. This is one reason that the world of high tech is and will remain geographically concentrated.

<sup>8</sup> Harbison and Myers 1965.

<sup>9</sup> The outlier in the top right corner is Stamford. Because 305 other cities are in the graph, the relationship is not driven by this outlier.

<sup>10</sup> Moretti 2004b.

<sup>11</sup> See, for example, Glaeser (1994a,b, 1999) and Gaspar and Glaeser (1998).

<sup>12</sup> Azoulay, Zivin, and Wang 2011.

<sup>13</sup> Moretti 2012.

<sup>14</sup> None of this should be an argument for complacency for successful cities. The forces of agglomeration are no guarantee that cities will keep their lead in innovation forever. Detroit was the Silicon Valley of its day, and its successful industrial cluster has largely disappeared.

<sup>15</sup> This section is based largely on Moretti (2012).

<sup>16</sup> Moretti 2012.

<sup>17</sup> Kline and Moretti 2012.

<sup>18</sup> Moretti 2012.

<sup>19</sup> This section is based largely on Moretti (2012).

<sup>20</sup> Glaeser and Gottlieb 2008.

<sup>21</sup> Moretti 2004a.

<sup>22</sup> Moretti 2004a.

<sup>23</sup> Moretti 2011.

<sup>24</sup> Glaeser, Gourkyo, and Saks 2005.

<sup>25</sup> Moretti 2012.

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