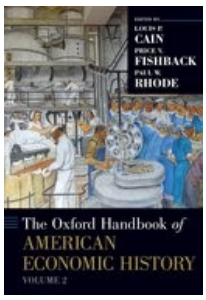

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CHAPTER

22 Urbanization in American Economic History, 1800–2000

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Abstract

This chapter explores the economic forces that led the United States to become an urban nation. The urban wage premium in the United States was remarkably stable over the past two centuries, ranging between 15 and 40 percent. The wage premium rose through the mid-nineteenth century as new manufacturing technologies enhanced urban productivity, then fell from 1880 to 1940 (especially through 1915) as investments in public health infrastructure improved the urban quality of life, and finally rose sharply after 1980, coinciding with the skill- (and apparently also urban-) biased technological change of the computer revolution. Over the twentieth century, households and employment have relocated from the central city to the suburban ring. Rising incomes and falling commuting costs can explain much of this pattern, while urban crime and racial diversity also played a role.

Keywords: urbanization, city, wage, productivity, suburbs, public health

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During its two-hundred-year history, the United States has become an urban nation. Workers and firms flowed to cities following urban-biased productivity shocks, including the new manufacturing technologies of the first and second industrial revolution and, more recently, the advent of computerization. In addition, workers were drawn to cities by improvements in the quality of urban life, especially in public health.

Seminal work in urban economics by Rosen (1978) and Roback (1982) suggests that the urban wage and rental premia can be used to disentangle these competing explanations for urban growth. Novel wage and rent series for urban and rural areas back to 1820 (wages) and to 1918 (rents) show that the urban wage

premium in the United States was remarkably stable over the past two centuries, ranging between 15 and 40 percent, while the rent premium was somewhat more variable, reaching above 70 percent in 1940 and again more recently.

Despite this overall stability, fluctuations in urban wage and rental premia provide insight into the economic forces underlying city growth. Urban premia rose from 1870 to 1940 as new manufacturing technologies enhanced urban productivity and then again after 1980, coinciding with the skill- (and apparently also urban-) biased technological change of the computer revolution.

Changes in urban wages and rents reflect both the productivity of economic activity and the quality of life in urban areas. Historical episodes provide useful variation to document the presence of agglomeration economies in cities and to understand the mechanisms through which density enhances productivity. An
p. 76 extensive literature documents that the urban public health investments of the late nineteenth and early ↳ twentieth centuries led to dramatic reductions in urban mortality; newer work has collected and analyzed data on public health improvements at the neighborhood level.

As urbanization continued, the location of workers and firms *within* metropolitan areas began to decentralize. Over the twentieth century, both households and employment relocated from the central city to the suburban ring. The two forces emphasized in the monocentric city model—rising incomes and falling commuting costs—can explain much of this pattern, while urban crime and racial diversity also played a role.

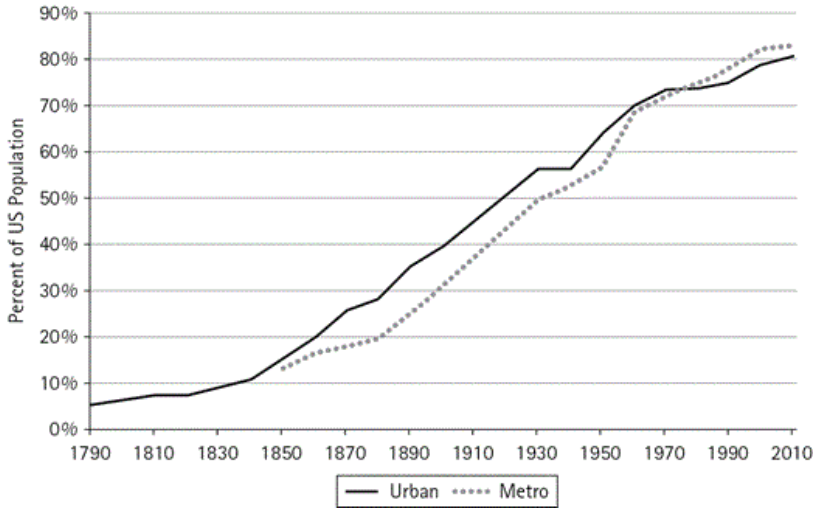

Figure 22.1a. Percent of US population[…] in urban and metropolitan areas, 1790–2010

Notes: Before 1950, the urban share only includes residents living in incorporated places. From 1950 onward, the urban share includes residents living in both incorporated and unincorporated places.

Sources: The urban population share is calculated from Haines (2010). The metropolitan area population share is calculated from Ruggles et al. (2015).

The housing units and commercial buildings that make up a city are often more durable than the city's population itself. The problems associated with "vintage capital" in cities include the lingering housing stocks in declining cities, as well as the coordination failures that delay redevelopment in existing neighborhoods.

Urbanization Rates, 1790–2010

Since the country's founding, the US population has been moving from rural to urban areas and from smaller towns to larger cities. Figure 22.1a displays population trends over the past two centuries. The figure reports the share of the population that lives in an urban place, defined as a town with 2,500 or more residents, as well as the share of the population that lives in a metropolitan area. Metropolitan areas are
p. 77 geographic units defined by the Census Bureau to include one or more contiguous counties anchored by ↳ a central city of a sufficient size. The number of metropolitan areas increased over time from 66 in 1900 to 373 by 2010. As a result, the metropolitan share shown in figure 22.1a increased both because existing areas attracted a larger share of the population and because the number of metropolitan areas expanded over time.

The US population experienced little growth in urbanization in the first decades of the nineteenth century, with the urbanization rate remaining below 10 percent. From 1830 to 1930, the pace of urbanization accelerated quickly, with the urban share of the population increasing more than sixfold from 9 to 56 percent. After a decade of stasis in the 1930s, the urban share again increased rapidly from 1940 and 1970 and then more slowly from 1970 to 2010, reaching 81 percent in 2010. The share of the population living in a metropolitan area tracks the urban share closely. The South has long lagged behind other regions in urbanization rates, although this gap has narrowed over time (see fig. 22.1b).[1]

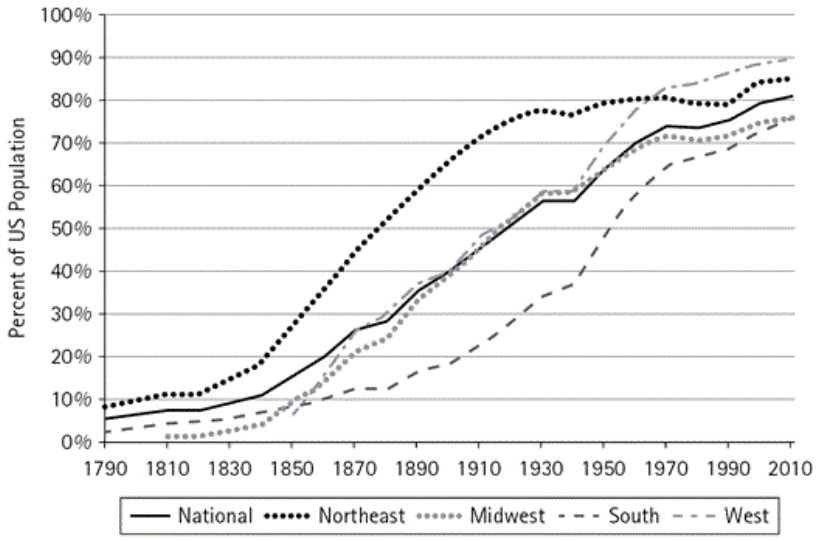

Figure 22.1b. Percent of US population in urban areas, 1790–2010

Source: The urban population shares are calculated from Haines (2010).

