History and urban economics☆

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ABSTRACT

This article reviews recent literature using insights from history to answer central questions in urban economics. This area of research has seen rapid growth in the past decade, thanks to new technologies that have made available increasingly rich data stretching far back in time. The focus is to review innovative methods to exploit historical information and discuss applications of these data that provide new insights into (i) the long run growth of cities or regional economies and (ii) the spatial organization of economic activities within cities. The review also surveys the growing literature outside urban economics that uses the historical urbanization as a proxy for economic growth, discusses differences between how economic historians and urban economists think about the relationship between urbanization and growth, and considers how these views might be reconciled.

1. Why turn to history?

The past decade has seen rapid growth in studies using historical data to address some of the central questions in urban economics. The left panel of Fig. I illustrates this phenomenon. The columns in this figure show the count of papers with a historical theme published in three leading urban economics journals, the *Journal of Urban Economics*, *Regional Science and Urban Economics*, and the *Journal of Economic Geography*.[1] The line plots the number of papers across all economics journals (using the EconLit database) that list one of the economic history JEL codes with topics related to urban or regional economics (starting with N9). Both series show an increase in papers at the intersection of urban economics and economic history starting from about 2010, relative to the previous decade.[2]

As a second approach to tracking this development, we pick one prominent dataset on the development of cities, Paul Bairoch's data on urban populations in Europe and the world from the year 800 on, and track its use over the past few years.[3] Studies relying on Bairoch's data are only a small subset of work at the intersection of urban economics and economic history, but they are easy to identify and provide further insight into research on urban development over time. The right panel of Fig. I shows citations of the "Bairoch data" in economics articles.[4] The datasets for Europe and the world (Bairoch et al., 1988; Bairoch, 1988) have been cited 172 times over this period. Most of these citations reflect papers using the data. The graph shows a steady increase of citations over the past few years. Closer inspection of the citations provides additional insight into who is interested in urbanization. Out of a total of 172 citations in economics journals between 1992 and 2016, the "top five" journals in economics cited Bairoch 23 times and another

[1] Specifically, this is the number of papers with at least one economic history JEL code (starting with N).

[2] At this point, it is hard to interpret the drop we observe in the last two years. It may either be a general trend decline driven by an increasing interest in big data that are typically not available for the past or it may indicate that the low-hanging fruit (e.g. archival records that can easily be digitized) are picked and we need new methods to unlock additional historical information.

[3] See (Bairoch, 1988; Bairoch et al., 1988).

[4] We use the definition of "article" and "Economics" from the Web of Science.
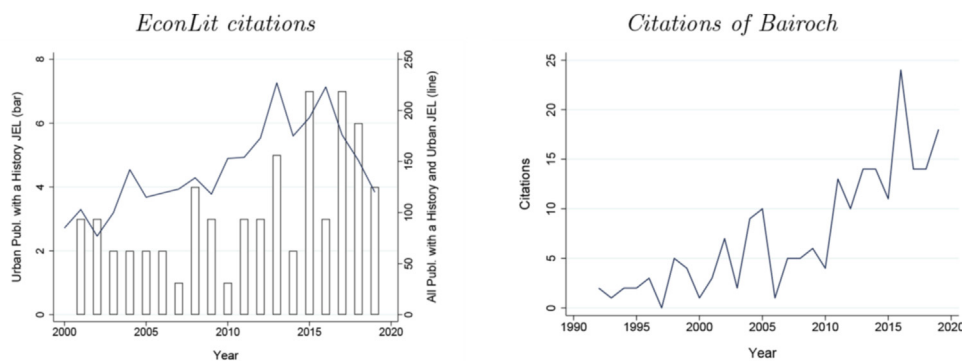
Fig. 1. Tracking the growth of historical papers dealing with urban economics topics. Notes: The left panel plots, in columns, the number of publications in the urban journals JUE, JoEG and RSUE with a history JEL code (starting with N)) and, in the line, the overall number of publications in all economics journals with urban and history JEL codes (starting with N9). The right panel of the figure plots the number of citations of "Bairoch, 1988" or "Bairoch et al., 1988", the sources of Bairoch's city growth data, in English-speaking economics journal publications. *Source*: EconLit and Web of Science database.

21 citations come from other highly ranked general interest journals.[5] Economic history journals cited Bairoch 38 times closely followed by 37 citations from urban economics journals.[6] Finally, there are 23 citations in development and growth journals.[7]

Motivated by the increase in research at the intersection of urban economics and economic history documented in Fig. 1, this article aims to provide an overview of key research trends in this area. A natural first question, then, is why has this recent increase in urban-history research occurred? This trend is undoubtedly related to the increasing availability of historical data as digitization methods and computing technologies advance (Mitchener, 2015). Until recently, the advantages of using historical data to study cities have been balanced by the constraints imposed by data availability. However, as Combes et al. (2022) discuss in this issue, recent innovations have substantially increased the quantity and quality of data available for studying cities. Given their importance, we begin this article, in Section 2, with a brief review of data sources that help us quantify economic activities in the past and recent methodological advances to make this data useable. Ahlfeldt and Barr (2022) and Nagy (2022) in this issue provide a more detailed review of recent methodological advances.

However, there is more to the rise of historical themes in urban economics than data availability. While there have been amazing advances in the availability of incredibly detailed and high-frequency data in modern settings, from cellular phones, taxis, web reviews, and other sources, many of the core questions of urban economics deal with forces that play out over long periods of time. For these questions, taking advantage of historical data offers insights into urban economic processes that cannot be obtained from modern data alone.

For example, one question at the heart of urban economics is, why do cities exist? As discussed by Bosker (2022) in this issue, urban theory suggests that exogenous location factors (first nature geography) together with endogenous agglomeration and congestion forces (second nature geography) explain observed differences in productivity and amenities. Yet these factors often play out over many years, decades, or even centuries. First nature advantages, such as those offered by the portage sites studied by Bleakley and Lin (2012) or the sources of water power highlighted by Crafts and Wolf (2014), change slowly over time as technology advances. Several papers in this issue look at specific periods of urbanization and discuss underlying drivers. Jedwab et al. (2022) discuss the rise of medieval cities; Atack et al. (2022) focus on urbanization and industrialization in the nineteenth century United States; and Eriksson and Ward (2022) study how settlement patterns during the era of mass immigration to the United States shaped cities.

Finally, Andrews & Whalley (2022) look at the geography of innovation in the United States over the past 150 years to show how technological advances drive spatial disparities.

Similarly, the urban built environment, and the infrastructure that connects cities, evolves slowly. Large scale infrastructure projects, such as the railway or sewer infrastructure studied by Bogart (2022); Brooks and Denoeux (2022) and Beach (2022) in this issue, take years or decades to construct: Rome wasn't built in a day. And once constructed, these enormous infrastructure investments depreciate slowly (Glaeser and Gyourko, 2005). Historical buildings, bridges, sewer systems, and the layout of railway tracks or roads are often testimonials of the distant past. In addition to physical remnants, historical institutions like zoning laws that led to racial segregation and disparities in the provision of public goods can also have long-lasting effects as discussed by Shertzer et al, (2022) in this issue. These long-run dependencies make it particularly difficult to trace the factors that contribute to city dynamics using short-run data. Thus, while short-run or cross-sectional data can shed light on processes that determine the existence of cities, much more can be learned through the use of long-run historical data that explain path-dependencies. But history may not always matter. To shed more light on this, Lin and Rauch (2022) discuss in this issue conditions under which history matters and Allen and Donaldson (2022) provide in this issue a simple dynamic model of economic geography that can help analyze dynamic spatial phenomena such as multiplicity, persistence and path dependence. Chen and Kung (2022) complement this in this issue with an interesting application to China where they show how nomadic intrusions and subsequent waves of mass migration shifted China's population center from the North to the South.

A third reason why we might have to reach deep into the past is that some important economic changes occur only infrequently. One recent example is the 2008 housing bubble. Glaeser (2013) goes back in U.S. history to trace precedents and points out an optimistic assessment of future price growth and the neglect of long-run elastic supply as an important similarity. Detecting such regularities is an important starting point for the design of public policies. In a similar vein, catastrophic events like major earthquakes or urban fires that destroy large parts of a city are luckily rare events (Belloc et al., 2016; Hornbeck and Keniston, 2017). Nevertheless, they occur and studying them provides insights into the importance of location factors and the dynamics underlying the subsequent readjustment.

Beyond the fact that many urban processes play out over long time scales, studying urban economies through the lens of history also offers features that can help us identify causal economic connections. By looking back in time we expand the types of variation that can be harnessed. History offers a range of natural experiments that can help us identify key features of urban economies. As pointed out by Holmes (2010), controlled experiments are often not viable in an urban or regional context (in his words "Good luck to the researcher trying to get a National Science Foundation grant to run a controlled experiment to set up a

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[5] Among the top five, we observe QJE: 11; AER: 6; JPE: 3, ReStud: 3. Other top general interest journals include EJ, JEEA, AEJ, and ReStat.

[6] For history, we consider citations in JEH, EHR, EEH, EREH and for urban economics JUE, RSUE, JRS, JoEG.

[7] This includes JDE, JEG, WD, JCE, WBER, RED.

new city!", p.14) which is why we rely on quasi-experimental variation to identify key relationships. In the following sections we review papers drawing on natural experiments as diverse as the bombing of Japan during the Second World War, the fall of the Roman Empire, the construction of the U.S. highway system, and the division and reunification of Germany. Each of these events provide a unique window into the working of urban economies. Drawing on history also allows us to study cities across a broader range of institutional and technological environments. As an example, in Section 3 we review a set of recent studies suggesting that the impact of location fundamentals on city formation evolves as technology changes. Glaeser (2022) in this issue, then takes a broader perspective and discusses ways how developing world cities today can learn from the history of cities of the west.

Another identification advantage offered by some historical settings is that there are fewer interdependencies between separate economic units, which can make mechanisms more easily observable. To cite one example, Steinwender (2018) studies the impact of the first trans-Atlantic telegraph cable on trade between the U.S. and Britain.[8] Here, history offers a setting where information flows can be isolated in a way that would be difficult in a more modern and interconnected economy. A similar argument applies to regulations that were often absent or less developed in the past, thus allowing researchers to focus on the underlying economic mechanism.

Of course, identification advantages arising either from the availability of a natural experiment or from a unique institutional context also come with limitations. Most importantly, we should be vigilant in assessing the generalizability of the results and, in particular, the extent to which lessons can be applied to current policy debates. Another word of caution is also required. While we believe that history holds many insights that contribute to our understanding of spatial distributions today, harnessing the past successfully requires a careful understanding of historical circumstances. Knowledge about contextual factors like the socio-economic environment, political institutions, available technologies, etc. is the key to working out sources of exogenous variation.

Finally, recent research has highlighted the potential for historical work on urban and regional economies to inform our understanding of economic growth. At least since Adam Smith's inquiry into the nature and causes of the Wealth of Nations, economists have sought to uncover the factors that drive differences in development. A natural starting point for doing so is a comparison across countries, but one quickly realizes that countries vary so dramatically in their features, from city-states like Singapore and Monaco to the enormous expanses of Canada and Russia, that they may not be the most relevant unit at which to analyze economic growth. Moreover, the borders of countries change over time, sometimes for largely arbitrary reasons. Often a more relevant unit to study is the city or region, and since the study of growth naturally requires looking over larger times scales, this inevitably leads to the use of historical data. This is a topic that we explore in Section 5.

In the next section of this paper, we review recent methodological advances in the use of historical data to address urban economics questions. The next two sections then review the major stands of recent research in this area. In Section 3, we take a *between*-city perspective where we attempt to understand the historical origins of why cities grow and develop, how they interact and why they differ in size and perform different activities. This includes a review of work on agglomeration forces, city amenities, or transportation links between cities and regions. Then, in Section 4, we narrow our focus to look *within* cities. Specifically, we turn our attention to the spatial distribution of people and economic activities within cities and examine how this distribution is affected by factors such as new transport technologies, health infrastructure, local amenities and urban policies. Finally, Section 5

discusses the use of urban data to understand long-run patterns of economic growth.

Overall, our review reveals a vibrant literature using history to understand cities. While recent methodological advances have led to a rapid growth in work in this area, many interesting questions, particularly those related to long-run processes, remain to be explored.

2. Innovations in historical research

One important challenge in harnessing the past in order to improve our understanding of urban economies is the availability of data. However, recent advances in computing technology and creativity in the use of new applications and data sources have opened up a digital window to the past. This section briefly introduces important sources for historical data along with approaches to make these data useable for research. More detailed discussions of methods are provided in other contributions to this special issue.

We first look at ways to digitize historical data from official statistics and other historical sources that are available in print. Next, we turn from text to images and discuss ways to unlock the information that is included in historical maps. Statistics and maps present the most reliable sources of spatial information about the past. In the absence of such detailed insight, there are other ways to look back in time. One approach is to focus on location features that are observed today but likely did not change much over time. Such factors can *predict* historical outcomes and thus provide useful covariates for historical studies. Another way to predict historical outcomes and complete the picture is to use economic modeling. A rising amount of research combines observed historical data with structural models that solve for unobserved parameters and allow researchers to evaluate actual outcomes relative to counterfactual development paths.

2.1. Historical statistics

Archives are one way to open the door to the past. Probably the most comprehensive source of historical data with a spatial dimension are printed publications of official statistics such as censuses, birth and death records, trade registers, patent records, immigration lists, or tax records. More and more of these data have been digitized over the last few years thanks to national archives and libraries, genealogy platforms, or large-scale academic projects.

A central challenge in using archival data is that historical records are in many cases not already digitized. Two approaches to digitization have emerged over the past years. One relies on automated optical character recognition (OCR) programs that may embed elements of machine learning. The accuracy of this approach depends on the quality of the original printing as well as the scans. In particular, historic documents often present a challenge for OCR methods because (i) the quality of the original records is low, (ii) the historical typesetting process was not automated and thus noisy, and (iii) characters and fonts differ. Hand-written documents present an additional layer of complexity.

An alternative way to digitize data from printed documents is to outsource this process to specialized service providers who rely on manual labor and some automation. The use of outsourcing companies, principally in developing countries, has dramatically reduced the cost of digitizing data over the past decade. The main limitations to this approach are historic records that are hand-written or printed in font styles (e.g. gothic or fraktur) that are hard to recognize by laymen. A less expensive and viable way to digitize non-standard records are crowdsourcing projects. For example, the British Library developed the platform *LibCrowds* that allows users to help digitize records. Similarly the German Society for Computer Genealogy developed a tool to administer the digitization of casualty lists from the First World War (Zedlitz, 2017).

Information from official statistics can be combined with other historical data sources like the *Encyclopedia Judaica* and the *Germania Judaica* which document the historical location of Jewish communities

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[8] In a similar vein, Koudijs (2015) studies how variation in sailing conditions affected the financial markets in London and Amsterdam in the 18th century.

across German cities (see for example Becker and Pascali, 2019; Johnson and Koyama, 2017; Voigtländer and Voth, 2012, for details). One way to combine datasets is to assign them to common spatial units like counties or parishes which are mapped. Linking these units over time is, however, often complicated by changes in the geographic boundaries of spatial units. One way to overcome this is to fix boundaries in one reference year and disaggregate units in other years into these boundaries using area weights (Eckert et al., 2020; Hornbeck, 2010). If one is concerned that area weights do not adequately represent the spatial distribution of individuals or activities in space, one could aggregate units using a transitive closure algorithm (Kitson et al., 2012) or specify alternative weights. But what weights can we use? If administrative data come with address information, one could use the approach in Heblich et al. (2021) to geolocate addresses and create population-adjusted weights. The approach combines fuzzy text matching with an algorithm that exploits the spatial clustering of entries in enumeration books to infer the location of unmatched addresses in historical UK censuses.[9]

Some data sources are not organized in administrative boundaries but include geographic information in the text. In this case, methods from computational linguistics can help researchers to extract information from texts. For example, Perlman (2015) and Packalen and Bhattacharya (2015) apply automated text analysis to historic U.S. patents which allows them to document the movement of idea-use over time and space. Dittmar and Seabold (2022) go one step further. They build on work by Gentzkow and Shapiro (2010) to measure changes in the language of historical book titles. In this way, they track the dissemination of new religious ideas across German-speaking Europe between 1454 and 1600.

