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Summaries of Doctoral Dissertations

The Dissertations of Hannah Postel, Lillian Trotter, and Lukas Althoff: 2023 Allan Nevins Prize Competition of the Economic History Association

Each year, we come together as economic historians to celebrate emerging research from some of the brightest new members of our scholarly community. The opportunity to engage with this work in the course of convening the Nevins Prize was daunting, with many excellent and highly deserving dissertations. It was also thrilling—I learned a great deal, and I have come away from this experience inspired and energized about the possibilities of economic history in an age of urgent questions, big data, and increasingly sophisticated empirical methods. After learning more about our finalists' research, I hope you will, too.

I am honored to present the three finalists for the 2023 Nevins Dissertation Prize: in random order, they are Hannah Postel (Ph.D. Princeton), Lillian Gaeto Trotter (Ph.D. Vanderbilt), and Lukas Althoff (Ph.D. Princeton).

HANNAH POSTEL

Our first finalist is Hannah Postel, whose dissertation is titled "Records of Exclusion: Chinese Immigration in Historical Perspective." This is an original and tremendously ambitious project, forging a path forward on a topic largely untouched by work in economics and economic history. The dissertation consists of five chapters.

The first chapter outlines the historical facts of Chinese immigration to the United States, and of subsequent attempts to exclude this highly visible, othered, and "unassimilable" population. It also contextualizes the Chinese case in the broader literature on immigration, race, and ethnicity in the nineteenth and twentieth centuries. Here, Postel builds a convincing argument that understanding the era of Chinese exclusion is not only important per se, but also crucial to understanding the evolution of racially discriminatory systems in the United States more generally. Specifically, Postel contends that the Chinese case laid the blueprint for subsequent and much more familiar strategies of systemic racial oppression, including Jim Crow. In this context, the era of Chinese exclusion is especially insidious: a laboratory for refining tactics of political, social, and economic dominance that would soon be scaled up and deployed against other vulnerable groups.

The second chapter draws on population-wide Census microdata to provide the first systematic accounting of patterns in Chinese residential segregation in the era prior to legal exclusion. In this chapter, Postel challenges the conventional view that Chinese immigrants to the United States lived in isolated and relatively large ethnic enclaves—so-called "Chinatowns" that have completely dominated the discourse around Chinese immigration in the United States. Instead, she finds that once enlarging the sample outside of major cities such as San Francisco and Seattle, the evidence supports the view that Chinese residential patterns were much more rural, racially integrated, and

varied than previously assumed. In her words, "urban Chinatowns were the exception, not the rule." Moreover, Postel's findings suggest that federal policies restricting the immigration of Chinese women—not the exceptional culture or preferences of Chinese people, as conventional wisdom has posited—likely circumscribed these patterns.

This chapter in particular is a terrific showcase for the sort of care and thoughtfulness around data that, in my view, is a hallmark of research in economic history. Like the best work in our field, this chapter is well informed by its historical setting—it sees the realities on the ground as being crucial to understanding the phenomena under study, rather than as inconvenient or incidental. To give one example, the prior literature focuses almost exclusively on urban centers, and on those living as household heads outside of group quarters. These choices are largely the result of searching in areas famous for their Chinatowns, or of imposing assumptions based on the behavior of other, dramatically different immigrant groups. Crucially, these ahistorical choices, which fundamentally shape the structure and scope of the analysis, fail to reflect the actual experiences of early Chinese immigrants in the United States. To wit, roughly 65–80% of Chinese immigrants at this time were single men living as boarders or in group quarters, due in part to policies at the time precluding Chinese household formation. Accordingly, we might expect empirical choices like the ones in prior studies to yield an incomplete and highly selected view of Chinese residential patterns. Indeed, when Postel corrects these omissions, our understanding of this phenomenon flips entirely, and a previously obscured mechanism—namely, restrictions on Chinese women's immigration—is revealed. Postel resists searching under the lamppost—an excellent quality in an empirical social scientist.