The trends in figure 22.1a classify locations as "urban" (or "metropolitan") if they reach a certain population threshold. However, within the United States, cities varied tremendously in their size and population density over time and across regions. Figure 22.2 graphs county-level population density for the median resident by region. Despite the rapid expansion of urbanization after 1830, population density rose more slowly through the nineteenth century. In the Northeast, the growth in population density accelerated after 1890, whereas density in other regions only began increasing rapidly after 1940 (West) or 1970 (South). Regional gaps in population density are driven both by variation in urbanization rates and by
p. 78 differences in density *within* urban areas. ↳

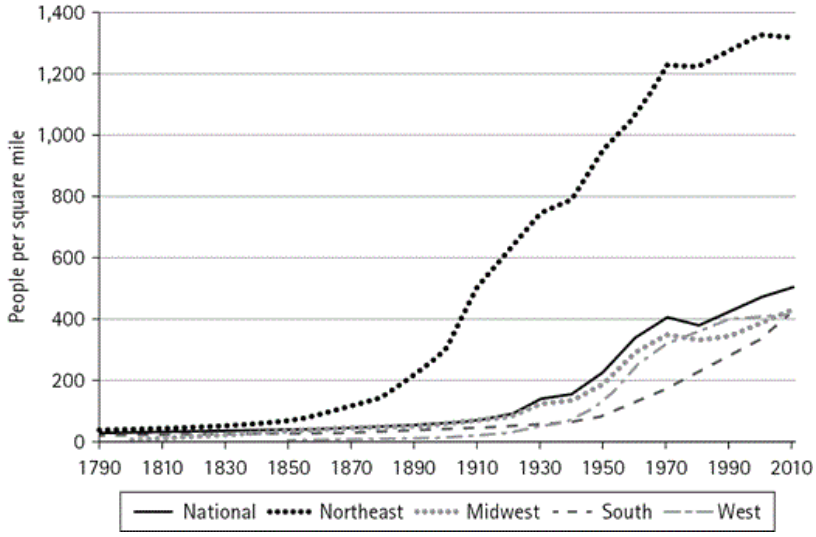

Figure 22.2. US population density (per sq. mi.), 1790–2010

Sources: The population densities are calculated from Haines (2010) and Siczewicz (2011).

Historical Background

The pattern of urban growth over time and across regions was shaped by historical shifts in industrial composition and transportation technology. The towns and cities of the early to mid-nineteenth century served as "central places" for their agricultural hinterlands. As the US economy shifted from agriculture to manufacturing over the late 1800s, cities expanded their functions from central places for the trade and shipment of agricultural products to the location of industrial activity.[2] The transition from waterways to rail as the primary modes of locomotion also influenced the ascendancy of various cities at particular moments in time.

In the early period, towns emerged as hubs for surrounding farmers to process and sell their crops and, once there, to purchase consumer goods and specialized services, such as legal and financial assistance. Weiman (1988) provides a useful case study of this process in Atlanta. The location of these central places was strongly influenced by geographic advantages, such as the presence of waterways and the proximity to rich farmland, but it was also reinforced by human investments in supportive infrastructure—a process that Cronon (1992) refers to as "second nature." New York City, for example, was built around a natural harbor that provided access to domestic and international markets. In addition, the Hudson and East Rivers offered connections to agricultural land in upstate New York and Long Island. The fertile farmland in these areas supported a large rural population that generated a customer base for the services offered in the city. Beyond these natural advantages, New York City's ascendancy was strengthened by investment in the Erie Canal, which linked upstate New York to the Great Lakes and thereby expanded the city's set of easily accessible markets.

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The natural advantages that shaped the historical locations of cities in the United States changed over time as innovation rendered existing transportation infrastructure obsolete. The stagnation of St. Louis in the twentieth century offers one such example. St. Louis sits at the junction of the Mississippi and Missouri Rivers. Furthermore, the Mississippi River narrows at this point, preventing the passage of large steamboats traveling from New Orleans and requiring traders to offload their cargo onto smaller boats to complete their journey to northern markets. This confluence of trade created an opportunity for commercial activity and, hence, St. Louis emerged. Yet, as river transport was eclipsed by rail, which minimized the need for these

trans-shipment points, St. Louis became overshadowed by Chicago as the largest city in the Midwest (Cronon 1992, 296).[3]

Even as natural advantages diminish, forces of path dependence can preserve a relatively stable array of city locations as long as there are sufficiently strong "agglomeration economies," by which the productivity advantages of proximity to other firms either leads existing firms to stay in place or encourages new firms to locate in the area. Even St. Louis, which has been surpassed in regional prominence, remains a city of 320,000 residents, anchoring a metropolitan area of nearly 3 million, in a location that was historically valuable, despite the fact that there might be little independent reason to build a city in this location today. Bleakley and Lin (2012) illustrate this point further by examining the contemporary fate of cities located at historical portage sites.

With the growth of the railroad, transportation costs fell and manufacturing establishments no longer needed to remain close to local customers. Instead, manufacturing firms could concentrate production in regions that offered productive advantages, such as an abundance of natural resources (Kim 1995), or access to broader markets (Klein and Crafts 2012). Furthermore, the switch first from water power to coal-fired steam power in the 1840s and, eventually, to electricity freed up firms from locating close to power sources (Chandler 1972; Kim 2005; Rosenberg and Trajtenberg 2004). By 1920, 69 percent of manufacturing employment occurred in a metropolitan setting, compared to only 43 percent of general work activity.[4]

Theoretical Framework

As the relative advantages of urban and rural locations change over time, where do workers choose to settle and where do firms choose to operate? A Rosen-Roback model of firm and worker location generates predictions about how the relative wages and rents in urban areas change with the desirability of urban locations. These predictions allow us to interpret historical time series of urban factor prices.

Consider a group of workers and firms, each free to move between a set of cities. Cities are endowed with a fixed quantity of land (L) and are distinguished by an amenity level (S); S can include consumer amenities (e.g., cultural activities) that attract workers, as well as productive amenities (e.g., access to natural waterways) that attract firms. In each city *i*, workers receive a wage (w_i) and allocate their resources
p. 80 between a consumption ↳ good (X_i) and land for housing (L^h_i). Firms in location *i* produce consumption good X_i with a combination of labor, land for production (L^p_i), and—if relevant—the productive amenity S_i. Wages and rents adjust until, in equilibrium, each firm and worker is indifferent between locating in all possible cities. Implicitly, the model assumes that the consumption good can be shipped without cost between markets, a condition that limits the applicability of the model in the nineteenth century but may be a reasonable approximation in the twentieth and twenty-first centuries.