An alternative to joining data at a spatial level is to employ computationally more demanding matching methods that link individual names between censuses and registers or across census waves. An early application is Abramitzky et al. (2012) who used fuzzy name matching algorithms to identify distinctive immigrant names in U.S. censuses; in another application, Dippel and Heblich (2021) link civil war rosters and immigrant ship lists to U.S. census data; Arkolakis et al. (2020) link information from the U.S. Population Census, patents and historical immigration record to study how European immigrants affected local and aggregate economic growth in the U.S. between 1880 and 1920; and Heblich et al. (2020a) follow individuals in the English and Welsh census between the years 1851–1911 to study the distributional consequences of the invasion or new-world grain on geographical areas within England and Wales. For a more detailed discussion of name matching techniques, we refer the interested reader to recent reviews by Abramitzky et al. (2021) and Bailey et al. (2020).

2.2. Maps

Historical maps present another great source to learn about the past. Maps often contain spatial information about historical features such as political or cultural borders, neighborhoods and building footprints, land cover, infrastructure, etc. Similar to historical texts or statistics, maps are becoming increasingly available thanks to the digitization efforts of archives and libraries. However, scanned maps still require substantial digital processing before the spatial information they contain can be analyzed. Moreover, relative to scanned texts or tables, maps (and especially historical maps) present even more complex challenges to automated pattern recognition methods, owing to the mix of symbols, lines and area objects used to portray geographic information. As a result, researchers often have to rely on time-consuming manual digitization. However, as Combes et al. (2022) discuss in this issue, methods

are improving and this will facilitate the utilization of map information in the future.

A common use of historical maps in economic research is to identify transportation infrastructure (Bogart et al., 2015; Donaldson, 2018; Duranton and Turner, 2011; Hornung, 2015), boundaries (Becker et al., 2016; Dell, 2010; Michalopoulos and Papaioannou, 2013; Wahl, 2017), bilateral distances (Becker and Woessmann, 2009; Dittmar, 2011b), or trade activities (Wahl, 2016). One complication for these approaches is that historical maps often lack precision. This can be critical, e.g., for projects that study discontinuities along boundaries. To overcome this, Sequeira et al. (2020) overlay an accurate modern shapefile of the railway infrastructure over scanned and georeferenced versions of the historical maps and trim the modern railway network to match the historical map. If significant changes render this procedure unworkable, an alternative is to glean historic texts for information that improves the precision. For example, historic texts might mention towns or landmarks along historic roads that still exist today and thus serve as anchor points.

Once digitized, historical maps can provide a wealth of information. One common use of map data is to reconstruct the structure of cities and neighborhoods in the past. Examples include Ahlfeldt and McMillen (2018) who use printed maps from *Olcott's Blue Books of Chicago* to derive detailed land value estimates for buildings in Chicago; Hornbeck and Keniston (2017) who assembled plot-level data for Boston between 1867 and 1894; and Redding and Sturm (2016) who digitized bomb damage maps that recorded World War II destruction in London at the level of individual houses.

2.3. Time invariant factors

One way researchers compensate for a lack of controls that might explain the spatial distribution of economic activity is to use modern data describing features that are time-invariant (or change very slowly over time) in order to infer historical conditions. For example, Combes et al. (2011) discuss the use of plausibly time-invariant geological characteristics from the European Soil Database to explain the emergence of population concentrations. The underlying logic is that geology and the nature of soils were an important predictor of past settlement patterns and have changed little over time. Bosker et al. (2013) take this one step further. To measure the importance of geography, they determine the agricultural productivity of cities' hinterland using a combination of time-invariant soil and terrain characteristics and climate conditions.

Time invariant location factors may be used in balance tests that assess the instrument validity or they may be interacted with year indicators in panel regressions where historical records inform the researcher about the time when the location factor gained importance. A canonical example of such a difference-in-differences strategy is Nunn and Qian (2011), which combines historical knowledge about the timing of the arrival of the potato to Europe with modern data on the spatial variation in local suitability for potato cultivation.

Another group of time-invariant factors that have been productively used in economic research are genetic markers and linguistic traits. Genetic databases as well as detailed language and dialect surveys provide spatial variations which are employed to predict cultural borders in space that limit integration or migration. The underlying idea is that differences in cultural traits explain spatial disparities in economic development, possibly through better functioning institutions (see Tabellini, 2010).[10] Early papers that used genetic markers to predict cultural borders across space include Spolaore and Wacziarg (2009) or Guiso et al. (2009). Falck et al. (2012) introduce an alternative measure to predict cultural boarders. They exploit linguistic micro-data from a unique lan-

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[9] Another promising way to exploit the systematic nature of enumeration books is to measure the social composition of neighborhoods (Logan and Parman, 2017; Shertzer et al., 2018).

[10] Nunn (2014) and Alesina and Giuliano (2015) review the growing body of literature on institutions, culture and long-run economic growth.

guage survey conducted around 1880 in German schools to derive a measure of cultural similarity between German regions.

2.4. Predicting outcomes

Historical conditions can also be inferred with the help of models from outside of economics, such as transportation, engineering or atmospheric models, that predict conditions in the past. One illustrative example is Pascali (2017), who simulates the routes of sailboats to understand how the introduction of steamships changed trade patterns. To calculate bilateral sailing times between country pairs, the paper divides the world into grid squares and determines for all sea-cells the average velocity, direction of sea-surface winds and ocean current. Knowing that these factors determined the sailing routes, one can predict least-cost paths for sailing vessel between country pairs and compare them with, e.g., entries from logbooks. In a similar vein, Feyrer and Sacerdote (2009) use wind patterns to identify islands near prevailing sailing routes to show that they were more easily revisited and colonized.

Historical travel routes on land can be predicted with the help of engineering rules. Bogart et al. (2022) use insights into nineteenth-century railway construction to calculate least-cost paths. Voigtländer and Voth (2022) and Faber (2014) use a similar approach to calculate least-cost paths for roads. Information on historical travel speeds in combination with transportation networks further provides a way to predict historical transportation costs (Donaldson and Hornbeck, 2016; Donaldson, 2018; Heblich et al., 2020b).

A somewhat different example is provided by Heblich et al. (2021), who model the dissemination of coal smoke from georeferenced industrial chimneys in 19th century England in order to predict neighborhood pollution exposure. This study combines recent data on meteorological conditions and terrain with historical information on height, exit velocity, and combustion temperature obtained from historic documents to predict pollution dissemination patterns.

Lastly, Flückiger et al. (2021) make creative use of archaeological data from excavated Roman ceramics which name the production location. Combined with precise information on the location of archaeological excavation sites, this enables them to predict interregional trade volumes within Western Europe during the Roman era and they show that connectivity differentials observed in the past continue to influence cross-regional firm investment behavior until today.

2.5. Structural models

A growing strand of research now combines historical data and modeling to rationalize observed outcomes. The latest generation of quantitative spatial models are sufficiently rich to incorporate a large number of heterogeneous, interconnected locations and rationalize them as an equilibrium of the model. If a unique equilibrium is identified and the structural fundamentals are stable and invariant to interventions, this framework will enable researchers to quantify key theoretical mechanisms, evaluate policy interventions and simulate counterfactual outcomes. An illustrative example of this approach is Nagy (2020) who combines novel historical data for the U.S. on population, trading routes and agricultural productivity at a high spatial resolution with a dynamic quantitative model of economic geography to show that the availability of farm hinterlands fostered urbanization and aggregate growth. The model captures key patterns of U.S. urbanization and city formation and counterfactual analysis help quantify the effect of geography on cities and growth.

Another recent paper illustrates how the creative use of economic modeling can help us draw a more complete picture from quantitatively observable fragments of the past. Assyrian merchants used clay tablets to record their shipment consignments, expenses, and contracts. Excavated samples that were translated provide insights into merchants' trade networks during the Bronze Age. Barjamovic et al. (2019) build

on these data and combine them with a structural gravity model of trade. Based on the model, they predict the locations of yet undiscovered cities, some of which overlap with historians' conjectures. Future excavations will tell us about the validity of these predictions.

A more detailed review of this growing strand of literature goes beyond this brief overview. Instead, we refer the interested reader to a review on Quantitative Spatial Economics by Redding and Rossi-Hansberg (2017) and Nagy (2022) or Allen and Donaldson (2022) in this issue.

3. Long-run studies of cities and regions

One of the more fertile areas of urban economics research over the past two decades has been the use of historical data to study the factors affecting the distribution of population across space and, in particular, the existence of cities. This strand of research is well integrated in a broader research agenda on the importance of history for economic development as reviewed by Nunn (2014). Studies in this area address classic urban economics questions, such as the size and type of cities, agglomeration benefits, the importance of locational advantages, and the impact of place-based policies. Yet new lines of work are also building bridges between urban economics and other areas of study, including international trade, education and human capital, and structural change.

Many of the papers described in this section are, in one way or another, related to two classic urban questions. Why do cities exist? What causes them to grow or decline? Among the answers considered by the papers reviewed below are locational fundamentals, productivity advantages, amenities or disamenities, trade and market access, education and information technology, and structural transformation. These answers, in turn, can inform other questions, such as whether cities are too large or too small, which we discuss at the end of the section.

3.1. Locational fundamentals

One influential line of research in this area draws on historical natural experiments to inform the theoretical debate over the fundamental drivers of city growth. A starting point for this literature is Davis and Weinstein (2002), which used the U.S. bombing of Japanese cities during the Second World War to study whether large temporary shocks have a long-run impact on city size. Surprisingly, they found that, despite the severity of the bomb damage, Japanese cities fully rebounded within a few decades. This result suggests that locational fundamentals play a key role in shaping the distribution of economic activity across space, while their results run counter to models of random growth (Gabaix, 1999) or those featuring multiple equilibrium city locations (Krugman, 1991).[11]

A second seminal paper in this literature, Bleakley and Lin (2012), studies cities in the U.S. that were located on portage sites. Historically these were important trading locations, but their natural advantages became irrelevant as river shipping declined in importance.[12] Yet Bleakley and Lin show that these portage sites remained important urban centers many decades after the value of their initial nat-

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[11] The basic approach introduced by Davis and Weinstein (2002) has been applied to German cities by Brakman et al. (2004), Bosker et al. (2007), and Bosker et al. (2008) with mixed results. Another related paper, Miguel and Roland (2011), looks at whether the bombing during the Vietnam War had persistent impacts on outcomes such as the local poverty rate, consumption levels, literacy, etc. They find no evidence of persistent effects.

[12] The location and purpose of cities was typically determined by defense considerations (Dincecco and Onorato, 2016; Glaeser and Shapiro, 2002) or their commercial capabilities (Bakker et al., 2021; Michaels and Rauch, 2018; Acemoglu et al., 2005).

ural advantage disappeared.[13] These result suggests that there must be important factors other than locational fundamentals generating the spatial distribution of economic activity that we observe.

The strikingly different results found in the two seminal papers described above have motivated a growing body of follow-on research. Recent studies have taken several approaches to making progress in this area. One approach focuses on building up evidence from a variety of different empirical settings. Hanlon (2017), for example, looks at the impact of a large economic shock to British cities that were heavily reliant on cotton textile production resulting from the U.S. Civil War, which sharply reduced cotton supplies. This paper provides evidence that the temporary shock had a persistent impact on city size.

Persistent effects of a temporary relocation of population are also documented by Schumann (2014), which studies the resettlement of Germans after the Second World War who were expelled from land controlled by Germany prior to the war.[14] This study uses an RD approach that takes advantage of the fact that resettlement was generally not allowed in the part of Germany occupied by France after the war. The results show that the differences in population generated by the resettlement were quite persistent.[15]

Comparing the settings considered by Hanlon (2017) and Schumann (2014) to the Japanese cities studied by Davis and Weinstein (2002) offers a potential explanation for why these two studies find results that differ from those obtained by Davis and Weinstein (2002). In Hanlon (2017), the cities affected by the shock were surrounded by many other geographically-similar nearby locations where unemployed workers could move. Similarly, Schumann highlights the fact that the border used in his RD setting runs through territory that is fairly homogeneous in terms of topography and climate. In contrast, Japan's more extreme mountainous geography may have limited the set of alternative locations. This suggests that locational fundamentals may be key when differences across locations are large, but other factors will dominate as locations become more similar.

Two other papers falling into this literature look at the impact of shocks associated with plague outbreaks on cities. Bosker et al. (2008) looks at the impact of plagues outbreaks on the size of Italian cities. Jedwab et al. (2020) looks at the short and the long-run impact of a plague outbreak across European cities. They find that cities recovered their pre-plague population over two centuries, a much slower response than the one found by Davis and Weinstein in Japan. They also provide evidence that the recovery from the Black Death was heterogeneous, with cities in more advantageous locations recovering more rapidly. This heterogeneous recovery links to work by Michaels and Rauch (2018) which we will discuss later.

Bosker and Buringh (2017) adds another perspective by highlighting that the success of a city not only depends on a location's own fundamentals but also on the distribution of fundamentals in the surrounding region. Comparing 250,000 randomly drawn potential city locations to actual European city locations over the period between 800 and 1800, they find geography to be the dominant factor underlying city location choices. Second nature geography effects are less relevant but follow the regularity of so called market potential curves that assign to every location in a given distance from an existing city the likelihood to become

a city as well (Fujita and Mori, 1996). Specifically, Bosker & Buringh find that the net effect of large neighbors was negative, they imposed growth shadows.[16]

Historical studies also have the potential to help us understand how the impact of locational fundamentals on city growth changes over time as new technologies are introduced. A seminal paper in this area is Nunn and Qian (2011), which shows that the introduction of the potato to Europe had a substantial effect on city growth. To gain identification, they interact the timing of the arrival of the potato with measures of local agricultural suitability for the crop based on climatological features.[17] This identification strategy is now being applied in a variety of similar studies. Two other similar studies in this area focus on issues of central importance to economic historians. Crafts and Wolf (2014) look at the factors that drove the spatial distribution of the cotton textile industry in Britain, while Fernihough & O'Rourke (2021) study the impact of coal reserves on economic growth in Europe during the Industrial Revolution.[18] Another paper in this area is Brooks et al. (2021), which looks at how the introduction of containerized shipping affected economies near ports depending on whether geographic factors made the port well-suited for handling large container ships. They find that ports with geographic features that accommodated large ships experienced increases in population and employment following the introduction of containerization. All of these studies show that locational fundamentals matter, but that their importance is also determined by the technologies available at any point in time. This raises questions about the extent to which churning in city size or regional economic development can be explained by the interaction of locational fundamentals and new technologies. This is likely to be a fruitful area for future research.

An innovative paper by Michaels and Rauch (2018) pushes our understanding of locational fundamentals forward, by asking whether urban systems can be locked into patterns that are sub-optimal as technologies change. They focus on a comparison of the urban systems in Britain and France from 117 to 2012. They argue that the collapse of the Western Roman Empire by 410 CE led to the collapse of the urban system in Britain, while the urban system remained largely intact in France. In addition, they note that the Romans tended to rely on road transport, while access to water transport became much more important later. Using this variation, they show that after the re-establishment of urban centers in Britain, the location of British cities tended to be further from the earlier Roman cities, compared to the pattern observed in France, and closer to advantageous geographic features such as seaports. Thus, they argue that path dependence trapped French cities in less advantageous positions. This study opens a new range of interesting questions in urban economics, but it remains to be seen whether additional settings can be found that allow these issues to be investigated further.

3.2. Productivity effects of agglomeration

Results from papers such as Bleakley and Lin (2012) suggest that, while fixed locational features are important, other agglomeration benefits also matter. One potential source of these other agglomeration forces are productivity advantages related to city size or the clustering of particular industries. Next, we review papers using history to look at the productivity effects of agglomeration. In reviewing this literature,

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[13] Using data on colonial railroads in Kenya, Jedwab et al. (2017) show that temporary advantages related to railroad access can generate population agglomerations that persist, even after many of the benefits of such access have disappeared. Maloney and Valencia Caicedo (2016) present a similar finding for the Americas.

[14] Other recent papers that look at the economic effects of the inflow of expellees in Germany include Braun and Kvasnicka (2014), Braun and Omar Mahmoud (2014), Burchardi and Hassan (2013), or Peters (2019).

[15] Sarvimäki (2012) presents similar results for the forced relocation of 11 percent of the Finnish population after Finland ceded its eastern parts to the Soviet Union. The exogenous increase in the local labor force had a positive effect on later population growth, industrialization and wages.

[16] Cuberes et al. (2021) present a similar finding for the U.S. though interestingly, they show that the negative growth effects of large cities turn positive after 1920. This coincides with the rise of commuting technologies as discussed im section 4.

[17] In a similar vein, Chen and Kung (2016) study the adoption of maize in China from 1600 to 1910.

[18] Also see Ploeckl (2012), which looks at the impact of locational advantages on the spatial distribution of population in Saxony in the 19th century.

it is important to note that the approach used in long-run papers look-ing for productivity effects differs from that used in short-run papers with modern data. In particular, in historical data, direct measures of wages or firm productivity, which may be the outcome of interest in papers using modern data, are generally unavailable. To overcome this challenge, historical papers often look at employment or city size as the outcome of interest. The use of either wages or population/employment as a measure of agglomeration forces relies on similar theoretical foun-dations. However, one important difference between these approaches is that estimates obtained using population or employment as the out-come of interest end up being denominated in terms of jobs or pop-ulation, rather than in value, which can make them more difficult to compare across different contexts.

Following up on their 2002 study, Davis and Weinstein (2008) con-siders the impact of the bombing of Japanese cities at the level of city-industries. They find no evidence that Second World War bomb-ing reallocated industries across locations. In contrast, Redding et al. (2011) show that the division of Germany did have a permanent effect on the location of the main German airport, even after reunification. Even more focused studies are provided by Buenstorf and Klepper (2009) and Buenstorf and Klepper (2010), which study the cluster of tire manufacturers in Akron, Ohio; Cabral et al. (2018), which studies the development of the early auto industry; and Klepper (2010), which looks at clustering among automakers in Detroit and semi-conductor manufacturers in Silicon Valley. A slightly different approach is taken by Borowiecki (2013), who focuses on a specific group of individuals, European classical composers in the late 18th and 19th centuries, and estimates the impact of proximity to other composers on their produc-tivity. Being located in a contemporaneous cluster of composers has a pronounced effect on individual productivity, but historical cluster locations or large cities in general have no effect, suggesting that sec-ond nature geography is the driving agglomeration force. In a simi-lar vein, Mitchell (2019) finds that prominent authors born in the UK and Ireland in 18th and 19th centuries experience huge productivity increases when they were residing in London, the only major literary cluster. These very detailed studies provide evidence that can be used to inform our broader understanding of agglomeration economies.

The focus on industry-level outcomes connects to a classic line of work in urban economics which compares city-industry growth over several decades to initial city features, such as industry concentration or diversity (Glaeser et al. (1992); Henderson et al. (1995)). While innova-tive at the time of publication, these papers were constrained by limita-tions on the availability of historical data on city-industry employment or output. However, new datasets tracking city-industry employment over long periods are increasingly available, allowing a richer analysis. In the U.S., data from the County Business Patterns going back to 1957 have been digitized by Duranton et al. (2014) while data from the U.S. Census covering an even longer period has been digitized by Lee (2015) and Klein and Crafts (2020). Recently, Hornbeck & Rotemberg (2019) digitized the U.S. Census of Manufactures for the years 1860, 1870, and 1880 as a source of county-by-industry variation. In the U.K., Hanlon and Miscio (2017) digitize consistent data on city-industry employment for 1851–1911. These data are then used to look at how the composition of industries in a city affects city-industry growth. They find that indus-tries grow more rapidly when they have more local suppliers or other industries using occupationally similar workforces, while they find no evidence that industries grow more rapidly in locations in which are initially large. This suggests that cross-industry (Jacobs) spillovers are likely to be more important than within-industry (MAR) spillovers.

Another interesting paper in this area is Severnini (2022), which looks at the long-run impact of hydroelectric power on local economic activity. Crucial for his identification strategy is the fact that prior to the 1950s transmitting power across longer distances was expensive, so dams provided a location-specific advantage, while the introduc-tion of high-voltage transmission cables after 1950 eliminated these advantages. The paper finds that access to early, but not late, hydro-

electric dams had both short and long-term effects on local popula-tion and employment growth. In a related paper, Lewis and Severnini (2020) find that the expansion of the U.S. electric grid into rural areas increased agricultural employment, but that this crowded out non-agricultural work.

Geographic concentration may also come with countervailing costs as firms compete for scarce local inputs. The effect of increased local agglomeration on incumbent firm performance is thus ambiguous. Falck et al. (2013) identify the impact of local firm concentration on incum-bent performance in the context of the German machine tool indus-try after the Second World War. During that time, many firms fled the Soviet-occupied zone to prevent expropriation. In the aftermath of the war, these location decisions were driven by non-economic factors and thus quasi-random. The paper finds that relocating firms increased the likelihood of incumbent failure in destination regions because they increase competition for labor.

One reason to care about how agglomeration affects productivity is that these effects have implications for the use of place-based policies. Place based policies are widely used and can be very costly, but evi-dence on their efficacy remains somewhat sparse. An important recent paper that speaks directly to this issue using historical data is Kline and Moretti (2013). They study the impact of a very large local develop-ment policy, the Tennessee Valley Authority (TVA) project. This project, which began in the 1930s, peaked in the 1950s, and effectively ended in the 1960s, involved investments such as new dams, roads, and canals, in several U.S. states. Taking advantage of the spatial and temporal variation offered by this project, Kline & Moretti provide evidence that these investments had a long-run impact on manufacturing employment but not on agriculture, a pattern that can be explained by the presence of agglomeration economies in manufacturing. In addition, they use a structural model to assess the aggregate impact of the program, which they find to have net positive effects on national manufacturing pro-ductivity.

Ehrlich and Seidel (2018) looks a temporary place-based subsi-dies for the West German regions that were located along the inner-German border to compensate firms and households for their loss in market access (see Redding and Sturm, 2008). The paper finds persis-tent effects on economic density which is attributed to physical infras-tructure investments in locational advantages such as industrial parks, roads, power networks, or sewage systems. The benefits of the policy are capitalized in land rents.

Becker et al. (2021) study a specific form of a place based policy, the decision to create public sector jobs as an instrument to address employ-ment problems in declining areas. However, these employment effects may be offset if the location of public employment affected private sec-tor activity through wage effects, increasing housing costs and potential productivity and amenity spillovers. The paper exploits the relocation of the (West) German federal government from Berlin to Bonn after the Second World War as exogenous shock to study the effect of pub-lic employment on the spatial distribution of private sector activity. As expected, Bonn experienced a substantial increase in total employ-ment and population which was mostly due to the increase in public employment. Private sector employment remained largely unchanged. This is in line with the predictions of a simple economic geography model where public sector employment in a city can crowd out private employment through higher wages and house prices, but also gener-ates potential productivity and amenity spillovers. Further empirical evidence suggests that the results are driven by an increase in ameni-ties in Bonn while productivity in the private sector remained largely unchanged.

3.3. Amenities and disamenities

Another classical urban economics question addressed using histor-ical data is the role of amenities or disamenities in contributing to city growth. On the amenities side, Falck et al. (2011) uses history to pro-

vide plausibly exogenous variation in the location of baroque opera houses across Germany and shows that these locations attracted high-human-capital workers which in turn has positive growth effects. On disamenities, Hanlon (2020) studies the impact of industrial pollution on city growth using British cities in the 19th and early 20th century, which experienced extreme levels of air pollution. This paper finds that industrial pollution substantially affected the growth of employment and population in British cities during this period. Moreover, most of this effect appears to come through the impact of pollution on the productivity of workers and firms, rather than through impacts on residents' utility.[19]

Another historically important disamenity associated with cities, and one that continues to affect urban areas in developing countries today, is poor sanitation. The impact of sanitation improvements on cities has been the focus of a number of studies at the intersection of urban economics and economic history. We review this literature in Section 4.2.

3.4. Trade and market access

A very active line of research on cities using historical data explores the impact of trade or "market access" on the development of local and regional economies. A transformational paper in this literature was Donaldson (2018), which provided an early indication of the types of rich historical data that could be brought to bear on this topic. Focusing on India, this paper showed how theory and historical data could be combined to measure the local impact of transportation infrastructure improvements. This contributes to a larger literature looking at the impact of railroads or other transportation improvements on the spatial distribution of economic activity.[20] A follow up paper, Donaldson and Hornbeck (2016), provides additional tools for assessing the impact of transportation infrastructure on local economies and applies them to U.S. data from the 19th century. One application of the market access approach that they introduce is provided by Jaworski and Kitchens (2019), who study the impact of the construction of the Appalachian Development Highway System on regional economic development. Another, Morten & Oliveira (2018), looks at the construction of Brazil's new capital city, Brasilia, in 1960, which triggered the development of a new highway network that connected the national capital to the existing state capitals. That paper finds a positive effect of the road improvement on both goods markets and labor markets. In an extension, Hornbeck and Rotemberg (2019) use data from the U.S. Census of Manufactures between 1860 and 1880 to show that improved market access from railway expansions benefited manufacturing productivity.[21] A key contribution of their paper is highlighting the importance of the interaction between market access and factor misallocation.

Redding and Sturm (2008) also study the impact of market access on city growth, using the change in market access induced by the division of Germany following the Second World War and the subsequent reunification in 1990. Their results provide strong evidence on the impact of market access on the growth of cities.[22] A recent paper by Johnson and Koyama (2017) suggests that cities in Europe with Jewish communities grew faster than cities without Jewish communities over the period between 1400 and 1850, a result of Jewish communities' ability to exploit increases in market access after 1600.

Another study focused on how transport costs affects cities is Fajgelbaum and Redding (2021), which uses data from Argentina in the 19th century to investigate the interaction of falling international trade costs and internal transportation costs on the spatial distribution of economic activity. Their data show that a reduction in international trade costs led to relative increases in population density in locations with better access to external markets, a pattern that they rationalize with a model in which improvements in market access lead transport hubs to shift away from agriculture toward services and manufacturing, which use land less intensively and therefore allow greater density.

In a somewhat related vein, Nagy (2020) uses historical data, together with a dynamic model of trade, labor mobility, and endogenous growth, to assess the impact of the construction of railroads on the U.S. urban system on economic growth in the 19th century. Longer-run effects of early transport-infrastructure investments that facilitated interregional trade are reported in Flückiger et al. (2021) and Dalgaard et al. (2018) who study the persistent effects of the Roman road network across Europe. The former argues that trade-links led to cultural integration which facilitates economic interactions today. The latter paper adds an interesting perspective when it shows that the effects only persist in areas where the road infrastructure was permanently used and supplemented with the emergence of market towns. This is in line with Wahl (2016) who shows that involvement in medieval trade has a lasting effect on contemporary regional economic development across European countries. The persistent effect of historical infrastructure investments is the underlying motivation for studies that employ historical infrastructure investments as an instrument in contemporaneous studies of road infrastructure and interregional trade (Duranton et al., 2014; Baum-Snow et al., 2017; Volpe Martincus et al., 2017).[23]

All of the studies cited in this subsection suggest that locations benefit from improved market access, in terms of greater population density, land prices, or productivity. However, a recent study at the industry level by Juhász (2018) shows a somewhat different pattern. Juhasz studies a temporary increase in trade barriers in France in the early 19th century caused by the Napoleonic Blockade of Britain. This sheltered French textile firms from competition from more advanced British textile producers. Juhasz shows that this had a long-run positive effect on the development of the local cotton textile industry, a finding that suggests that temporary trade protection may have long-term benefits for certain local industries, and perhaps local economies as a whole.

3.5. Education, information and finance

One of the most active areas of research at the intersection of urban economics and economic history focuses on the long-run impact of education and human capital on local economic development. Historical research has a natural advantage in this area because it makes available natural experiments that can provide exogenous variation in the location of educational institutions or labor force skills, which is often difficult to obtain in modern settings. In addition, many of the benefits of educational investments may accrue slowly over time.

One strand of work in this area looks at the impact of educational institutions on the local economy. Cantoni and Yuchtman (2014), for example, provide evidence on the long-run contribution of medieval

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[19] Other recent contributions on historic pollution effects include Barreca et al. (2014); Clay and Troesken (2011); Clay et al. (2016).

[20] Atack et al. (2010) studies the relationship between urbanization, population density and the coming of the railroad in the U.S. Midwest in the mid-19th century. Berger and Enflo (2017) looks at the impact of railroads on 150 years of urban growth in Sweden. Hornung (2015) undertakes a somewhat similar exercise to Donaldson using data from Prussia in the 19th century. Bogart et al. (2015) compares the growth contribution of railways in India and Latin America. Crafts and Mulatu (2006) studies the impact of transportation improvements on the location of industry in Britain in the period before the First World War.

[21] Similarly, Costinot & Donaldson (2016) point to long-run gains from economic integration of US agricultural markets that are comparable to the productivity improvements.

[22] Another interesting historical paper looking at the impact of access to trade on city growth in a very different context is Jia (2014), which studies the development of Chinese treaty ports.

[23] Section 4 refers to other studies that employ historical transport infrastructure as an instrument.

universities to local economic development using an identification strategy that relies on the founding of new universities following the Papal Schism of 1386. In a very different context, Kantor and Whalley (2019) find evidence of spillovers from agricultural experiment stations in the U.S. which peak decades after the opening of the stations. Thus, both studies suggest that investments in educational and research institutions can have important long-run effects which may take decades to fully manifest themselves. In contrast, Andrews (2022) uses historical details on the founding of U.S. universities to identify their (surprisingly modest) impact on local innovation rates.

A second line of work in this area looks at the impact of transfers of knowledge or skills across urban areas. Dittmar (2011b) focuses on the example of the printing press, a groundbreaking technology that was invented in Mainz, Germany in the 15th century (see also Rubin, 2014). He shows that cities that had earlier access to printing technology thanks to their proximity to Mainz grew 60% faster from 1500 to 1600 than other similar cities. Hornung (2014) provides evidence on the impact of inflows of skilled workers by looking at the migration of the Huguenot Diaspora to Prussia following their expulsion from France in the 17th century. He finds that these skilled workers had a long-term positive effect on productivity in the receiving cities. One implication of these studies is that the gains that urban areas receive from market integration may go far beyond access to goods alone.

A third strand of work looks at the impact of education on industrialization and long-run economic development. Becker et al. (2011) focus on Prussia, where detailed census data are available at the county level before and after the onset of the Industrial Revolution, which reached Prussia in the 1830s. Using instruments based on pre-Industrial Revolution data, they provide evidence that education was associated with industrialization.[24] More recently, an innovative paper by Squicciarini and Voigtländer (2015) uses data on purchasers of the *Encyclopédie* in mid-18th century France to identify the location of "knowledge elites" and then shows that these locations experienced more rapid city growth after the onset of industrialization in France. Bai and Kung (2015) look at China and show how Protestant missionaries promoted economic prosperity during the period from 1840 to 1920. While the missionaries converted few Chinese, their presence triggered urbanization driven by knowledge diffusion from the schools and hospitals that they established. In a similar spirit, Caicedo (2019) shows that Jesuit missionaries instructing indigenous inhabitants in reading, writing, and crafts had lasting effects on educational attainment and income in those areas in modern-day Argentina, Brazil, and Paraguay.