Cities will grow either if workers are attracted to the area by a new consumer amenity or if firms are attracted to the area by a new producer amenity. First, consider a new producer amenity, such as a new port for international shipping in city *i*. Firms move to city *i* to take advantage of this local productivity boost. Firms in city *i* are now willing to pay higher wages because each worker generates more output, thereby inducing workers from elsewhere to move to city *i*. As firms and workers move to the area, competition over the fixed land resource drives up rents, offsetting the increase in wages and equalizing worker utility across locations. Despite the productivity advantage in city *i*, the need to pay higher rents and higher wages together ensure zero profits for firms. Therefore, it is possible to infer that *cities whose growth is due to the arrival of a new productive amenity will offer higher wages and charge higher rents*.

Next, consider a new consumption amenity, such as the development of a new theater district. This consumption amenity will attract workers to the area and thereby drive up rents. Firms facing higher rents

will lower their demand for land, thereby reducing workers' marginal product and their wage. The combination of higher rents and lower wages counterbalance the higher consumer amenity level, equalizing worker utility across cities. Therefore, *cities whose growth is due to a new consumption amenity will offer lower wages and charge higher rents*. Note that, in both cases, the model predicts that urban growth is accompanied by higher rents; what distinguishes between producer- or consumer-led growth is the correlation between urban growth and wages.

Urban Wage and Rent Premia in the United States, 1820–2010

The Rosen-Roback model can be combined with long-run series of urban wage and rental premia to infer the underlying causes of urban growth in the United States over time.

Census and American Community Survey data from the Integrated Public-Use Microdata Series (IPUMS) allow a construction of wage series for the period 1940–2010 and rental series for the period 1930–2010. Data from the Bureau of Labor Statistics' (BLS) Cost of Living Survey Series, the Iowa State Census, and the Census of Manufacturing permit us to extend the series back to 1820 for wages and 1918 for rents (Ruggles et al. 2010).[5],[6] Wages are calculated for working-age men who are currently ↳ employed (i.e., not unemployed and not out of the labor force) and who report earning nonnegative annual wage and salary income.[7] The rent series is calculated using contract rents.[8] All dollar figures are inflation-adjusted to 2010 values using the urban consumer price index from the BLS for 1913 onward and from David and Solar (1977) before 1913. Before 1918, the series compares urban to rural workers using the 2,500-resident threshold; after 1918, it compares metropolitan to nonmetropolitan workers.[9]

p. 81

Figure 22.3 shows the US urban wage premium for the period 1820–2010, along with the underlying urban and rural wages; figure 22.4 portrays the corresponding rent series for the period 1918–2010. Both the wage and rent premia are positive over the entire period—the wage premium ranges between 13 and 42 percent over nearly two centuries, while the rent premium ranges between 25 and 102 percent—suggesting a consistent productivity advantage for urban areas despite the considerable decade-by-decade volatility in the series.

Taken together, the figures broadly illustrate four episodes of urban evolution in the United States. In the early nineteenth century (1820–1870), the series is characterized by fairly flat wages in the manufacturing sector within urban and rural areas and a steady urban wage premium of around 20 percent.[10] From 1870 to 1940, there are steadily rising wages in both urban and rural areas and a *rising* urban wage premium, which increased from 17 percent to 37 percent. Together with the fact that workers continued to move to the cities during this period, the heightened wage premium suggests that cities were becoming more productive centers of economic activity during the second industrial revolution.[11]

The third episode, spanning from 1940 to 1980, is characterized by rapidly rising wages and rents, together with *declines* in the urban wage and rent premia. Over this period, wages more than doubled in each sector while the urban wage premium fell substantially, from 37 percent to 22 percent. At the same time, urban and rural rents also increased, while the urban rent premium declined substantially, from 86 percent to 48 percent. According to the Roback model, a simultaneous decline in both the urban wage and rental premia suggests that productive amenities in cities were falling relative to those in nonmetropolitan areas—perhaps due to the construction of interstate highways and the rise of trucking, which minimized the need to be near fixed transportation nodes in central cities (e.g., train depots or ports). For a fixed housing supply, then, as assumed in the Roback framework, we would expect population to shift away from urban areas. Yet throughout this period, the urbanization rate continued to rise. Taken together, these trends suggest that the growth in the urbanization rate in the mid-twentieth century was likely driven by an increase in urban housing supply. The substantial amount of home-building in the suburban ring in the

decades after World War II reduced urban rents, thereby leading to an increase in urban residence despite the loss of relative urban productivity.

The fourth episode, from 1980 to the present, is characterized by another sustained *increase* in both urban wage and rental premia. The urban wage premium grew from 22 to 34 percent over this period. Likewise, the rent premium jumped from 48 to 66 percent. At the same time, the urbanization rate grew modestly. In
p. 82 light of the Roback model's ↳

p. 83 ↳
predictions, these trends imply that urban areas enjoyed a boost in productivity—coinciding with the diffusion of the personal computer and later the Internet. It is often suggested that the skill-biased technological change of this era contributed to rising income inequality by education level. What is less well known is that computerization was also associated with rising inequality between metropolitan and nonmetropolitan areas. In other words, computers and cities appear to be complements; computers may facilitate the types of learning or worker-firm matching that take place in cities (Wheeler 2001).