Another active area for research focuses on the local impact of finance. An example of work in this vein is Heblich and Trew (2019) who use parish level data for England and Wales in 1817 and 1881 to study the effect of banking access on manufacturing growth and structural change. Similarly, Bodenhorn & Cuberes (2018) find that the entrance of a new bank had a positive effect on subsequent population growth in the Northeastern United States over the period 1830–1870. Another paper in this area is Atack et al. (2014), which looks at the relationship between banking and railroads in the U.S. before the Civil War. More recently, Feigenbaum et al. (2018) documents the long-run impact of the destruction caused by Sherman's March to the Sea during the U.S. Civil War. They argue that underdeveloped financial markets played an important role in the slow recovery of counties affected by the capital destruction that occurred during the March.

3.6. Structural transformation

A relatively new line of urban studies using historical data have focused on linking structural transformation and urban growth. For example, Michaels et al. (2012) study the impact of structural transformation on the population density distribution. They begin by using uniquely detailed data tracking population in the U.S. from 1880 to 2000 in a consistent way, including both urban and rural areas. Their data show that population growth is positively related to initial population density at intermediate population densities, a pattern that is inconsistent with Gibrat's Law. At higher population densities, however, this positive relationship disappears, a pattern that has been documented in numerous settings. To explain these patterns, they offer a model economy composed of agricultural and manufacturing sectors. In the model, agriculture concentrates in less dense areas and experiences mean reversion, while manufacturing employment growth is uncorrelated with initial density. These features, together with structural transformation from agriculture toward manufacturing across the study period in intermediate locations, can explain the stylized facts found in the data. This paper provides an important bridge between research on urban systems and work on structural transformation which has often been focused on patterns at the national level. A somewhat different approach is taken by Trew (2014), which calibrates a model based on Desmet and Rossi-Hansberg (2014) on occupational data for England in 1710 and uses it to predict changes in the spatial distribution of manufacturing and agricultural employment in the mid-19th century. In a follow-up paper, Trew (2020) investigates the interplay of infrastructure development and economic growth in England across 18th and 19th centuries. Herrendorf et al. (2012) perform a similar exercise for the U.S. and show that transport improvements determined where people lived and what industry they worked in and led to important welfare gains.

A second paper linking cities and structural change, Michaels et al. (2019), studies the evolution of the types of tasks done in cities relative to less dense locations. To track tasks across locations and over the period 1880–2000, they classify the actions (verbs) associated with each occupation in the Dictionary of Occupational Titles compiled by the U.S. Department of Labor and then link these to locations using occupation data from the U.S. Census (via IPUMS). These data show a trend toward what they call "interactive" occupations – those that involve thought, communication, and inter-social activity – over time, and this trend is stronger in cities than in less dense areas. These patterns can be rationalized by a model in which dense locations have a comparative advantage in interactive tasks, a finding that is also documented in Bacolod et al. (2009).

3.7. Are cities too large or too small?

Historical data is also being used to improve our understanding of the distribution of city sizes and whether cities are too larger or too small. For example, two recent papers in this area look at the timing of the emergence of Zipf's law. Dittmar (2011a) provides evidence that in Europe, Zipf's Law emerged after 1500. Before that, big cities were too small, which he attributes to the constraint imposed by land entering as a fixed factor, a constraint that was relaxed after 1500 by innovations in transportation technology and agricultural productivity improvements. In the U.S., Desmet and Rappaport (2017) show that large cities experienced a gradual transition toward Gibrat's Law (where growth rates are uncorrelated with initial size) across the 19th and early 20th centuries, which we know from Gabaix (1999) will lead to the emergence of Zipf's Law. They offer a model which rationalizes the observed patterns through the entry of new locations on the western frontier of the country. A useful take-away from this paper is that, because of the open frontier, the U.S. city system may behave quite differently than other

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[24] In a somewhat related exercise, Cinnirella and Hornung (2016) study the relationship between large landownership concentration and the expansion of mass education in nineteenth-century Prussia. The stepwise abolition of serfdom increased the private demand for education.

locations until the middle of the 20th century. This study builds on earlier work tracing long-run city and regional development in the United States, including seminal work by Kim (1995).[25] Giesen and Südekum (2014) take an alternative approach to Zipf's law by focusing on city age. Using data on the founding date of 10,000 U.S. cities, they show that city age is positively correlated with city population, a feature that they explain by modeling an urban system with entry of new cities over time.

Historical studies can also help improve our understanding of the role of developers, which play an important role in determining city size in urban models such as Henderson (1974). As pointed out by Helsley and Strange (1997), one of the key challenges faced by developers is land assembly. This is an issue studied by several recent papers using historical data. Libecap and Lueck (2011) consider the impact of two different land demarcation systems in 19th century Ohio. One of these generated regular rectangular plots while the other allowed irregular plots that tracked terrain features. They find that rectangular plots had large long-run net benefits. Similarly, Bleakley & Ferrie (2014) uses exogenous variation in plot size allocations from land lotteries in Georgia to study the ease with which land can be assembled into optimal sizes. They find that misallocation initially depressed land values by 20% and that it took 150 years for these effects to disappear. Another study of the U.S. frontier, Smith (2020) finds instead that large landholdings resulted in depressed values. Overall, these studies suggest that there may be substantial barriers to the assembly of land into parcels of optimal size, as hypothesized by Helsley and Strange (1997).

The papers reviewed in this section show us that historical studies have a lot to tell us about why cities exist, how they interact, and how they grow. While many of the studies in this area address core urban economics questions – including the reasons that cities exist, agglomeration economies, and the causes of Zipf's Law – historical work is also creating bridges between urban economics and topics typically studied by other fields, including structural change, trade, education and migration. Given the continued growth of rich long-run historical data sources, we expect that this will continue to be a fertile research area for years to come.

4. Studies of city structure and neighborhood sorting

The previous section discussed historical reasons for the existence of cities and interactions between cities. This section shifts from a between-city perspective to a within-city perspective. Specifically, we are interested in what history can teach us about determinants of the equilibrium distribution of residents, workers and land rents across locations within a city, how major urban infrastructure investments, such as transport networks or sewer systems, affected the shape and size of cities, and how the organization and segregation of cities today is influenced by the past.

Papers that apply quantitative urban models in combination with historical data (see Ahlfeldt et al., 2015; Heblich et al., 2021) illustrate how a historical perspective can help us understand to what extent large shocks like the division of Berlin or historical pollution exposure changed the structure of the city in the long-run. Being able to account for these changes qualitatively and quantitatively provides a handle to evaluate future changes to e.g. the transport network. Additionally, a better understanding of path dependencies holds important policy implications, especially if initial conditions or shocks that determined a spatial equilibrium in the past are redundant today. Here, policies that promote a movement to a better steady-state could be welfare enhancing (Donaldson and Allen, 2020).

4.1. Transport infrastructure

Before the Industrial Revolution, walking was the most common way to travel within cities and people lived close to where they worked (Voth, 2001). Cities were typically organized around a center where the economic activity took place and they did not stretch out more than a few miles (this is why the City of London is also colloquially known as square mile). Urban development was constrained by distance (Duranton, 1999). While the introduction of horse omnibuses increased travel speed slightly, it was only the introduction of railways and subways that had a lasting effect on inner-city travel speeds.[26]

With the emergence of railways and subways, people started moving to suburbs and commuting to their place of work in city centers. As a result, employment and residence locations became increasingly segregated, as shown in (Heblich et al., (2020b)) for the case of London.[27] This gave rise to highly localized production and residential externalities, a key result in the seminal paper by Ahlfeldt et al. (2015). Outside of metropolises that invested in the construction of railways and subways, street cars were a less costly but equally effective way to allow people to commute (Brooks and Lutz, 2019; Xie and Levinson, 2010). Early version of streetcars were horse drawn but this technology was not sustainable as growing numbers of workhorses lined the streets with piles of manure. The introduction of electricity in streetcars overcame this problem and was equally beneficial for subways, since steam driven engines in tunnels posed significant ventilation problems.

After the introduction of rail technology, cars and trucks were the next big technological shock, with lasting effects on the internal organization of cities around the world (see Glaeser and Kohlhase, 2004). The development occurred in two main waves. First, roads and the introduction of trucks freed up firms' location choice within cities, leading to an emergence of sub-centers (Moses and Williamson, 1967; Anas et al., 1998; Glaeser and Kahn, 2001). The second wave of change was the result of newly built urban highways starting in the 1950s, which led to a significant reduction in commuting costs and with it a further increase in urban sprawl as people moved to suburbs. To identify the effects of decreased travel time on residential choice, Baum-Snow (2007) uses a 1947 highway system plan for the U.S. as a source of exogenous variation.[28] In subsequent research, the 1947-highway-map has been augmented by two more historical instruments–the 1898 railroad network and maps of historical routes of exploration–to assess the effect of transport infrastructure on road usage (Duranton and Turner, 2011), urban growth (Duranton and Turner, 2012), within and between city trade (Duranton et al., 2014), driving speed in large U.S. cities (Couture et al., 2018), and knowledge flows in support of innovative activities (Agrawal et al., 2017).[29]

Historical evidence tells us that the layout of road infrastructure can have long-lasting effects on city development. Existing layouts range from the iconic regular grid of midtown New York to the hub-and-spoke

[25] Other studies in this area include Eaton and Eckstein (1997), Kim (1998, 2006), Ioannides and Overman (2003), Cuberes (2011), and Beeson et al. (2001).

[26] see Bogart (2014) for a survey of the transportation revolution.

[27] Ahlfeldt and Wendland (2011) and Ahlfeldt and Wendland (2013) use historical land values in Berlin, Germany, from 1890 to 1936 and show a similar impact of the rapid transport system on urban decentralization.

[28] Other research on suburbanization in the U.S. since the 1950s includes Glaeser and Gyourko (2005) and Glaeser and Kahn (2001). We also refer readers to *Crabgrass Frontier*, by Jackson (1985), which provides a comprehensive summary of the factors that promoted suburbanization over the course of history.

[29] Studies that use historical route instruments outside the U.S. include Garcia-López et al. (2015) who employ Roman roads and the 1760 Bourbon roads to instrument the Spanish road infrastructure today; Hsu and Zhang (2014) who exploit historical Japanese railroad networks; or Baum-Snow et al. (2017) who rely on the 1962 road and rail network in China. Somewhat related to this strand of research are papers which exploit the historical layout of the voice telephony infrastructure (Falck et al., 2014) or cable-TV infrastructure (Czernich et al., 2011) to explain the regional diffusion of high-speed internet.

of Washington D.C. and the less regular patterns observed in the center of many older cities around the world. O'Grady (2014) presents one of the few quantitative studies on the coordinating effects of rectangular grids in cities.[30] The paper exploits the 1811 adoption of an iconic regular grid in midtown Manhattan while Lower Manhattan was built on a decentralized grid. These spatial differences in the street patterns continue to exist today, and it turns out that regular grids increase land values and land use because irregular property shapes are less common and connectivity is better (Barr and Ort, 2013). Related to this, using data on Indian cities, Harari (2020) shows that a more compact city shape due to favorable terrain facilitates transit accessibility. This is reflected in faster population growth.

Historical studies of the impact of transportation infrastructure on cities remains one of the most active areas of historical urban research. As we look ahead at further advances in transportation technology, whether in the form of self-driving cars, electric scooters for hire, or package delivery drones, historical studies can offer insights into how we might expect urban environments to change in response.

4.2. Urban health amenities

Transport infrastructure is an important factor if we think about the internal organization of cities. An equally important though less visible part of the urban infrastructure is the network of water and sewer pipes. Its importance for the (healthy) rise of densely populated cities cannot be overestimated. During the industrialization, more and more people cramped into cities hoping to earn higher wages. The price they paid was a lower life expectancy.[31] Water-borne illnesses, like cholera and typhoid, were a main factor underlying urban mortality before the oral-fecal method of disease transmission was understood and cities started investing in water and sewerage infrastructure to improve public health.[32] An important line of research, including work such as Cutler and Miller (2005), Ferrie and Troesken (2008), Troesken (2008), and Kesztenbaum and Rosenthal (2011), documents the importance of sanitation improvements for urban health and development. This literature has played an influential role in policy responses in modern developing countries, where cities continue to struggle with high mortality rates. More recently Alsan and Goldin (2019) highlight the importance of combining water and sewer infrastructure, while work by Clay et al. (2014) and Feigenbaum and Muller (2016) on lead pipes shows that mistakes in the provision of health infrastructure can be costly. Yet despite a substantial body of research on this topic, reviewed in more detail in Brian Beach's article in this volume, debate remains over the true effect of public health efforts on urban mortality (Anderson et al., 2021).

Another factor underlying urban mortality was air pollution. While coal smoke from small workshops and heating existed prior to the industrial use of coal, the amount of air pollution in emerging manufacturing towns was unprecedented. Coal was fueling rising incomes but workers had to breath its smoke in the notoriously polluted centers of the industrialization which came at the cost of a lower productivity and poor health (Bailey et al., 2018; Barreca et al., 2014; Beach and Hanlon, 2018). Even more insights into the health effects of air pollution come from Hanlon (2019) who combines a long time series of mortality data for London with London fog events where pollution got trapped in the city. That paper highlights the substantial contribution that pollution made to overall mortality in the past, as well as documenting

interactions between pollution exposure and the presence of infectious diseases. Clay and Troesken (2011) study the Spanish Influenza Pandemic and find a similar interaction with pollution. These results indicate that pollution is likely to be more costly in cities, such as those in modern developing countries, that also struggle with high infections disease burdens.

Unlike the case of water supply, cities were less influential in regulating urban air pollution. One potential explanation is that managing air pollution would directly affect the competitiveness of one location compared to others within the same country. Only a nationwide regulation could have prevented this, but nothing substantial had been done before the lethal London Fog in 1954 led to the 1956 Clean Air Act in England. Subsequently, other countries followed.

Despite the fact that cities in modern developed countries are remarkably healthy by historical standards, the results reviewed in this subsection suggest that urban economists should not lose sight of the important role that health plays in cities, a role that has been starkly illustrated by the Covid-19 pandemic. Even after that passes, health concerns will remain important, particularly in developing cities, though urban health challenges remain even in developed countries, as the recent experience of Flint, Michigan can attest.[33]

4.3. Residential amenities

The public sewers and pollution regulations that we have just discussed represent just two of the many factors that influence the amenity value of neighborhoods and cities. Other important influences on city amenities that have been studied with historical evidence include those related to public safety, natural amenities, as well as the many beneficial pieces of urban infrastructure, ranging from opera houses to iconic buildings, bequeathed to cities by past generations of residents.

As protests in U.S. urban cities following the death of George Floyd remind us, how cities invest in public safety continue to be an important topic for discussion and study. This is a topic where historical evidence has much to offer, though one where existing work remains limited. One recent example in this vein is Bindler and Hjalmarsson (2019), which studies the formation of the world's first professional police force, the London Metropolitan Police, in 1829, as well as the subsequent role-out of a professional police forces across Britain. They show that this led to an overall reduction in crime, contributing to the declining crime rates in England and Wales in the second half of the nineteenth century despite a growing population. That paper highlights two important features that influenced the effectiveness of the new police force. First, there was a new focus on crime prevention and deterrence rather than ex-post punishment. Second, there was an emphasis on police quality, a topic that clearly remains relevant.

Other *historical amenities*, to use the term offered by Brueckner et al. (1999), continue to influence patterns of urban development today.[34] Examples of historical investments that have lasting effects on the attractiveness of neighborhood include park designations in expensive downtown locations; opera houses (Falck et al., 2011); and historical buildings and cultural landmarks (Koster and Rouwendal, 2017; Ahlfeldt and Holman, 2018). However, it is worth noting that these amenities can also come with costs, in addition to benefits. For example, in England, Hilber et al. (2019) highlight the costs of preserving

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[30] Ellickson (2012) discusses the economic benefits of a grid pattern but he does not present quantitative evidence.

[31] Cities were already deadly places before that as discussed in Voigtländer and Voth (2013b) and Jedwab et al. (2020) but the population growth during the Industrial Revolution brought this to a new level.

[32] The epidemiologist John Snow provided important evidence on the oral-fecal transmission mechanisms when he detected that one contaminated well in a London parish caused a cholera epidemic Ambrus et al. (2020).

[33] The 2014 *Flint Water Crisis* emerged when the city of Flint decided to disconnect from Detroit's drinking water system that drew water from Lake Huron and set up their own water supply that drew from the Flint river. Tragically, officials failed to apply corrosion inhibitors to the more corrosive river water, thus causing lead to leach into the drinking water. Residents noticed health effects but local officials denied anything wrong for over a year. After that, Flint switched back to Detroit's water system and the state of Michigan has agreed to compensate the victims.

[34] The value of amenities is often assessed with the help of the hedonic pricing. This approach runs up against a natural limitation in historical studies.

historic buildings in terms of lost energy efficiency. Another cost are building height restrictions meant to preserve skylines with the silhouette of historical buildings, that may limit beneficial development.

In addition to historical amenities, exogenous natural amenities can have lasting effects on the attractiveness of neighborhoods. Looking at the period 1880–2010 in the U.S., Lee and Lin (2018) uncover an interesting heterogeneity in the spatial distribution of income within cities; those cities with natural amenities like oceans, mountains, and lakes show a more persistent spatial distribution of income, while the spatial distribution of income in cities with few natural amenities churns quickly. This result nicely complements Rosenthal (2008) who shows that neighborhoods cycle through periods of decline and renewal. As their housing stock deteriorates, so does the average income until old dwellings are replaced with newer dwellings which attracts higher income families. Rosenthal argues that local externalities may amplify these cycles while Lee & Lin point out a countervailing force, natural amenities. Villarreal (2014) is another paper which explores how exogenous environmental amenities–undesirable historical marshes–shaped initial settlement patterns in New York City, as well as the channels through which these initial conditions influence the long-run distribution of housing prices and household income.

Historical amenities can have long-run effects on the sorting of population within cities. These effects are shown in recent work by Heblich et al. (2021), which examines the long-run effects of historical air pollution as an example of an endogenous man-made disamenity. They show that coal pollution from industrial chimneys in England had a disproportionately stronger effect on cities' east side due to the prevailing wind patterns. Interestingly, these effects persist to this day, even though the initial pollution sources have waned. In a related paper, Ambrus et al. (2020) show that the cholera epidemic in 19th century London affected the spatial distribution of poverty within the city until today. One implication of these results is that the nature and distribution of urban amenities, even those that existed in the past but disappeared long ago, can continue to exert influence on the urban segregation.

4.4. Segregation

The lasting pollution effects on the east sides of cities is an example of historically inherited *income segregation*. A much larger body of research focuses on the origins and lasting effects of *racial segregation*, predominantly in the U.S. Using a new next-door-neighbor measure, Logan and Parman (2017) show that segregation doubled nationally from 1880 to 1940 and this was a general trend for rural and urban areas as well as the North and South. This corroborates earlier work by Cutler et al. (1999) who employ a less disaggregate segregation index to document the rise (since the 1890s) and decline (since the 1970s) of black ghettos in urban centers.[35] Boustan (2010) focuses on the period between 1940 and 1970 where segregation increased rapidly. An important driver of this trend was the white flight from city centers to suburbs as black migrants left the rural South to find jobs in the booming industrial centers in the North, results that are reinforced in recent work by Shertzer and Walsh (2019). These patterns had important consequences, such as on the provision of (locally financed) public goods such as education (Boustan, 2013).

Historical transportation infrastructure has had an important role to play in segregation within cities. Ananat (2011) shows that historical railroad tracks physically separate neighborhoods, thereby contributing to segregation and black-white income disparities. In the case of white flight in the U.S., the availability of highways facilitated suburbanization by white residents. A different aspect of the interplay between transportation infrastructure and segregation is highlighted by

Brinkman and Lin (2017). They show that freeways have disproportionately negative effects on the predominantly black homeowners in central locations.[36] This was because accessibility improved relatively little in those areas, which were already well-connected, while the city freeway network meant increased pollution and noise.

Another historical factor that fostered racial segregation patterns in the U.S. which continue to exist today was a practice known as *redlining*. Redlining prevented African Americans access to home loans backed by the federal government (Aaronson et al., 2017). A similar practice were racial covenants that prohibited the sale or renting of a property to specific races or religious minorities (Sood et al., 2020). While these practices have been officially banned since the middle of the nineteenth century, their influence remains. Moreover, not only did such practices generate segregated neighborhoods, they also had other impacts, such as contributing to racial wealth disparities (Akbar et al., 2020). While redlining is no longer legal, other less obviously discriminatory policies continue to be in place. For example, wealthy neighborhoods may deter poorer residents by minimum lot size requirements or limiting mixed-use or multifamily zoning (Shertzer et al., 2016).

Segregation remains one of the most active research topics at the intersection of history and urban economics (as well as real estate). Given the prominence of this issue, and the long reach of history in urban environments, we expect this to continue. While much of the focus in recent work has been on the U.S., this is a topic where there is ample need, and opportunity, for evidence from other settings.

4.5. Zoning and other urban policies

Today, how cities are organized depends crucially on urban regulations, which include a wide range of policies such as zoning, historical designations, etc. In many cases, these regulations represent historical institutional arrangements that restricted location choices in the past and, to the extent that they did not adjust to changes in local demand over time, have grown to be a significant obstacle for urban economic growth today. Understanding the origin and persistence of these regulatory forces, and the extent to which they influence modern cities, is important for helping design more effective urban policies.

One of the most prominent urban policies is zoning (see Fischel (2004) for a comprehensive historical review). A first wave of zoning laws, which originated in the early twentieth century, were designed to protected home-owners from industrial developments and lower income apartment when trucks and buses improved mobility across town. A second wave of zoning restrictions in suburbs was a reaction to the rising demand for suburbanization. Historical studies have a natural advantage in investigating the impact of zoning because they can look before and after the introduction of zoning laws. In contrast, modern studies are often constrained by the fact that most modern zoning laws were enacted many decades ago and change slowly over time. Two examples of historical work on zoning are McMillen and McDonald (2002) and Shertzer et al. (2018), both of which study zoning in Chicago going back to the 1920s.

While economists agree that zoning laws restrict urban growth, it is important to note that land development is not necessarily optimal in the absence of regulations. This point is made by Hornbeck and Keniston (2017), who exploit the 1873 Boston fire as exogenous shock and test whether the opportunity to simultaneously reconstruct a wide area came with economic gains. The findings suggest that the simultaneous reconstruction efforts after the fire helped developers overcome redevelopment frictions and translated into higher land values. This shows that the durable building stock is a redevelopment burden in itself. Two other studies, Siodla (2015, 2017), examine similar topics using the

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[35] Part of the decline might be related to the longer-run success of urban renewal programs (Collins and Shester, 2013).

[36] The white flight to suburbs led to a reduction of house prices in the center which benefited black homeownership (Boustan and Margo, 2013).

effect of the San Francisco fire of 1906. These studies show the potential for harnessing historical natural experiments to study urban topics that are often difficult to tackle using modern data.

Looking beyond the zoning of land for particular uses, other recent work examines topics such as the impact of historic designations (Waights, 2019). Another class of regulations have to do with building heights. As urban areas grew in the nineteenth and early twentieth centuries, land prices in the center increased, giving developers an incentive to increasing building heights. This led to the emergence of skyscrapers at the end of the nineteenth century, first in Chicago, then in New York, and then around the world. With an increasing number of skyscrapers and competition over the prize of being tallest (Helsley and Strange (2008)), there were rising concerns about negative externalities on surrounding buildings as a result of sunlight blockage and increased traffic congestion. To address this, U.S. zoning laws were extended to regulate the vertical expansion of buildings from the early twentieth century on. Research by Barr (2013) provides an interesting perspective on the effect of these regulations. Comparing the skyscraper developments in Chicago and New York City, he shows changing zoning regulations did reduce the height of each city's own skyline while triggering increased building activity in the other city. Ahlfeldt and McMillen (2018) study the vertical evolution of Chicago and find evidence that the footprint of taller buildings cover a smaller fraction of the plot to comply with restrictions on the floor area ratio. To assess the costs of height restrictions, Koster and Dericks (2020) exploit the Blitz bombings of London during the Second World War as an exogenous shock to local density restrictions and show that bombed areas host taller buildings today.

Zoning and other policies that restrict urban development are sure to remain a core concern for urban economists for many years. This is because they drive up land prices and Knoll et al. (2017) have shown that rising land prices are a significant driver of the global house price boom that has taken place since the Second World War. As the studies cited above illustrate, history offers numerous natural experiments that can be harnessed to help us understand the effects of these policies. Just as important, by looking back in history we can observe a world in which such regulations were largely absent. While much has changed since zoning laws were introduced, doing so still offers the potential for helping us understand the consequences of rolling back existing restrictions.

5. Cities and growth

There has been a growing interest in the historical urbanization process from different subfields within economics. Part of the growing popularity relates to the insight that urbanization can proxy for economic prosperity. While it is comparatively hard to compile reliable data on countries' GDP growth going back in time, data on historical city sizes are easier to access. Under assumptions that we discuss below, the urbanization rate or population density can provide suitable proxies for countries' economic growth and development over long periods of time. It is worth noting however, that the exact nature of the relationship between urbanization and development may have changed over time, a point argued by Jedwab and Vollrath (2015).

5.1. Urbanization as an indicator of economic growth

Economists in different fields have approached the relationship between urbanization and economic growth from different perspectives. Economic historians often focus on the impact of economic growth on the level of population in a location. In contrast, urban economists are often more interested in how a given population is spread across space, i.e., the extent to which a given population agglomerates in urban areas. Below, we briefly describe the foundations of these two views, discuss the extent to which they complement each

other, and seek to highlight areas where further work is needed to bring them into agreement.

Urbanization or population density in the past is widely used as a proxy for technological progress and economic growth. One motivation for this approach emphasizes the impact of technological progress on population (Kremer, 1993; Galor and Weil, 2000). In particular, the link between economic growth and population is a key prediction of the Malthusian model, which is the dominant framework for thinking about economies prior to the Industrial Revolution, as well as modern developing countries that have not yet passed through the demographic transition. The basic intuition behind the Malthusian model is that, given sufficient time, changes in per capita income due, for example, to a technological discovery or natural fluctuations, will ultimately result in population growth. This will erode the increase in per capita income. The result is a long-run equilibrium in which per capita income is determined only by fertility and mortality parameters and technological progress appears in the form of rising population density.[37] While extremely simple, the Malthusian model has held up well in recent empirical studies (e.g., Ashraf and Galor, 2011). This is a useful fact for urban economists to consider, because it suggests that city growth can provide a useful proxy for technological progress before the demographic transition. Note, however, that in this framework individual income does not provide insight into productivity changes.

An alternative view of the relationship between urbanization and technological progress focuses on the distribution of a given population across space, rather than the sources of population growth. This view, which is more associated with urban economics than economic history, emphasizes the key role that local agricultural productivity and the costs of transporting agricultural goods played in constraining city size in the past (Bairoch, 1988; Duranton, 1998, 1999; Dittmar, 2011a). The costs of supplying food to cities represent the key congestion force that balances agglomeration forces in order to determine city size. In this framework, technological progress, either in the form of improved agricultural productivity or a fall in transport costs, allows cities to grow in size. Urbanization, therefore, is a direct reflection of technological progress.

Thus, both of the approaches described above draw a link between technological progress and urban growth. On one hand, urban growth is a byproduct of population growth, while on the other it is the result of the release of constraints on city size, which causes a reallocation of population from the countryside to the city. Both frameworks thus provide a theoretical foundation for the large set of papers using population density or urbanization to measure the impact of new technologies (Dittmar, 2011b), new crops (Nunn and Qian, 2011; Chen and Kung, 2016), improved institutions (Acemoglu et al., 2002), better education (Cantoni and Yuchtman, 2014), improved trading links (Acemoglu et al., 2005), etc.

It seems likely that the two views described above both contribute to the historical relationship between technology, rising population, and urbanization. Thus, we view these approaches as complementary, and in particular, we note that it may be beneficial for urban economists to consider the relationship between urbanization and population growth, not just how a given population is spread across space.

However, there are also important difference between these views. For example, in models of the spatial distribution of population, such as Duranton (1998), the transition from pre-industry to modern cities is characterized by a shift in the main constraint on city growth from the ability to access food supplies to the shortage of land and commuting costs. In contrast, unified growth theories, which model the transition between the Malthusian world and modern economic growth (Galor and Weil (1999)), emphasize the role of rising productivity growth coupled with the demographic transition. These differences will matter

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[37] See Voigtländer and Voth (2013a) for a useful description of this theoretical framework.

when urbanization is used as a proxy for technological progress during the transition from pre-industrial to modern economic growth. Given this, integrating these views into a unified framework that explains both the source of population growth and its distribution over space seems like a useful direction for future work.

5.2. The contribution of cities to growth

Up to now, this section has focused on the impact of productivity growth on population growth and urbanization. However, it is also likely that cities are central contributors to the development of new technologies, a view argued forcefully by Jacobs (1969). This possibility raises both theoretical and empirical considerations. On the empirical side, it means that we have to worry about the direction of causality when relating urbanization and productivity growth. One empirical paper that makes progress in disentangling this causality problem is Cermeño and Enflo (2019), which studies the impact of towns founded by Swedish rulers on local productivity, both before and after the onset of industrialization. On the theoretical side, it calls for the integration of the causal effect of cities on technological progress into models of urban growth. Progress has already been made on this front in a series of papers by (Rossi-Hansberg, (2005); Desmet and Rossi-Hansberg, (2014); Desmet et al., (2018)) but work in this direction is sure to continue.

There is also an interesting line of work in this vein that considers the trade-offs between achieving optimal city size in the short-run and reducing technological progress in the long-run. For example, Duranton (1998) argues that cities may be too large in equilibrium, but that "large actors" may be able to reduce the city to an optimal size. He suggests that guilds may have played this role in historical European cities. By limiting entry into specific crafts within a city, guilds acted as a constraint on city size. In addition, guilds may have provided other functions, such as acting as an enforcement mechanism that constrained local rulers and thereby fostered trade (Greif et al., 1994). However, while guilds may have helped achieve a more optimal city size in a static sense, there is also evidence that they slowed down the development and adoption of new technologies (Mokyr, 1990; Desmet and Parente, 2014). This highlights a trade-off that cities may face between static and dynamic gains. This is a valuable direction for future research, with potentially important implications for modern policies, such as zoning, that constrain city size.

6. Summary

In our review of research applying historical data to the understanding of urban economics, four broad themes have emerged. The first is the drastic increase in the quality and richness of available data over the past decade or so, driven by methodological advances in computing and digitization. This is an important force behind the large and rapidly growing set of historical urban papers that we have reviewed. We see no evidence that this trend is likely to slow in the near future. Rather, technological advances in machine reading and learning are likely to allow the collection of even more detailed and comprehensive historical data, at lower cost, in the near future.