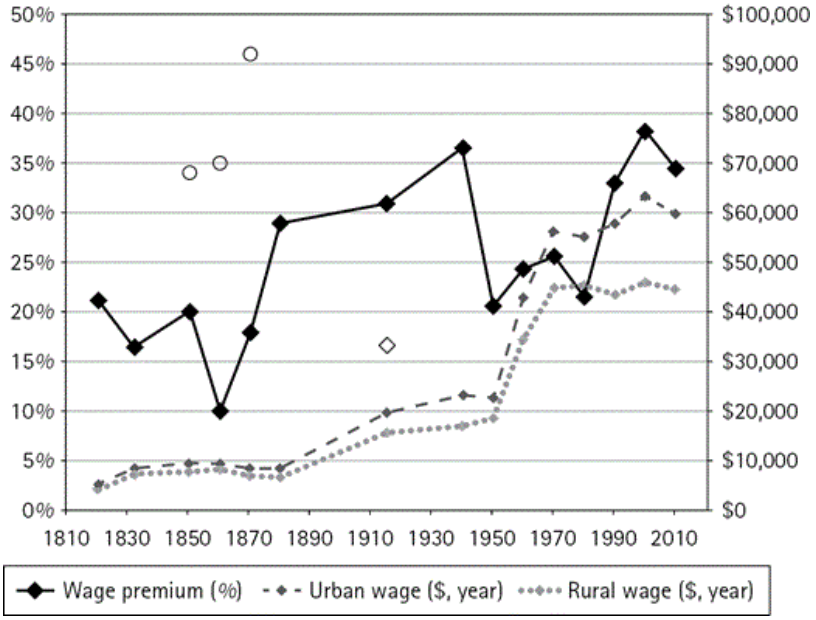

Figure 22.3. US urban wage premium, 1820–2010

Notes: All dollar figures for the period 1913–2010 are inflation-adjusted to 2010 values using the urban consumer price index from the BLS; David and Solar's (1977) historical cost of living estimates are used for years prior to 1913. The values for 1820 and 1832 are from Sokoloff and Villaflor (1992), and represent the urban wage premium in New England and the Mid-Atlantic for male manufacturing workers in a county with at least one city of 10,000 residents or more, or in a county adjacent to such a county. The premium for 1850–1880 was calculated using firm-level data on monthly wages from the Census of Manufacturing, and represents the premium nationally for men (and women for 1870 and 1880) employed in nonfarm industries earning non-negative wages in incorporated cities of at least 2,500 residents. The estimates for all years control for industry and state fixed effects; those for 1870 and 1880 also control for months of operation and the workforce share of women and children. The premium was calculated at the mean values of the control variables (Atack and Batemen 2004; Atack, Weiss, and Bateman 2004). The open white circles for 1850–1870 represent estimates of the urban wage premium prepared using data from Lindert and Williamson (2016). The Lindert and Williamson estimates are calculated by weighting the urban wage premium for three occupation categories—unskilled (common labor), blue collar (manufacturing) and white collar (male teachers)—by the shares of these categories in the workforce in 1850 (= 48.2, 39.6, and 12.1 percent). The urban wage premium for 1915 is estimated from the Iowa State Census and represents the premium in Iowa for working-age men employed in nonfarm industries earning non-negative wage income annually in Des Moines, Davenport, and Dubuque (Goldin and Katz 2010). The open white diamond in 1915 represents the actual urban wage premium in Iowa, whereas the closed black diamond represents the estimated national urban wage premium, which we calculate by adjusting the Iowa premium upward using the ratio of the Iowa premium relative to the national premium in the IPUMS data from 1940 onward. The urban wage premium for 1940–2010 was calculated using data provided by IPUMS, and represents the premium nationally for working-age men employed in nonfarm industries earning non-negative wage income annually living in metropolitan areas. Results are similar if we instead use men living in urban areas, defined as towns with at least 2,500 residents.

Sources: Consumer price index data used in the following calculations are from Lindert and Sutch (2006, Table Cc1–2); and Bureau of Labor Statistics, US Department of Labor (2015), "Inflation and Prices." http://www.bls.gov/data/. The urban wage premia for 1820 and 1832 are calculated from Sokoloff and Villaflor (1992). The urban wage premia for 1850–1880 are calculated from Atack, Bateman, and Weiss (2004); Atack and Bateman (2004); and Lindert and Williamson (2016). The urban wage premia for 1915 are calculated from Goldin and Katz (2010); and Ruggles et al. (2015). The urban wage premia for 1940 to 2010 are calculated from Ruggles et al. (2015).

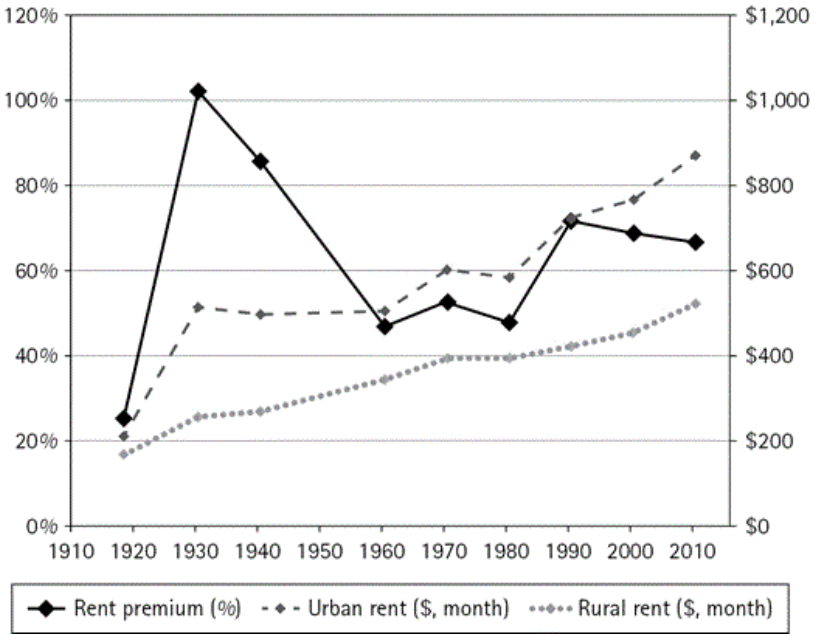

Figure 22.4. US urban rent premium, 1918–2010

Notes: All dollar figures for the period 1918–2010 are inflation-adjusted to 2010 values using the urban consumer price index from the BLS. The value for 1918 was calculated using data from the Bureau of Labor Statistics, and represents the premium nationally for households of industrial workers living in cities located in metropolitan areas (US Department of Labor 1986). The values for 1930–2010 were calculated using data from IPUMS, and represent the premium nationally for nonfarm households in metropolitan areas.

Sources: Consumer price index data used in the following calculations are from Lindert and Sutch (2006, Table Cc1–2); and Bureau of Labor Statistics, US Department of Labor (2015). "Inflation and Prices." http://www.bls.gov/data/. The urban rent premium for 1918 is calculated from US Department of Labor, Bureau of Labor Statistics (1986). The urban rent premia for 1930–2010 are calculated from Ruggles et al. (2015).

One caveat to the preceding analysis is the issue of worker quality. The Roback model assumes that all workers supply one identical unit of labor. Yet if the highest-quality workers are attracted to city living, then the urban wage premium could simply be due to higher-quality workers sorting into cities, rather than to underlying changes in urban productivity for workers of a fixed quality. Furthermore, it is possible that changes in sorting patterns over time could account for a rising (or falling) urban wage premium if the most talented rural dwellers leave for the city, thereby lowering the average rural wage and, at the same time,
p. 84 either increasing or decreasing the urban wage, depending ↳ on how these in-migrants compare to the existing urban population. For a modern approach to this selection problem, see Glaeser and Mare (2001).

Agglomeration Economies

The preceding historical wage and rental series suggests that the productivity of urban areas, relative to their rural counterparts, has fluctuated over time. Urban productivity appeared to increase sharply from 1980 to 2010. Perhaps as a result, academic interest in the concept of "agglomeration economies," or the potential productivity advantages of being in close proximity to other firms, has expanded tremendously in recent years.[12] Economic history has strongly contributed to this growing field, both in documenting the presence (or absence) of agglomeration economies in various historical settings and in using these historical episodes to distinguish between possible mechanisms underlying the forces of agglomeration.

The use of historical data allows scholars to chronicle the strength of agglomeration economies over long periods of time and to contrast the role of agglomeration economies under different technological regimes. Davis and Weinstein (2002) examine regional population growth in Japan over the past 8,000 years. In particular, they highlight the persistence of this spatial distribution even in the face of the decimation of many cities during World War II. The authors claim that the postwar rebound of Japanese cities is more consistent with a story of locational fundamentals, in which cities arise in areas that are blessed with innate productive advantages, than with a story of agglomeration economies, in which initial density confers productivity advantages. Yet, they also demonstrate that the most productive regions of Japan grew relatively more populous after industrialization, suggesting that agglomeration economies may have played a larger role over time.