A second broad theme that emerges from our review is the advances made in bringing the increasingly rich historical data into closer contact with economic theory. This trend is particularly notable among papers focused on the role of trade and market access, the spatial allocation of people and firms within cities, and in recent work on cities and growth. Combining historical data with theory offers a number of advantages, including guiding the structure of the empirical analysis, making it easier to interpret reduced-form parameter estimates, and facilitating the construction of counterfactuals. Perhaps most important for urban economics, theory offers a useful tool for accounting for general equilibrium effects and spatial spillovers. The increasing use of theory together

with historical data is a trend that we expect to continue, particularly as more detailed historical data become available.

A third broad theme of our review has to do with the depth and breath of urban topics being addressed using historical data. Historical settings have played a key role in our understanding of some core urban questions, such as the nature of agglomeration economies and congestion forces and the long-run impact of urban infrastructure investments. At the same time, a number of papers have used historical data to form connections between urban economics and other topics, including finance, education, health, and structural change. Both of these trends seem likely to continue. Beyond that, one area where we believe historical studies have the potential to make additional contributions is in connection to factors that affect contemporary city structure, including zoning laws, local resource endowments, city shape, and the impact of these factors on long-run city performance.

Finally, our review suggests that urban economists have been largely successful in integrating the insights and techniques of economic history into their work. The papers we have reviewed generally show an impressive understanding of the historical context in which they are embedded as well as care in the use of historical data, two hallmarks of high quality economic history research. However, there is still scope to bring urban economics into closer contact with work in economic history. In Section 5, we provide an example focused on city growth, showing how urban economists and economic historians take differing views on similar issues. Integrating the lessons of economic history more fully into work on urban economics, and vice versa, seems like another fruitful direction for future work.

Authors contribution

Walker Hanlon: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. Stephan Heblich: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing

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References

Aaronson, Daniel, Hartley, Daniel, Mazumder, Bhashkar, 2017. The Effects of the 1930s "HOLC Redlining" Maps. Working Paper Series WP-2017-12. Federal Reserve Bank of Chicago.

Abramitzky, Ran, Boustan, Leah Platt, Eriksson, Katherine, 2012. Europe's tired, poor, huddled masses: self-selection and economic outcomes in the age of mass migration. Am. Econ. Rev. 102 (5), 1832–1856.

Abramitzky, Ran, Boustan, Leah Platt, Eriksson, Katherine, Feigenbaum, James, Perez, Santiago, 2021. Automated linking of historical data. J. Econ. Lit. 59 (3), 865–918.

Acemoglu, Daron, Johnson, Simon, Robinson, James A., 2002. Reversal of fortune: geography and institutions in the making of the modern world income distribution. Q. J. Econ. 117 (4), 1231–1294.

Acemoglu, Daron, Johnson, Simon, Robinson, James, 2005. The rise of Europe: atlantic trade, institutional change, and economic growth. Am. Econ. Rev. 95 (3), 546–579.

Agrawal, Ajay, Galasso, Alberto, Oettl, Alexander, 2017. Roads and innovation. Rev. Econ. Stat. 99, 417–434.

Ahlfeldt, Gabriel, Barr, Jason, 2022. Viewing urban spatial history from tall buildings. Reg. Sci. Urban Econ. (this issue).

Ahlfeldt, Gabriel M., Holman, Nancy, 2018. Distinctively different: a new approach to valuing architectural amenities. Econ. J. 128, 1–33.

Ahlfeldt, Gabriel M., McMillen, Daniel P., 2018. Tall buildings and land values: height and construction cost elasticities in Chicago, 1870–2010. Rev. Econ. Stat. 100 (5), 861–875.

Ahlfeldt, Gabriel M., Wendland, Nicolai, 2011. Fifty years of urban accessibility: the impact of the urban railway network on the land gradient in Berlin 1890 - 1936. Reg. Sci. Urban Econ. 41 (2), 77–88.

Ahlfeldt, Gabriel M., Wendland, Nicolai, 2013. How polycentric is a monocentric city? Centers, spillovers and hysteresis. J. Econ. Geogr. 13 (1), 53–83.

Ahlfeldt, Gabriel M., Redding, Stephen J., Sturm, Daniel M., Wolf, Nikolaus, 2015. The economics of density: evidence from the Berlin wall. Econometrica 83 (6), 2127–2189.

Akbar, Prottoy A., Li, Sijie, Shertzer, Allison, Walsh, Randall P., 2020 Jan. Racial Segregation in Housing Markets and the Erosion of Black Wealth. NBER Working Paper No. 25805.

Alesina, Alberto, Giuliano, Paola, 2015. Culture and institutions. J. Econ. Lit. 53 (4), 898–944.

Allen, Treb, Donaldson, Dave, 2022. Persistence and path dependence: a primer. Reg. Sci. Urban Econ. (this issue).

Alsan, Marcella, Goldin, Claudia, 2019. Watersheds in infant mortality: the role of effective water and sewerage infrastructure, 1880-1915. J. Polit. Econ. 127 (2), 586–638.

Ambrus, Attila, Field, Erica, Gonzalez, Robert, 2020. Loss in the time of cholera: long-run impact of a disease epidemic on the urban landscape. Am. Econ. Rev. 110 (2), 475–525.

Ananat, Elizabeth Oltmans, 2011. The wrong side(s) of the tracks: the causal effects of racial segregation on urban poverty and inequality. Am. Econ. J. Appl. Econ. 3 (2), 34–66.

Anas, Alex, Arnott, Richard, Small, Kenneth A., 1998. Urban spatial structure. J. Econ. Lit. 36 (3), 1426–1464.

Anderson, D. Mark, Charles, Kerwin Kofi, Rees, Daniel I., 2021. Re-examining the contribution of public health efforts to the decline in urban mortality. Am. Econ. J. Appl. Econ. (Forthcoming)

Andrews, Mike, 2022. How do institutions of higher education affect local invention? Evidence from the establishment of U.S. Colleges. Am. Econ. J. Econ. Pol. (forthcoming).

Andrews, Mike, Whalley, Alex, 2022. 150 years of the geography of innovation. Reg. Sci. Urban Econ. (this issue).

Arkolakis, Costas, Lee, Sun Kyoung, Peters, Michael, 2020. European Immigrants and the United States' Rise to the Technological Frontier. mimeo.

Ashraf, Quamrul, Galor, Oded, 2011. Dynamics and stagnation in the malthusian epoch. Am. Econ. Rev. 101 (5), 2003–2041.

Atack, Jeremy, Bateman, Fred, Haines, Michael, Margo, Robert A., 2010. Did railroads induce or follow economic growth? Urbanization and population growth in the American midwest, 1850-1860. Soc. Sci. Hist. 34 (2), 171–197.

Atack, Jeremy, Jaremski, Matthew S., Rousseau, Peter L., 2014. American banking and the transportation revolution before the civil war. J. Econ. Hist. 74 (4), 943–986.

Atack, Jerry, Margo, Robert, Rhode, Paul, 2022. Urbanization and industrialization in nineteenth century America. Reg. Sci. Urban Econ. (this issue).

Bacolod, Marigee, Blum, Bernardo S., Strange, William C., 2009. Skills in the city. J. Urban Econ. 65 (2), 136–153.

Bai, Ying, Kung, James Kai-sing, 2015. Diffusing knowledge while spreading god's message: protestantism and economic prosperity in China, 1840-1920. J. Eur. Econ. Assoc. 13 (4), 669–698.

Bailey, Martha, Cole, Connor, Henderson, Morgan, Massey, Catherine, 2020. How well do automated linking methods perform? Lessons from U.S. Historical data. J. Econ. Lit. 58 (4), 997–1044.

Bailey, Roy E., Hatton, Timothy J., Inwood, Kris, 2018. Atmospheric pollution, health, and height in late nineteenth century Britain. J. Econ. Hist. 78 (4), 1210–1247.

Bairoch, Paul, 1988. Cities and Economic Development. The University of Chicago Press.

Bairoch, Paul, Batou, Jean, Chèvre, Pierre, 1988. La Population Des Villes Européennes de 800-1850: Banque de Donnés et Analyse Sommaire des Résultats (The Population of European Cities, 800-1850: Data Bank and Short Summary of Results). Librairie Droz, Genève, Switzerland.

Bakker, Jan, Maurer, Pischke, Stephan, Steffen, Jörn, Ferdinand, Rauch, 2021. Of mice and merchants: connectedness and the location of economic activity in the iron age. Rev. Econ. Stat. 103 (4), 652–665.

Barjamovic, Gojko, Chaney, Thomas, Coşar, Kerem, Hortaçsu, Ali, 2019. Trade, merchants, and the lost cities of the Bronze age. Q. J. Econ. 134 (3), 1455–1503.

Barr, Jason, 2013. Skyscrapers and skylines: New York and Chicago, 1885-2007. J. Reg. Sci. 53 (3), 369–391.

Barr, Jason, Ort, Teddy, 2013. Population Density across the City: the Case of 1900 Manhattan. Mimeo.

Barreca, Alan, Clay, Karen, Tarr, Joel, 2014. Coal, Smoke, and Death: Bituminous Coal and American Home Heating. NBER Working Paper No. 19881.

Baum-Snow, Nathaniel, 2007. Did highways cause suburbanization? Q. J. Econ. 122 (2), 775–805.

Baum-Snow, Nathaniel, Brandt, Loren, Henderson, J. Vernon, Turner, Matthew A., Zhang, Qinghua, 2017. Roads, railroads, and decentralization of Chinese cities. Rev. Econ. Stat. 99 (3), 435–448.

Beach, Brian, 2022. Health infrastructure. Reg. Sci. Urban Econ. (this issue).

Beach, Brian, Hanlon, W. Walker, 2018. Coal smoke and mortality in an early industrial economy. Econ. J. 128 (615), 2652–2675.

Becker, Sascha O., Pascali, Luigi, 2019. Religion, division of labor and conflict: anti-semitism in German regions over 600 years. Am. Econ. Rev. 109 (5), 1764–1804.

Becker, Sascha O., Woessmann, Ludger, 2009. Was weber wrong? A human capital theory of protestant economic history. Q. J. Econ. 124 (2), 531–596.

Becker, Sascha O., Hornung, Erik, Woessmann, Ludger, 2011. Education and catch-up in the industrial revolution. Am. Econ. J. Macroecon. 3 (3), 92–126.

Becker, Sascha O., Boeckh, Katrin, Hainz, Christa, Woessmann, Ludger, 2016. The Empire is dead, long live the Empire! Long-run persistence of trust and corruption in the bureaucracy. Econ. J. 126 (590), 40–74.

Becker, Sascha O., Heblich, Stephan, Sturm, Daniel M., 2021. The impact of public employment: evidence from Bonn. J. Urban Econ. 122.

Beeson, Patricia E., DeJong, David N., Troesken, Werner, 2001. Population growth in U.S. Counties, 1840-1990. Reg. Sci. Urban Econ. 31 (6), 669–699.

Belloc, Marianna, Drago, Francesco, Galbiati, Roberto, 2016. Earthquakes, religion, and transition to self-government in Italian cities. Q. J. Econ. 131 (4), 1875–1926.

Berger, Thor, Enflo, Kerstin, 2017. Locomotives of local growth: the short- and long-term impact of railroads in Sweden. J. Urban Econ. 98, 124–138.

Bindler, Anna, Hjalmarsson, Randi, 2019 October. The Impact of the First Professional Police Forces on Crime. Mimeo.

Bleakley, Hoyt, Ferrie, Joseph, 2014 January. Land Opening On the Georgia Frontier: the Coase Theorem In the Short And Long-Run. Mimeo.

Bleakley, Hoyt, Lin, Jeffrey, 2012. Portage: path dependence and increasing returns in U.S. History. Q. J. Econ. 127 (May), 587–644.

Bodenhorn, Howard, Cuberes, David, 2018. Finance and urbanization in early nineteenth-century New York. J. Urban Econ. 104, 47–58.

Bogart, Dan, 2014. Industrialisation. The Cambridge Economic History of Modern Britain, vol. 1. Cambridge University Press, pp. 1700–1870.

Bogart, Dan, 2022. Infrastructure and institutions: lessons from history. Reg. Sci. Urban Econ. (this issue).

Bogart, Dan, Chaudhary, Latika, Herranz-Loncan, Alfonso, 2015. The Growth Contribution of Colonial Indian Railways in Comparative Perspective. Mimeo.

Bogart, Dan, You, Xuesheng, Alvarez, Palau, Eduard, J., Satchell, Max, Shaw-Taylor, Leigh, 2022. Railways, divergence, and structural change in 19th century England and Wales. J. Urban Econ. 128.

Borowiecki, Karol Jan, 2013. Geographic clustering and productivity: an instrumental variable approach for classical composers. J. Urban Econ. 73 (1), 94–110.

Bosker, Maarten, 2022. Origin of cities. Reg. Sci. Urban Econ. (this issue).

Bosker, Maarten, Buringh, Eltjo, 2017. City seeds: geography and the origins of the European city system. J. Urban Econ. 98, 139–157.

Bosker, Maarten, Brakman, Steven, Garretsen, Harry, Schramm, Marc, 2007. Looking for multiple equilibria when geography matters: German city growth and the WWII shock. J. Urban Econ. 61 (1), 152–169.

Bosker, Maarten, Brakman, Steven, Garretsen, Harry, Schramm, Marc, 2008. A century of shocks: the evolution of the German city size distribution 1925-1999. Reg. Sci. Urban Econ. 38 (4), 330–347.

Bosker, Maarten, Buringh, Eltjo, van, Zanden, Jan, Luiten, 2013. From baghdad to London: unraveling urban development in Europe, the Middle East, and North africa, 800–1800. Rev. Econ. Stat. 95 (4), 1418–1437.

Boustan, Leah P., Margo, Robert A., 2013. A silver lining to white flight? White suburbanization and African–American homeownership, 1940–1980. J. Urban Econ. 78, 71–80.

Boustan, Leah Platt, 2010. Was postwar suburbanization "white flight"? Evidence from the black migration. Q. J. Econ. 125 (1), 417–443.

Boustan, Leah Platt, 2013. Local public goods and the demand for high-income municipalities. J. Urban Econ. 76, 71–82.

Brakman, Steven, Garretsen, Harry, Schramm, Marc, 2004. The strategic bombing of German cities during WWII and its impact on city growth. J. Econ. Geogr. 4, 201–218.

Braun, Sebastian, Kvasnicka, Michael, 2014. Immigration and structural change: evidence from post-war Germany. J. Int. Econ. 93 (2), 253–269.

Braun, Sebastian, Omar Mahmoud, Toman, 2014. The employment effects of immigration: evidence from the mass arrival of German expellees in postwar Germany. J. Econ. Hist. 74 (1), 69–108.

Brinkman, Jeffrey, Lin, Jeffrey, 2017. Freeway Revolts!. Mimeo.

Brooks, Leah, Denoeux, Genevieve, 2022. what if you build it and they don't Come?How the ghost of transit past haunts transit present. Reg. Sci. Urban Econ. (this issue).

Brooks, Leah, Lutz, Byron, 2019. Vestiges of transit: urban persistence at a microscale. Rev. Econ. Stat. 101 (3), 385–399.

Brooks, Leah, Gendron-Carrier, Nicolas, Rua, Gisela, 2021. The local impact of containerization. J. Urban Econ. (forthcoming).

Brueckner, Jan K., Thisse, Jacques-François, Zenou, Yves, 1999. Why is central Paris rich and downtown Detroit poor? An amenity-based theory. Eur. Econ. Rev. 43 (1), 91–107.

Buenstorf, Guido, Klepper, Steven, 2009. Heritage and agglomeration: the Akron tyre cluster revisited. Econ. J. 119 (537), 705–733.

Buenstorf, Guido, Klepper, Steven, 2010. Why does entry cluster geographically? Evidence from the US tire industry. J. Urban Econ. 68 (2), 103–114.

Burchardi, Konrad B., Hassan, Tarek A., 2013. The economic impact of social ties: evidence from German reunification. Q. J. Econ. 128 (3), 1219–1271.

Cabral, Luis, Wang, Zhu, Xu, Daniel Yi, 2018. Competitor, complementors, parents and places: explaining regional agglomeration in the U.S. Auto industry. Rev. Econ. Dynam. 30 (October), 1–29.

Caicedo, Felipe Valencia, 2019. The mission: human capital transmission, economic persistence, and culture in South America. Q. J. Econ. 134 (1), 507–556.

Cantoni, David, Yuchtman, Noam, 2014. Medieval universities, legal institutions, and the commercial revolution. Q. J. Econ. 129 (2), 823–887.

Cermeño, Alexandra L., Enflo, Kerstin, 2019. Can kings create towns that thrive? The long-term implications of new town foundations. J. Urban Econ. 112, 50–69.

Chen, Shuo, Kung, James Kai-sing, 2016. Of maize and men: the effect of a new world crop on population and economic growth in China. J. Econ. Growth 21 (1), 71–99.

Chen, Ting, Kung, James, 2022. War shocks, migration, and historical spatial development in China. Reg. Sci. Urban Econ. (this issue).

Cinnirella, Francesco, Hornung, Erik, 2016. Landownership concentration and the expansion of education. J. Dev. Econ. 121, 135–152.

Clay, Karen, Troesken, Werner, 2011. Did Frederick Brodie Discover the World's First Environmental Kuznets Curve? Coal Smoke and the Rise and Fall of the London Fog. University of Chicago Press, pp. 281–309. of: The Economics of Climate Change: Adaptations Past and Present.

Clay, Karen, Troesken, Werner, Haines, Michael, 2014. Lead and mortality. Rev. Econ. Stat. 96 (3), 458–470.

Clay, Karen, Lewis, Joshua, Severnini, Edson, 2016. Canary in a Coal Mine: Infant Mortality, Property Values, and Tradeoffs Associated with Mid-20th Century Air Pollution. NBER Working Paper No. 22155.

Collins, William J., Shester, Katharine L., 2013. Slum clearance and urban renewal in the United States. Am. Econ. J. Appl. Econ. 5 (1), 239–273.

Combes, Pierre-Philippe, Duranton, Gilles, Gobillon, Laurent, 2011. The identification of agglomeration economies. J. Econ. Geogr. 11 (2), 253–266.

Combes, Pierre-Philippe, Gobillon, Laurent, Zylberberg, Yanos, 2022. Urban economics in a historical perspective: recovering data with machine learning. Reg. Sci. Urban Econ. (this issue).

Costinot, Arnaud, Donaldson, Dave, 2016. How Large Are the Gains from Economic Integration? Theory and Evidence from U.S. Agriculture, 1880-1997. NBER Working Paper No. 22946.

Couture, Victor, Duranton, Gilles, Turner, Matthew A., 2018. Speed. Rev. Econ. Stat. 100 (4), 725–739.

Crafts, Nicholas, Mulatu, Abay, 2006. How did the location of industry respond to falling transport costs in Britain before world war I? J. Econ. Hist. 66 (3), 575–607.

Crafts, Nicholas, Wolf, Nikolaus, 2014. The location of the UK cotton textiles industry in 1838: a quantitative analysis. J. Econ. Hist. 74 (4), 1103–1139.

Cuberes, David, 2011. Sequential city growth: empirical evidence. J. Urban Econ. 69 (2), 229–239.

Cuberes, David, Desmet, Klaus, Rappaport, Jordan, 2021. Urban growth shadows. J. Urban Econ. (forthcoming).

Cutler, David M., Miller, Grant, 2005. The role of public health improvements in health advances: the twentieth-century United States. Demography 42 (1), 1–22.

Cutler, David M., Glaeser, Edward L., Vigdor, Jacob L., 1999. The rise and decline of the American ghetto. J. Polit. Econ. 107 (3), 455–506.

Czernich, Nina, Falck, Oliver, Kretschmer, Tobias, Woessmann, Ludger, 2011. Broadband infrastructure and economic growth. Econ. J. 121 (552), 505–532.

Dalgaard, Carl-Johan, Kaarsen, Nicolai, Olsson, Ola, Selaya, Pablo, 2018. Roman Roads to Prosperity: the Long-Run Impact of Transport Infrastructure. CEPR DP12745.

Davis, Donald R., Weinstein, David E., 2002. Bones, bombs, and break points: the geography of economic activity. Am. Econ. Rev. 92 (5), 1269–1289.

Davis, Donald R., Weinstein, David E., 2008. A search for multiple equilibria in urban industrial structure. J. Reg. Sci. 48 (1), 29–65.

Dell, Melissa, 2010. The persistent effects of Peru's mining mita. Econometrica 78 (6), 1863–1903.

Desmet, Klaus, Parente, Stephen L., 2014. Resistance to technology adoption: the rise and decline of guilds. Rev. Econ. Dynam. 17, 437–458.

Desmet, Klaus, Rappaport, Jordan, 2017. The settlement of the United States, 1800-2000: the long transition towards Gibrat's law. J. Urban Econ. 98, 50–68.

Desmet, Klaus, Rossi-Hansberg, Esteban, 2014. Spatial development. Am. Econ. Rev. 104 (4), 1211–1243.

Desmet, Klaus, Nagy, David K., Rossi-Hansberg, Esteban, 2018. The geography of development. J. Polit. Econ. 126 (3), 903–983.

Dincecco, Mark, Onorato, Massimiliano Gaetano, 2016. Military conflict and the rise of urban Europe. J. Econ. Growth 21, 259–282.

Dippel, Christian, Heblich, Stephan, 2021. Leadership and social movements: the forty-eighters in the civil war. Am. Econ. Rev. 111 (2), 472–505.

Dittmar, Jeremiah, Seabold, Skipper, 2022. New media and competition: printing and europe's transformation after gutenberg. J. Polit. Econ. (forthcoming).

Dittmar, Jeremiah E., 2011a. The Emergence of Zipf's Law. Mimeo.

Dittmar, Jeremiah E., 2011b. Information technology and economic change: the impact of the printing press. Q. J. Econ. 126 (3), 1133–1172.

Donaldson, Dave, 2018. Railroads and the raj: estimating the impact of transportation infrastructure. Am. Econ. Rev. 108 (4–5), 899–934.

Donaldson, Dave, Allen, Treb, 2020. Persistence and Path Dependence in the Spatial Economy. NBER Working Paper 28059.

Donaldson, Dave, Hornbeck, Richard, 2016. Railroads and American economic growth: a "market access" approach. Q. J. Econ. 131 (2), 799–858.

Duranton, Gilles, 1998. Labor specialization, transport costs, and city size. J. Reg. Sci. 38 (4), 553–573.

Duranton, Gilles, 1999. Distance, land, and proximity: economic analysis and the evolution of cities. Environ. Plann. 31 (12), 2169–2188.

Duranton, Gilles, Turner, Matthew, 2012. Urban growth and transportation. Rev. Econ. Stud. 1, 1–36.

Duranton, Gilles, Turner, Matthew A., 2011. The fundamental law of road congestion: evidence from US cities. Am. Econ. Rev. 101 (6), 2616–2652.

Duranton, Gilles, Morrow, Peter M., Turner, Matthew A., 2014. Roads and trade: evidence from the US. Rev. Econ. Stud. 81 (2), 681–724.

Eaton, Jonathan, Eckstein, Zvi, 1997. Cities and growth: theory and evidence from France and Japan. Reg. Sci. Urban Econ. 27 (4–5), 443–474.

Eckert, Fabian, Gvirtz, Andrés, Liang, Jack, Peters, Michael, 2020. A Method to Construct Geographical Crosswalks with an Application to US Counties since 1790. Working Paper 26770. National Bureau of Economic Research.

Ehrlich, Maximilian v., Seidel, Tobias, 2018. The persistent effects of place-based policy: evidence from the west-German zonenrandgebiet. Am. Econ. J. Econ. Pol. 10 (4), 344–374.

Ellickson, Robert C., 2012. The law and economics of street layouts: how a grid pattern benefits a downtown. Ala. Law Rev. 64 (3), 463–510.

Eriksson, Katherine, Ward, Zachary, 2022. Immigration and cities during the age of mass migration. Reg. Sci. Urban Econ. (this issue).

Faber, Benjamin, 2014. Trade integration, market size, and industrialization: evidence from China's national trunk highway system. Rev. Econ. Stud. 81, 1046–1070.

Fajgelbaum, Pablo, Redding, Stephen J., 2021. External integration, structural transformation and economic development: evidence from Argentina 1870-1914. forthcoming J. Polit. Econ..

Falck, Oliver, Fritsch, Michael, Heblich, Stephan, 2011. The phantom of the opera: cultural amenities, human capital, and regional economic growth. Lab. Econ. 18, 755–766.

Falck, Oliver, Heblich, Stephan, Lameli, Alfred, Südekum, Jens, 2012. Dialects, cultural identity, and economic exchange. J. Urban Econ. 72 (2), 225–239.

Falck, Oliver, Guenther, Christina, Heblich, Stephan, Kerr, William R., 2013. From Russia with love: the impact of relocated firms on incumbent survival. J. Econ. Geogr. 13 (3), 419–449.

Falck, Oliver, Gold, Robert, Heblich, Stephan, 2014. E-lections: voting behavior and the internet. Am. Econ. Rev. 104 (7), 2238–2265.

Feigenbaum, James, Muller, Christopher, 2016. Lead exposure and violent crime in the early twentieth century. Explor. Econ. Hist. 62, 51–86.

Feigenbaum, James, Lee, James, Mezzanotti, Filippo, 2018. Capital Destruction and Economic Growth: the Effects of Sherman's March. NBER Working Paper No. 25392.

Fernihough, Alan, O'Rourke, Kevin, 2021. Coal and the European industrial revolution. Economic Journal 131, 1135–1149.

Ferrie, Joseph P., Troesken, Werner, 2008. Water and Chicago's mortality transition, 1850-1925. Explor. Econ. Hist. 45 (1), 1–16.

Feyrer, James, Sacerdote, Bruce, 2009. Colonialism and modern income: islands as natural experiments. Rev. Econ. Stat. 91 (2), 245–262.

Fischel, William A., 2004. An economic history of zoning and a cure for its exclusionary effects. Urban Stud. 41 (2), 317–340.

Flückiger, Matthias, Hornung, Erik, Larch, Mario, Ludwig, Markus, Mees, Allard, 2021. Roman transport network connectivity and economic integration. Rev. Econ. Stud. (forthcoming).

Fujita, Masahisa, Mori, Tomoya, 1996. The role of ports in the making of major cities: self-agglomeration and hub-effect. J. Dev. Econ. 49 (1), 93–120.

Gabaix, Xavier, 1999. Zipf's law for cities: an explanation. Q. J. Econ. 114 (3), 739–767.

Galor, Oded, Weil, David N., 1999. From malthusian stagnation to modern growth. Am. Econ. Rev. 89 (2), 150–154.

Galor, Oded, Weil, David N., 2000. Population, technology, and growth: from malthusian stagnation to the demographic transition and beyond. Am. Econ. Rev. 90 (4), 806–828.

Garcia-López, Miquel-Àngel, Holl, Adelheid, Viladecans-Marsal, Elisabet, 2015. Suburbanization and highways in Spain when the Romans and the bourbons still shape its cities. J. Urban Econ. 85, 52–67.

Gentzkow, Matthew, Shapiro, Jesse M., 2010. What drives media slant? Evidence from U.S. Daily newspapers. Econometrica 78 (1), 35–71.

Giesen, Kristian, Südekum, Jens, 2014. City age and city size. Eur. Econ. Rev. 71 (Nov), 193–208.

Glaeser, Edward L., 2013. A nation of gamblers: real estate speculation and American history. Am. Econ. Rev. 103 (3), 1–42.

Glaeser, Edward L., Gyourko, Joseph, 2005. Urban decline and durable housing. J. Polit. Econ. 113 (2), 345–375.

Glaeser, Edward L., Kahn, Matthew E., 2001. Decentralized employment and the transformation of the American city. Brookings Wharton Pap. Urban Aff. 1–63.

Glaeser, Edward L., Kohlhase, Janet E., 2004. Cities, regions and the decline of transport costs. Pap. Reg. Sci. 83 (1), 197–228.

Glaeser, Edward L., Shapiro, Jesse M., 2002. Cities and warfare: the impact of terrorism on urban form. J. Urban Econ. 51 (2), 205–224.

Glaeser, Edward L., Kallal, Hedi D., Scheinkman, Jose A., Shleifer, Andrei, 1992. Growth in cities. J. Polit. Econ. 100 (6), 1126–1152.

Glaeser, Edward, L., 2022. What can developing world cities today learn from the history of cities of the west? Reg. Sci. Urban Econ. (this issue).

Greif, Avner, Milgrom, Paul, Weingast, Barry R., 1994. Coordination, commitment, and enforcement: the case of the merchant guild. J. Polit. Econ. 102 (4), 745–776.

Guiso, Luigi, Sapienza, Paola, Zingales, Luigi, 2009. Cultural biases in economic exchange? Q. J. Econ. 124 (3), 1095–1131.

Hanlon, W. Walker, 2017. Temporary shocks and persistent effects in the urban system: evidence from British cities after the U.S. Civil war. Rev. Econ. Stat. 99 (1), 67–79.

Hanlon, W. Walker, 2019. London Fog: A Century of Pollution and Mortality, 1866-1965. NBER Working Paper No. 24488.

Hanlon, W. Walker, Miscio, Antonio, 2017. Agglomeration: a long-run panel data approach. J. Urban Econ. 99, 1–14.

Hanlon, W.W., 2020. Coal smoke, city growth, and the costs of the industrial revolution. Econ. J. 130, 462–488.

Harari, Mariaflavia, 2020. Cities in bad shape: urban geometry in India. Am. Econ. Rev. 110 (8), 2377–2421.

Heblich, Stephan, Trew, Alex, 2019. Banking and industrialization. J. Eur. Econ. Assoc. 17 (6), 1753–1796.

Heblich, Stephan, Redding, Stephen, Zylberberg, Yanos, 2020a. The Distributional Consequences of Trade: Evidence from the Repeal of the Corn Laws. mimeo.

Heblich, Stephan, Redding, Stephen J., Sturm, Daniel M., 2020b. The making of the modern metropolis: evidence from London. Q. J. Econ. 135 (4), 2059–2133.

Heblich, Stephan, Trew, Andrew, Zylberberg, Yanos, 2021. east side story: historical pollution and neighborhood segregation. J. Polit. Econ. 129 (5), 1508–1552.

Helsley, Robert W., Strange, William C., 1997. Limited developers. Can. J. Econ./Rev. Can. Economique 30 (2), 329–348.

Helsley, Robert W., Strange, William C., 2008. A game-theoretic analysis of skyscrapers. J. Urban Econ. 64 (1), 49–64.

Henderson, J. Vernon, 1974. The sizes and types of cities. Am. Econ. Rev. 64 (4), 640–656.

Henderson, J. Veron, Kuncoro, Ari, Turner, Matthew A., 1995. Industrial development in cities. J. Polit. Econ. 103 (5), 1067–1090.

Herrendorf, Berthold, Schmitz Jr., James A., Teixeira, Arilton, 2012. The role of transportation in U.S. Economic development: 1840–1860∗. Int. Econ. Rev. 53 (3), 693–716.

Hilber, Christian, Palmer, Charles, Pinchbeck, Edward W., 2019. The energy costs of historic preservation. J. Urban Econ. 114.