The emergence of agglomeration economies in Japan only after industrialization is echoed in the findings of Bleakley and Lin (2012), who document the long-run growth of early American cities established at portage sites. Portage sites emerged at river rapids when early travelers needed to disembark and carry their boats, generating opportunities for trade. Even as the initial raison d'être for these cities disappeared with the advent of canals, railroads, and trucking, these portage cities maintained their size advantage well into the twentieth century. While locational fundamentals provided the initial impetus for the location of portage cities, the long-term growth differentials suggest that these cities were subject to forces of agglomeration.[13]

Although the benefits of agglomeration have been present throughout the industrial period, the long-run wage and rent series suggests that these forces have strengthened in recent decades. A burgeoning literature in urban and labor economics documents the presence of these spillovers at the firm level; Moretti (2004b) and Rosenthal and Strange (2004) provide useful reviews of this contemporary literature. Recent studies
p. 85
like Fu ↳ (2007), Greenstone, Hornbeck, and Moretti (2010), and Baum-Snow and Pavan (2012) continue to advance this research agenda.[14]

Beyond documenting the presence of agglomeration economies, it is also important to understand the mechanisms by which proximity to other firms may generate productivity advantages. A growing literature is utilizing the historical record to shed light on possible benefits of locating in a city, including access to larger product markets, larger input markets, and larger numbers of similar firms from which to learn new production techniques.

In the early nineteenth century, the large customer base available in cities allowed urban firms to economize on transportation costs. Sokoloff (1988) demonstrates the importance of market size in the nineteenth century by focusing on geographic variation in innovation, an economic activity with high fixed costs that often only becomes profitable if the resulting product can be sold in high volume (e.g., Krugman 1991). Sokoloff finds that, in the first half of the nineteenth century, patenting rates were higher in urban areas and along navigable rivers and canals.

With the rapid decline in transport costs in the late nineteenth century, the importance of access to a large local customer base receded. Instead, agglomeration economies may now arise due to the advantages of large labor markets in urban areas. Contemporary white-collar and technical jobs require specialized knowledge or experience and, thus, educated workers are often more productive at firms that are well matched to their specific skills. The potential for finding better matches in the labor market provides an edge to firms locating in large urban areas. Costa and Kahn (2000) explore the role of thick labor markets in generating agglomeration economies by focusing on the location choices of dual-career couples. They find that college-educated couples are more likely to live in large metropolitan areas and that this sorting has increased in recent decades alongside the growth in the urban wage premium.

Marshall (1890) theorized that the forces of agglomeration are strongest between firms in related industries that can more easily share ideas, workers, and inputs and output linkages. Offering a historical test of this

hypothesis, Bostic, Gans, and Stern (1997) contrast possible industrial externalities within large US cities in the late nineteenth century; their findings point to an important role for agglomeration externalities in urban growth.

Moving beyond the concept of city-wide agglomeration forces to that of specific inter-industry linkages is a promising direction for future work.[15] Hanlon (2012), for example, traces the asymmetric effects of the cotton blockade during the US Civil War on the growth rates of various industries in cotton- and wool-producing towns in England. He finds that industries closely related to textiles, such as machine tools, experienced much slower employment growth during and after the Civil War in cotton-producing towns, both relative to industries less connected to textiles and relative to similar industries in wool-producing towns; that is, the removal of certain links in the local industry mix seems to have particularly strong and long-lasting impacts on firms in related industries.

Another promising direction for new research on agglomeration is the use of historical conditions to
p. 86 generate cross-city variation in persistent factors that may contribute ↳ to contemporary economic growth. Moretti (2004a), for instance, uses the historical allocation of land grant universities as an instrument for the share of a city's workforce with a college degree. Glaeser, Kerr, and Kerr (2012) and Bunten et al. (2013) leverage the historical location of mining activity and other heavy industry to predict which areas will lack high levels of entrepreneurship today.

Amenities and Disamenities in Cities: The Case of Public Health

In addition to taking advantage of the productivity advantages of density, workers may choose to locate in cities to enjoy the amenities of proximity to other households and firms. Recent work by urban economists tends to emphasize the positive aspects of density—namely, that cities offer a wider array of shopping venues, cultural events, and bars and restaurants (Glaeser, Kolko, and Saiz 2001; Sinai and Waldfogel 2004). However, in the past, the negative aspects of density likely outweighed the positive, most importantly the spread of communicable and waterborne disease. Simply put, cities were deadly places until the spread of investments in clean water and sewer systems.[16] The role of public health in moderating urban mortality rates has been studied extensively in economic history, historical sociology, and epidemiology.

In 1900, death rates, particularly infant mortality, were substantially higher in urban areas than in rural areas, in large part due to infectious disease (Condran and Crimmins 1980; Haines 2001).[17] Part of the urban wage premium in the nineteenth century may have been a compensating differential for the health costs borne by urban residents (fig. 22.4).[18] The urban mortality penalty and corresponding wage premium both declined in the early twentieth century as cities began investing in clean water systems, sewage control, and sanitation. Early work by Gaspari and Woolf (1985) on these investment projects in 122 cities in 1910 finds that the extent of sewer lines in an area has a negative association with mortality rates.

Cutler and Miller (2005) substantially improve on this analysis by following a subset of fourteen cities from 1900 to 1930. The cities most likely to invest in clean water technology may have been those most susceptible to severe disease outbreaks or, alternatively, may have been those with the largest tax base and an otherwise healthy population. By following cities over time, Cutler and Miller can control for fixed differences across cities and instead estimate how a city's health record *changes* after implementing a new public health project. They find that cities experienced a 13 percent reduction in total mortality after the introduction of their first clean water systems, primarily due to a decline in deaths from waterborne disease. By this estimate, clean water alone can explain nearly half of the urban mortality decline in the early twentieth century.[19]

Looking ahead, the recent explosion of data collection at the neighborhood level within cities is a promising
p. 87 trend in the study of urban public health. Kesztenbaum and ↳ Rosenthal (2012) compile information on mortality and sewer infrastructure, along with income and rents, for the eighty *quartiers* of Paris. In the mid-nineteenth century, the average life expectancy in Paris was five years lower than in the rest of the country; yet at the same time there was a twelve(!)-year gap in life expectancy between residents of the healthiest and least healthy neighborhoods within Paris. In Paris, building owners had to pay a fee to receive a hookup to the sewer main, and so early sewer infrastructure widened the health disparity between wealthy and poor neighborhoods. In the United States, in contrast, Troesken (2002) argues that even African Americans, often a city's poorest residents, benefited from the provision of water and sewerage systems, especially in cities with lower levels of residential segregation. The Center for Population Economics at the University of Chicago has released comprehensive neighborhood data for seven US cities that can be found at usdata.org/hue. This data will allow scholars to measure local variation in disease and mortality rates and to understand how US cities were able to reduce disease in poor areas through public health investments (if, indeed, this result is borne out in the broader data).[20]

In a related study, Villarreal (2012) shows that historical variation in the health conditions between neighborhoods can have persistent effects on neighborhood quality (as proxied by housing prices) over time. He focuses on neighborhoods built in the historical marshland in New York City, which had high rates of waterborne disease in the nineteenth century. Over time, this health disamenity disappeared as the marshes were drained and infrastructure for clean water and sewers improved. Yet the housing price disparity between former marshland and the rest of the city remained—and even grew—over time, in large part due to the persistent sorting of poor residents into historically disadvantaged areas.