Holmes, Thomas J., 2010. Structural, experimentalist, and descriptive approaches to empirical work in regional economics. J. Reg. Sci. 50 (1), 5–22.

Hornbeck, Richard, 2010. Barbed wire: property rights and agricultural development. Q. J. Econ. 125 (2), 767–810.

Hornbeck, Richard, Keniston, Daniel, 2017. Creative destruction: barriers to urban growth and the great Boston fire of 1872. Am. Econ. Rev. 107 (6), 1365–1398.

Hornbeck, Richard, Rotemberg, Martin, 2019. Railroads, Reallocation, and the Rise of American Manufacturing. NBER Working Paper No. 26594.

Hornung, Erik, 2014. Immigration and the diffusion of technology: the Huguenot Diaspora in Prussia. Am. Econ. Rev. 104 (1), 84–122.

Hornung, Erik, 2015. Railroads and growth in Prussia. J. Eur. Econ. Assoc. 13 (4), 699–736.

Hsu, Wen-Tai, Zhang, Hongliang, 2014. The fundamental law of highway congestion revisited: evidence from national expressways in Japan. J. Urban Econ. 81, 65–76.

Ioannides, Yannis M., Overman, Henry G., 2003. Zipf's law for cities: an empirical examination. Reg. Sci. Urban Econ. 33 (2), 127–137.

Jackson, Kenneth T., 1985. *Crabgrass Frontier: the Suburbanization Of the United States.* History/Urban Studies. Oxford University Press, USA.

Jacobs, Jane, 1969. The Economy of Cities. Vintage Books, New York.

Jaworski, Taylor, Kitchens, Carl T., 2019. National policy for regional development: historical evidence from appalachian highways. Rev. Econ. Stat. 101 (5), 777–790.

Jedwab, Remi, Vollrath, Dietrich, 2015. Urbanization without growth in historical perspective. Explor. Econ. Hist. 58, 1–21.

Jedwab, Remi, Kerby, Edward, Moradi, Alexander, 2017. History, path dependence and development: evidence from colonial railways, settlers and cities in Kenya. Econ. J. 127 (603), 1467–1494.

Jedwab, Remi, Johnson, Noel, Koyama, Mark, 2020. The Effects of Historical Pandemics: the Black Death. Mimeo.

Jedwab, Remi, Johnson, Noel, Koyama, Mark, 2022. Medieval cities through the lens of urban economic theory. Reg. Sci. Urban Econ. (this issue).

Jia, Ruixue, 2014. The legacies of forced freedom: China's treaty ports. Rev. Econ. Stat. 96 (4), 596–608.

Johnson, Noel D., Koyama, Mark, 2017. Jewish communities and city growth in preindustrial Europe. J. Dev. Econ. 127, 339–354.

Juhász, Réka, 2018. Temporary protection and technology adoption: evidence from the napoleonic blockade. Am. Econ. Rev. 108 (11), 3339–3376.

Kantor, Shawn, Whalley, Alexander, 2019. Research proximity and productivity: long-term evidence from agriculture. J. Polit. Econ. 127 (2), 819–854.

Kesztenbaum, Lionel, Rosenthal, Jean-Laurent, 2011. The health cost of living in a city: the case of France at the end of the 19th century. Explor. Econ. Hist. 48 (2), 207–225.

Kim, Sukkoo, 1995. Expansion of markets and the geographic distribution of economic activities - the trends in US regional manufacturing structure, 1860-1987. Q. J. Econ. 110 (4), 881–908.

Kim, Sukkoo, 1998. Economic integration and convergence: U.S. Regions, 1840-1987. J. Econ. Hist. 58 (3), 659–683.

Kim, Sukkoo, 2006. Division of labor and the rise of cities: evidence from US industrialization, 1850-1880. J. Econ. Geogr. 6 (4), 469–491.

Kitson, P.M., Shaw-Taylor, L., Wrigley, E.A., Davies, R.S., Newton, G., Satchell, A.E.M., 2012. The Creation of a 'Census' of Adult Male Employment for England and Wales for 1817. Mimeo.

Klein, Alexander, Crafts, Nicholas, 2020. Agglomeration externalities and productivity growth: US cities, 1880–1930. Econ. Hist. Rev. 73 (1), 209–232.

Klepper, Steven, 2010. The origin and growth of industry clusters: the making of Silicon Valley and Detroit. J. Urban Econ. 67 (1), 15–32.

Kline, Patrick, Moretti, Enrico, 2013. Local economic development, agglomeration economies, and the big push: 100 Years of evidence from the Tennessee Valley Authority. Q. J. Econ. 129 (1), 275–331.

Knoll, Katharina, Schularick, Moritz, Steger, Thomas, 2017. No price like home: global house prices, 1870-2012. Am. Econ. Rev. 107 (2), 331–353.

Koster, Hans R.A., Dericks, Gerard H., 2020. The billion pound drop: the Blitz and agglomeration economies in London. J. Econ. Geogr. (forthcoming).

Koster, Hans R.A., Rouwendal, Jan, 2017. Historic amenities and housing externalities: evidence from The Netherlands. Econ. J. 127 (605), 396–420.

Koudijs, Peter, 2015. Those who know the most: insider trading in 18th c. Amsterdam. J. Polit. Econ. 123 (6), 1356–1409.

Kremer, Michael, 1993. Population growth and technological change: one million B.C. To 1990. Q. J. Econ. 108 (3), 681–716.

Krugman, Paul, 1991. Increasing returns and economic geography. J. Polit. Econ. 99 (3), 483–499.

Lee, James, 2015. Measuring Agglomeration: Products, People and Ideas in U.S. Manufacturing, 1880-1990. Mimeo.

Lee, Sanghoon, Lin, Jeffrey, 2018. Natural amenities, neighbourhood dynamics, and persistence in the spatial distribution of income. Rev. Econ. Stud. 85 (1), 663–694.

Lewis, Joshua, Severnini, Edson, 2020. Short- and long-run impacts of rural electrification: evidence from the historical rollout of the U.S. power grid. J. Dev. Econ. 143 (C).

Libecap, Gary D., Lueck, Dean, 2011. The demarcation of land and the role of coordinating property institutions. J. Polit. Econ. 119 (3), 426–467.

Lin, Jeffrey, Rauch, Ferdinand, 2022. What future for history dependence in spatial economics? Reg. Sci. Urban Econ. (this issue).

Logan, Trevon D., Parman, John M., 2017. The national rise in residential segregation. J. Econ. Hist. 77 (1), 127–170.

Maloney, William F., Valencia Caicedo, Felipe, 2016. The persistence of (subnational) fortune. Econ. J. 126 (598), 2363–2401.

McMillen, Daniel P., McDonald, John F., 2002. Land values in a newly zoned city. Rev. Econ. Stat. 84 (1), 62–72.

Michaels, Guy, Rauch, Ferdinand, 2018. Resetting the urban network: 117-2012. Econ. J. 128 (608), 378–412.

Michaels, Guy, Rauch, Ferdinand, Redding, Stephen J., 2012. Urbanization and structural transformation. Q. J. Econ. 127 (2), 535–586.

Michaels, Guy, Rauch, Ferdinand, Redding, Stephen J., 2019. Task specialization in U.S. Cities from 1880-2000. J. Eur. Econ. Assoc. 17 (3), 754–798.

Michalopoulos, Stelios, Papaioannou, Elias, 2013. Pre-colonial ethnic institutions and contemporary african development. Econometrica 81 (1), 113–152.

Miguel, Edward, Roland, Gerard, 2011. The long run impact of bombing Vietnam. J. Dev. Econ. 96 (11954), 1–15.

Mitchell, Sara, 2019. London calling? Agglomeration economies in literature since 1700. J. Urban Econ. 112, 16–32.

Mitchener, Kris J., 2015. The 4D future of economic history: digitally-driven data design. J. Econ. Hist. 75 (4), 1234–1239.

Mokyr, Joel, 1990. The Lever of Riches: Technological Creativity and Economic Progress. Oxford University Press.

Morten, Melanie, Oliveira, Jaqueline, 2018. The Effects of Roads on Trade and Migration: Evidence from a Planned Capital City. NBER Working Paper No. 22158.

Moses, Leon, Williamson, Harold F., 1967. The location of economic activity in cities. Am. Econ. Rev. 57 (2), 211–222.

Nagy, David, 2022. Quantitative spatial models in a historical perspective. Reg. Sci. Urban Econ. (this issue).

Nagy, David K., 2020. Hinterlands, City Formation and Growth: Evidence from the U.S. Westward Expansion. Mimeo.

Nunn, Nathan, 2014. Chapter 7 - historical development. In: Aghion, Philippe, Durlauf, Steven N. (Eds.), , Handbook of Economic Growth. Handbook of Economic Growth, vol. 2. Elsevier, pp. 347–402.

Nunn, Nathan, Qian, Nancy, 2011. The potato's contribution to population and urbanization: evidence from a historical experiment. Q. J. Econ. 126 (2), 593–650.

O'Grady, Trevor, 2014. Spatial Institutions in Urban Economies: How City Grids Affect Density and Development. Mimeo.

Packalen, Mikko, Bhattacharya, Jay, 2015. Cities and Ideas. NBER Working Paper No. 20921.

Pascali, Luigi, 2017. The wind of change: maritime technology, trade, and economic development. Am. Econ. Rev. 107 (9), 2821–2854.

Perlman, Elisabeth R., 2015. Dense Enough to Be Brilliant: Patents, Urbanization, and Transportation in Nineteenth Century America. Mimeo.

Peters, Michael, 2019 Dec. Market Size and Spatial Growth - Evidence from Germany's Post-War Population Expulsions. Mimeo.

Ploeckl, Florian, 2012. Endowments and market access; the size of towns in historical perspective: Saxony, 1550–1834. Reg. Sci. Urban Econ. 42, 607–618.

Redding, Stephen J., Rossi-Hansberg, Esteban, 2017. Quantitative spatial economics. Annual Review of Economics 9 (1), 21–58.

Redding, Stephen J., Sturm, Daniel A., 2008. The costs of remoteness: evidence from German division and reunification. Am. Econ. Rev. 98 (5), 1766–1797.

Redding, Stephen J., Sturm, Daniel M., Wolf, Nikolaus, 2011. History and industry location: evidence from German airports. Rev. Econ. Stat. 93 (3), 814–831.

Redding, Steven J., Sturm, Daniel M., 2016. Estimating Neighborhood Effects: Evidence from War-Time Destruction in London. Mimeo.

Rosenthal, Stuart S., 2008. Old homes, externalities, and poor neighborhoods. A model of urban decline and renewal. J. Urban Econ. 63 (3), 816–840.

Rossi-Hansberg, Esteban, 2005. A spatial theory of trade. Am. Econ. Rev. 95 (5), 1464–1491.

Rubin, Jared, 2014. Printing and protestants: an empirical test of the role of printing in the reformation. Rev. Econ. Stat. 96 (2), 270–286.

Sarvimäki, Matti, 2012. Agglomeration in the Periphery. Mimeo.

Schumann, A., 2014. Persistence of population shocks: evidence from the occupation of west Germany after world war II. Am. Econ. J. Appl. Econ. 6 (3), 189–205.

Sequeira, Sandra, Nunn, Nathan, Qian, Nancy, 2020. Immigrants and the making of America. Rev. Econ. Stud. 87 (1), 382–419.

Severnini, Edson, 2022. The power of hydroelectric dams: historical evidence from the United States over the 20th century. Econ. J. (forthcoming).

Shertzer, Allison, Walsh, Randall P., 2019. Racial sorting and the emergence of segregation in American cities. Rev. Econ. Stat. 101 (3), 415–427.

Shertzer, Allison, Twinam, Tate, Walsh, Randall P., 2016. Race, ethnicity, and discriminatory zoning. Am. Econ. J. Appl. Econ. 8 (13), 217–246.

Shertzer, Allison, Twinam, Tate, Walsh, Randall P., 2018. Zoning and the economic geography of cities. J. Urban Econ. 105 (C), 20–39.

Shertzer, Allisonand, Twinam, Tate, Walsh, Randy, 2022. Zoning and segregation in urban economic history. Reg. Sci. Urban Econ. (this issue).

Siodla, James, 2015. Razing san Francisco: the 1906 disaster as a natural experiment in urban redevelopment. J. Urban Econ. 89, 48–61.

Siodla, James, 2017. Clean slate: land-use changes in san Francisco after the 1906 disaster. Explor. Econ. Hist. 65, 1–16.

Smith, Cory, 2020 Aug. Land Concentration and Long-Run Development in the Frontier United States. Mimeo.

Sood, Aradhya, Speagle, William, Ehrman-Solberg, Kevin, 2020. Long Shadow of Racial Discrimination: Evidence from Housing Covenants of Minneapolis. Mimeo.

Spolaore, Enrico, Wacziarg, Romain, 2009. The diffusion of development. Q. J. Econ. 124 (2), 469–529.

Squicciarini, Mara P., Voigtländer, Nico, 2015. Human capital and industrialization: evidence from the age of enlightenment. Q. J. Econ. 130 (4), 1825–1883.

Steinwender, Claudia, 2018. Real effects of information frictions: when the states and the kingdom became united. Am. Econ. Rev. 108 (3), 657–696.

Tabellini, Guido, 2010. Culture and institutions: economic development in the regions of Europe. J. Eur. Econ. Assoc. 8 (4), 677–716.

Trew, Alex, 2014. Spatial takeoff in the First industrial revolution. Rev. Econ. Dynam. 17 (4), 707–725.

Trew, Alex, 2020. Endogenous infrastructure development and spatial takeoff in the first industrial revolution. Am. Econ. J. Macroecon. 12 (2), 44–93.

Troesken, Werner, 2008. Lead water pipes and infant mortality in turn-of-the-century Massachusetts. J. Hum. Resour. 43 (3), 553–575.

Villarreal, Carlos, 2014. Where the Other Half Lives: Evidence on the Origin and Persistence of Poor Neighborhoods from New York City 1830-2012. Mimeo.

Voigtländer, Nico, Voth, Hans-Joachim, 2012. Persecution perpetuated: the medieval origins of anti-semitic violence in nazi Germany. Q. J. Econ. 127 (3), 1339–1392.

Voigtländer, Nico, Voth, Hans-Joachim, 2013a. How the west "invented" fertility restriction. Am. Econ. Rev. 103 (6), 2227–2264.

Voigtländer, Nico, Voth, Hans-Joachim, 2013b. The three horsemen of riches: plague, war, and urbanization in early modern Europe. Rev. Econ. Stud. 80 (2), 774–811.

Voigtländer, Nico, Voth, Hans-Joachim, 2022. Highway to hitler. American Economic Journal: Applied (forthcoming).

Volpe Martincus, Christian, Carballo, Jerónimo, Cusolito, Ana, 2017. Roads, exports and employment: evidence from a developing country. J. Dev. Econ. 125, 21–39.

Voth, Hans-Joachim, 2001. Time and Work in England 1750-1830. Oxford University Press, Oxford.

Wahl, Fabian, 2016. Does medieval trade still matter? Historical trade centers, agglomeration and contemporary economic development. Reg. Sci. Urban Econ. 60, 50–60.

Wahl, Fabian, 2017. Does European development have roman roots? Evidence from the German limes. J. Econ. Growth 22 (3), 313–349 (Mimeo).

Waights, Sevrin, 2019. The preservation of historic districts - is it worth it? J. Econ. Geogr. 19 (2), 433–464.

Xie, Feng, Levinson, David, 2010. How streetcars shaped suburbanization: a granger causality analysis of land use and transit in the twin cities. J. Econ. Geogr. 10 (3), 453–470.

Zedlitz, Jesper, 2017. Web-based collaborative system for transcription of serial historic sources to structured data. Universitätsbibliothek Kiel, Kiel.