Location of Workers and Firms within Urban Areas

Once inside an urban area, workers and firms have the choice to settle in many possible locations, some closer to the central city and others on the periphery. Over the twentieth century, the share of households and firms located in the central city has declined substantially. Figure 22.5, which was originally published in Boustan and Shertzer (2013), documents trends in city and suburban growth from 1940 to 2000 for the 103 metropolitan areas anchored by a central city that had at least 50,000 residents by 1970. Over the second half of the twentieth century, the share of metropolitan residents living in a central city fell from 58 percent to 36 percent. Yet, with the exception of the 1970s, the average central city experienced positive population growth in each decade.[21] Despite population growth in central cities, the suburban population continued to grow at a substantially higher rate, leading to a steady decline in the share of the metropolitan population
p. 88 living in central cities. ↳

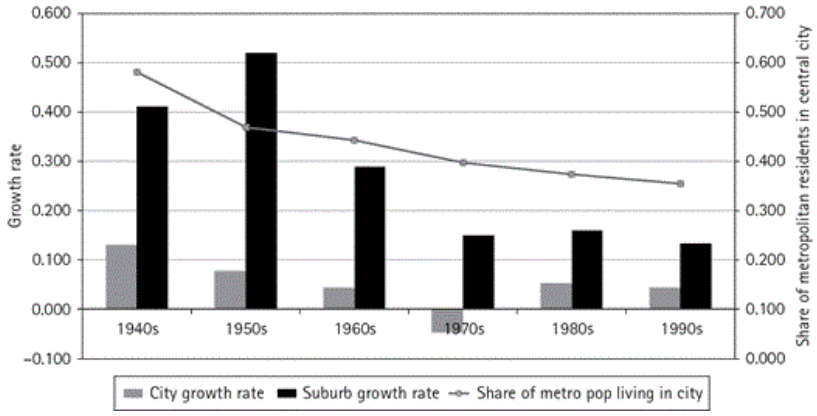

Figure 22.5. City and suburban population growth by decade, 1940–2000

Notes: Share of metropolitan population living in city refers to the end of the decade on the *x*-axis. Sample includes 103 metropolitan areas anchored by a city that had at least 50,000 residents in 1970. City and county population are taken from the City and County Data Books. The 1970 county definitions of metropolitan areas are applied in all years. Suburban population is computed as the total metropolitan area population minus the city population

Source: Figure 1 (p. 4) in Boustan and Shertzer (2013).

The Tiebout model is one useful structure for understanding the location decisions of households among various municipalities in a metropolitan labor market (Tiebout 1956). Mobile households within a metropolitan area are free to choose among a variety of municipalities offering different bundles of public goods and tax rates. As incomes rise, households may shift toward locations with better schools and correspondingly higher tax rates, which tend to be located in the suburbs. Yet Rhode and Strumpf (2003) caution that the long-run data are not consistent with some aspects of the Tiebout model. The framework implies that, as transportation costs fall, household sorting should rise. However, in samples of US municipalities and counties, Rhode and Strumpf show that jurisdictions have converged in their taxing and spending decisions over time.

The monocentric city model—jointly attributed to the work of Alonso (1964), Muth (1969), and Mills (1972)—offers an alternative approach to analyzing spatial location within metropolitan areas. A core feature of the model is the assumption that all employment is concentrated in a central business district (CBD). Households then decide whether to locate close to or far from the CBD, trading off a shorter commute for the higher rents of parcels closer to the CBD.[22]

According to the monocentric framework, suburbanization will occur—that is, households will move further from the CBD—when (1) transportation improvements reduce the time cost of travel, and (2) incomes rise, thereby increasing the demand for land and housing services and encouraging households to move to the periphery where housing prices (per square foot) are lower.[23] These hypotheses are borne out in
p. 89 the ↳ historical record. Margo (1992) demonstrates that rising real income can explain around 40 percent of suburbanization in the post–World War II period (1950–1980). At the same time, construction of the interstate highways reduced the time cost of commuting between the central city and outlying towns. Baum-Snow (2007) uses the original 1947 federal highway plan, which was designed for purposes of defense and interstate trade, to instrument for the actual number of highways later built in a metropolitan area. He finds that another one-third of the change in relative city population can be explained by the availability of new highways.

The core economic variables emphasized in the monocentric city model (rising income, falling commuting costs) explain a large portion of suburbanization over the twentieth century. Demographic and social changes within cities, including rising crime rates and growing racial diversity, also encouraged some

households to relocate to insulated suburbs via Tiebout-style sorting. Property crime in urban areas doubled between 1960 and 1990. Cullen and Levitt (1999) find that a 10 percent increase in city crime rates corresponds to a 1 percent decline in city population. According to this estimate, the mid-century crime wave should have reduced city population by at least 10 percent, which, in combination with the other factors noted in the preceding, would greatly over-explain the decline in city population. Yet, since 1990, crime rates have fallen almost as dramatically as they initially rose, which may have counteracted some of the initial mobility response.

Boustan (2010) exploits variation in black migration from the rural South to Northern and Western cities to estimate the role of "white flight" in the suburbanization process. She finds that each black arrival led to 2.7 white departures. By this estimate, white flight can account for around 10 percent of mid-twentieth-century suburbanization, equivalent to the construction of one new highway. White departures from central cities contributed to a rise in racial residential segregation; by 1970, 80 percent of black and white households would have needed to switch residences in order for each neighborhood in a metropolitan area to reflect the racial composition of the area as a whole (Cutler, Glaeser, and Vigdor 1999).

In the United States, suburban households are more likely to be white and affluent (although the same is not true of many European cities; see Brueckner, Thisse, and Zenou 1999).[24] Glaeser, Kahn, and Rappaport (2008) suggest that, in the United States, the rich are more likely than the poor to live in the suburbs because they tend to commute by car, whereas the poor rely on public transportation. Given that public transportation is more readily available in city centers, the poor are more likely to locate downtown.[25] In addition, once central cities began to attract poor residents, this concentration of poverty may have begotten more poverty, either due to an endogenous clustering of public services and private businesses attractive to the poor, or to the example of peers with weak attachment to the labor force.

Despite the strong predictive power of models allowing free mobility, households' optimal location decisions are often circumscribed in reality by the available housing stock, which is in turn influenced by local zoning restrictions. The first zoning laws were implemented in the 1910s and were upheld by the
p. 90 Supreme Court in 1926. Fischel (2001) ↳ models municipalities as selecting a triad of property taxes, public good, and zoning rules to maximize property values for the median homeowner/voter. In this modified Tiebout approach, zoning regulations ensure that new households with different preferences are unable to simply move in and overwhelm the local consensus of taxation and expenditures. Historically, Fischel argues, zoning enabled municipalities to add industrial employment centers, low-income apartment buildings, and other disfavored uses only when the use generated municipal revenues capable of offsetting the nuisance and congestion costs imposed on local residents.

If zoning enables municipal coordination, then the introduction of zoning laws ought to have increased property values by improving the fit between resident preferences and local conditions. McMillen and McDonald (2002) examine the implementation of Chicago's first zoning ordinance in 1923 and find that blocks zoned residential such that no industrial uses were permitted, save for those already in place, experienced an uptick in (estimated) land values relative to areas zoned to allow both industrial and residential use. Although industrial zones may be an eyesore to local residents, they also generate additional tax revenue that can be shared by a broader set of municipal residents; future work ought to address this trade-off.

The rapid implementation of zoning laws around 1920 presents a unique opportunity to study these processes.[26] In San Francisco, this implementation occurred shortly after the devastating 1906 earthquake and fire—disasters that resulted in a substantial increase in housing density within the burned area. Bunten and Siodla (2013) provide evidence that the resulting differences between burned and non-burned areas were codified in the city's first zoning law in 1921. The authors then use this historical coincidence to shed light on the contemporary effects of zoning restrictions on housing prices.

As population left city centers over the twentieth century, metropolitan employment also relocated to the open land in the suburbs. Glaeser and Kahn (2001) document that, by 2000, the majority of both residence and employment was located in the suburbs in the typical metropolitan area. Information-based industries like finance have not decentralized as rapidly—hence the density of Manhattan, an extreme outlier—but the majority of cities have experienced ongoing employment decentralization since at least 1950.

The decentralization of employment may simply be a byproduct of suburbanization as firms follow workers out of the city, or it may be driven by independent forces that allow more efficient production to occur at greater distances from the city center. One factor that may have encouraged firms to leave central cities was the growing network of interstate highways and the rise of truck-based transport, which decoupled distribution from downtown rail depots. Indeed, Baum-Snow (2010) shows that highways did not simply enable citizens to move outward and commute inward; rather, they appear to have encouraged both households and firms to locate at a distance from the central city.

Baum-Snow's analysis cannot disentangle whether highways first encouraged households to move to the suburbs with firms following suit, or vice versa. Boustan and Margo (2009a) analyze this interaction between workers and firms by contrasting the residential choices of workers whose employers are
p. 91 immobile, such as state government ↳ workers in state capitals or clerks at the US Postal Service, with similar workers whose employers moved to the suburbs. They find that these government workers are more likely to live downtown, suggesting that household location decisions are closely tied to firm location. Their results suggest that, if not for the decentralization of employment, suburbanization rates would be substantially lower today. Of course, employers may also follow households, so the two effects can be mutually reinforcing in a decentralized equilibrium.

The decentralization of employment opportunities has affected groups differently according to their ability to suburbanize. Boustan and Margo (2009b) present indirect evidence that urban blacks faced diminished employment opportunities as firms left cities by documenting a notable uptick in black employment at US Postal Service sorting facilities, a large employer that remained rooted in downtown areas, as other firms moved to the suburbs circa 1960.

Vintage Capital and "Lock-In" Effects

Although cities are, most importantly, dense centers of population, they are also made manifest physically through their architecture. The long-lived nature of urban buildings and neighborhoods has important implications for how households and firms organize themselves within and between cities. For instance, new residences can be constructed rapidly, but old houses decay slowly. This observation generates a number of predictions, which were outlined by Glaeser and Gyourko (2005). First, housing prices should not increase as a city expands because the construction sector should satisfy growing demand. Yet housing prices will fall quickly in contracting cities as demand for the existing housing stock declines. Second, lower housing prices will compensate residents for falling wages, thereby ensuring a slow decline in population: while cities can explode overnight, they take decades or more to fade away. In the meantime, the population of declining cities will be disproportionately low-skilled and less attached to the labor force. These predictions may help to explain patterns of rapid boom and slow decay experienced by many US cities including, most recently, Detroit.

Intra-city housing dynamics are also affected by the longevity of the housing stock. In any metropolitan area, high-income residents tend to occupy houses that are newer, larger, and of higher quality. As these houses age, their residents may seek newer homes, leaving the older units to "filter" down to lower-income denizens of the city. Brueckner and Rosenthal (2009) argue that, initially, filtering helped to explain why rich households were more likely to live in the suburbs with plentiful new construction. Yet, going forward,

they predict that this process will encourage gentrification of urban neighborhoods as deteriorating homes and neighborhoods in the central city are redeveloped.

The distributional consequences of urban gentrification remain an open question. Turning to history, one
p. 92 particularly controversial incidence of central-city ↳ redevelopment was the massive urban renewal efforts of the mid-twentieth century. Proponents argued that the strong negative externalities of "slum" neighborhoods could limit economic activity in the rest of the city. Furthermore, they asserted that private interests were unable to overcome the transaction costs of redevelopment and so local governments should use eminent domain to assemble land in affected neighborhoods and provide grants and loans to enable redevelopment. Exploiting differential passage of the necessary laws at the state level, Collins and Shester (2013) find that redevelopment had a positive and long-lasting effect on city growth across a number of metrics.

Siodla (2012) studies another (accidental) example of large-scale twentieth-century redevelopment: the rebuilding of San Francisco following the 1906 earthquake and fire. In the early twentieth century, San Francisco was growing rapidly, and yet its existing housing stock was primarily composed of low-density single-family homes. Areas that were razed by the fire transitioned more rapidly to a dense streetscape of apartment houses than did neighboring unburned areas. This differential persisted for over two decades, suggesting that the redevelopment costs and external coordination problems faced by durable capital owners are indeed significant enough to prevent rapid reoptimization of the urban capital stock in the face of shifting demands. Hornbeck and Keniston (2013) provide a model of this redevelopment process, along with further empirical evidence from the Boston fire of 1872.

Conclusion

Newly compiled series on urban wage and rental premia over two hundred years of US history show that urban growth in the United States was driven by a combination of urban-biased technological advances that enhanced productivity in cities and improvements in urban quality of life, especially due to investments in public health. Interest in agglomeration economies, their causes, and their implications for urban growth and persistence has been growing in recent years; historical work has much to contribute to this line of inquiry.

A combination of rising incomes and major road-building projects in the mid-twentieth century spurred both households and firms to leave central cities and settle in suburbs. Yet cities and suburbs are not only separated in space, but also jurisdictionally distinct. Aspects of local political economy, including differences in crime rates and police protection, public transportation investments, and zoning regulations, reinforced this spatial redistribution.

Notes

1. In 1900 only 18 percent of Southern residents lived in an urban area, compared to 66 percent of the Northeast. By 2010,
p. 93 the South had caught up with the Midwest, but both ↳ regions still lagged behind the West and the Northeast. Wright (1986) attributes this gap to differences between free and slave agriculture. He argues that free farmers held their wealth in land and therefore supported transport improvements, which indirectly supported city growth. Southern plantation owners, in contrast, held their wealth in slaves, the value of which was not tied to a particular place. In addition, farmers of staple grains sent their produce to town to be processed, while Southern planters processed cotton on plantation. Meyer (1988) provides some empirical evidence to support this hypothesis, although further research on the history of this regional urbanization gap is needed.

2. Michaels, Rauch, and Redding (2012) argue that the shift from agriculture to manufacturing can explain why population

growth is not correlated with initial population density at low density levels, but becomes positively correlated with initial density at intermediate density levels. At low density levels, they argue, population growth is driven by agricultural shocks, which are mean reverting, whereas at higher density levels, population growth is due to shifts into nonagricultural employment, which is stronger in areas with higher initial density.

3. Belcher (1947) provides further detail on the rivalry between St. Louis and Chicago.

4. Authors' calculations from the IPUMS sample (Ruggles et al. 2010).

5. The Weeks Report database, collected from the 1880 US Census, also provides wage data for the mid- to late-nineteenth-century period. However, because it is a retrospective survey of a nonrandom sample of surviving manufacturers and does not report the number of employees at each firm, it is inferior to the Census of Manufacturing for our purposes. In particular, we found that reported wages in rural and urban areas were substantially closer together in the Weeks Report data than in the Census of Manufacturing, likely because the rural firms that kept retrospective payroll records were larger and less remote than the typical rural firm.

6. Other cost of living surveys in the BLS series could not be used to extend the rent series beyond 1918. The data from the 1888–1890 survey do not provide sufficient geographic precision, only identifying respondents' state of residence, while the microdata for 1901 were destroyed.

7. In addition, we restrict our sample to men in the civilian labor force who are not living in group quarters or on a farm and are not currently attending school. Given the data at hand, the nineteenth-century observations contain only manufacturing workers, while the twentieth-century series is calculated using workers employed in all industries.

8. Calculations using total income or gross rent, when available, yielded similar findings.

9. Calculations using a consistent definition (such as an incorporated city of at least 2,500) or a consistent geography (such as the metropolitan statistical areas as of 1900, those as of 2000, or those consistently identifiable in the IPUMS data set) produced qualitatively similar results.

10. The urban wage premium appears to rise much more over this period if, instead of using wage data from the Census of Manufacturing, we instead rely on wage data for three occupation categories (unskilled, blue collar, and white collar) from Lindert and Williamson (2016). The premia based on this source are represented in figure 22.3 by the open white circles and are explained in more detail in the figure's notes.

11. Although systematic data on urban and rural rents are not available for this period, we do have information on farmland values (Pressley and Schofield 2001). We compare farm values in metropolitan and nonmetropolitan counties nationwide and in a subsample of counties that changed from nonmetropolitan to metropolitan status (or vice versa); we ↳ use the IPUMS definition to classify counties as "metropolitan." In both cases, we observe a declining urban land value premium from 1880 to 1920. One determinant of agricultural land values in areas near cities is the opportunity cost of developing this land for other urban uses. Taken literally, the decline in both urban wage and urban land value premia would suggest that the relative productivity of urban areas was declining over this period, which we find unlikely. Instead, this pattern may simply reveal the heightened productivity of areas far from urban centers for agricultural use over this period given the improvements in transportation that facilitated bringing agricultural products to market.

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12. Google Scholar catalogs fewer than 2,000 papers that mention the words "economics" and "agglomeration" in the year 1995–1996. Ten years later, this number had increased to more than 11,000, expanding at a pace twice as fast as the recorded number of hits for the word "economics" alone. We acknowledge that this measure may not be exact because the relative reliance on terms used to describe agglomeration economies (such as "increasing returns" and "external economies") may have changed over time.

13. Ahlfeldt et al. (2012) argue that agglomeration economies are also likely at work *within* cities. In particular, they show that employment centers near East Berlin experienced falling land prices as the Cold War partition cut them off from workers and customers but rebounded soon after reunification.

14. In contrast, Buenstorf and Klepper (2009) present evidence from the US tire industry suggesting that industrial clustering occurs through "heredity" as successful parent firms generate spinoffs, rather than through forces of agglomeration.

15. Ellison, Glaeser, and Kerr (2010) provide a general framework for measuring patterns of coagglomeration between

industry pairs in a single cross section. They find that sharing inputs, workers, and ideas all contribute to coagglomeration, in that order of importance. Hanlon and Miscio (2013) are extending this framework to historical data (1850–2000), in part to determine whether the patterns of coagglomeration and the channels generating such coagglomeration have changed over time.

16. The case of urban public health illustrates that the sharp division between productive and consumption amenities does not always hold. Improvements in public health may have attractive to both consumers and firms, if healthy workers were more productive on the job (see, e.g., Arora 2001).

17. Cain and Hong (2009) show that survival rates were higher in smaller cities than in larger cities in a late nineteenth-century sample of men who served in the Union Army. Kesztenbaum and Rosenthal (2011) use French military records to study the health consequences of moving to a city from a rural area. They find that rural newcomers enjoy a survival advantage for the first few years of urban residence but, within a decade, converge to the high mortality rates present in the city. Having been born in the city does not appear to confer a survival advantage due, say, to immunities to transmitted diseases, but neither did growing up in a rural area save migrants from the deadly conditions of the city due to improved childhood nutrition.

18. Williamson (1982) demonstrates that locations in England with higher infant mortality rates in the mid- and late nineteenth century had higher wages, thereby compensating workers for this extra risk.

19. Ferrie and Troesken (2008) analyze Chicago's three distinct water projects from 1867 to 1917. They find that each project reduced death both from typhoid fever, a typical waterborne disease, and from seemingly unrelated causes of death. This pattern is consistent ↳ with the epidemiological theory that reductions in waterborne disease strengthened the population's resistance to other health shocks.

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20. Price Fishback, Shawn Kantor, and Trevor Kollmann also plan to release neighborhood-level data on some cities for the 1930s. For preliminary work using some of this data, see Kollmann (2011).

21. The growth of central cities in figure 22.5 is partly driven by the expansion of land area in central cities via annexation. In 1940, the average city in this sample was 48 square miles; by 2000, it had grown to 117 square miles.

22. The assumption that all employment takes place in the CBD is not well-suited to most American cities, especially those that developed after the diffusion of the automobile and often feature two or more employment centers. Yet, despite its stylized nature, this framework generates sensible predictions for the conditions under which the majority of the population will live close to the city center and the conditions under which it will move further away.

23. This prediction will hold as long as the income elasticity of demand for land area is greater than the income elasticity of commuting costs. Glaeser, Kahn, and Rappaport (2008) show that, empirically, the income elasticity of demand for land is not large enough to account for very much of the association between income and suburban residence.

24. The income gap between cities and suburbs in the United States has widened over time. In 1940, the typical suburban resident earned only 3 percent more than his urban counterpart; by 2000, the city-suburban income gap had increased to 16 percent.

25. Of course, this association raises the question: Why is there more transit in central cities? To a certain extent, downtown's identity as a transit center may be a legacy of the historical concentration of economic activity in central cities and/or may be a natural outgrowth of the design of transit systems in hub-and-spoke arrangements. Yet, it is also possible that the continued investment in downtown transit is in response to the demands of poor local constituents, rather than the main cause of their location decisions. Historical analysis could be used to disentangle the relationship between access to transit and neighborhood poverty.

26. Brooks and Lutz (2013) argue that zoning regulations can "lock in" existing levels of urban density, rendering reoptimization difficult. They demonstrate that density remains higher around historical street car stops in Los Angeles even eighty years after the street car lines ceased to operate.

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