Postel's third chapter, joint with Beth Lew-Williams, generates a new database of anti-Chinese laws and ordinances in the American West, roughly quadrupling the body of documented anti-Chinese policies through the use of modern text-as-data methods applied to previously undigitized primary sources. By looking at fragmentary evidence over time and space—including policies that were couched in race-neutral language but had intentionally racialized effects—the authors are able to better capture the true extent of the anti-Chinese legal regime. This systematic view is not only important to the historical record. Rather, it is also consequential to causal inference: in the absence of this information on putatively untreated places and periods that in fact had their own discriminatory regimes, quantitative analyses of the impact of such laws may underestimate their pernicious effects. The authors then use these novel data to demonstrate "a legal regime of social control that left few aspects of Chinese life untouched"—one whose main purposes, the authors argue, were subordination and segregation.

Where the third chapter makes major data advances, the fourth chapter's contributions are methodological. Specifically, Postel develops an innovative method of large-scale automated record linkage for character-based languages. She then uses these to improve the size and quality of linked microdata samples studying the U.S.'s Chinese-origin population. Postel identifies three major obstacles to accurate linkage of historical Chinese populations using U.S. Census data: first, inappropriate name segmentation; second, inconsistent enumeration of name order; and third, mis-transcription arising from a combination of factors. She then proposes a three-step pre-linking processing method that roughly triples the match rate relative to standard methods in the literature, while also increasing representativeness. This type of strategy is clever and once again well attuned to the specific cultural and historical context. Importantly, it makes the best

of the historical realities of this setting and the data available. Consider, for instance, that the ability to link through household structure as in other studies of racial and ethnic minorities in the United States would be largely precluded by the prohibition in this setting against both miscegenation and the immigration of Chinese women.

Postel's fifth and final chapter outlines a fertile new research agenda, leveraging the novel data and methods generated in this dissertation. This line of research seeks to evaluate the impact of anti-Chinese policies on a range of wellbeing and development outcomes.

In summary, Postel's dissertation represents a major step forward in data, methods, and substantive findings. In terms of data and methods, it creates valuable public goods to facilitate the study of a group that is critically important but has received comparatively little attention both in American economic history and in studies of inequality. It also resists the common impulse to collapse American history into a simple racial dichotomy: Black versus white. By considering the experience of another early minority racial group in the United States, it sheds light on a more nuanced set of racial and policymaking dynamics—one that (perhaps ironically) actually deepens our understanding of even the better-studied Black-white disparities. On the matter of findings, it challenges assumptions about Asian essentialism and makes a case that understanding the Chinese experience in American history is central to explaining both U.S. immigration policy and the construction of race in America more generally.

LILLIAN TROTTER

The second finalist is Lillian Trotter, whose dissertation is titled "Essays in U.S. Financial History." In it, Trotter investigates the causes and effects of expanding financial participation over the early twentieth century. This project marries significant and highly novel data contributions with clever strategies for causal identification. It consists of three chapters.

The first of these uses the Great Depression as a natural experiment for understanding the impact of employee stock ownership programs (ESOPs) on firm performance. It emphasizes how these programs may operate differently during economic crises than under normal conditions. Moreover, Trotter's focus on the Great Depression era allows her to overcome identification concerns that have plagued prior research on these programs. Because of the endogenous timing of ESOP offerings, it has been difficult to study their causal impact on worker productivity. This paper cleverly overcomes this by using the fact that during the Great Depression, ESOPs that wanted to end could only do so under certain circumstances. Hence, Trotter is able to leverage plausibly exogenous variation both in the existence and value of employee stock benefits. Drawing on a wealth of new data she collects for this project, Trotter finds that price appreciation was an important mechanism driving worker productivity under these programs, with both real output and real wages falling in response to Depression-induced declines in the value of ESOP benefits. She also finds that incentive compatibility, as in the case of smaller firms where workers could more easily influence firm output, attenuated these negative effects.

Although Trotter's research is primarily in macro and financial history, the prospects of her approach for further research in personnel economics are tantalizing. Particularly given the advantages with respect to identification in this setting, one can imagine exciting avenues forward, including studying the effects of ESOPs on recruitment,

retention, layoffs, and workforce composition (and through these channels, on firm productivity); or comparing the productivity impact of compensation through ESOPs to that of similar-value units of compensation through other means (e.g., wages, work flexibility, health benefits, retirement benefits, or even other performance-based incentives such as commissions and bonuses).

Trotter's second chapter examines the impact of the Liberty Loan Program during WWI—the first large-scale and widely targeted government-sponsored savings drive—on the short-run effects of issuing public debt versus increasing taxation. Using a vector autoregression approach, she finds that Liberty bonds both raised savings rates and diverted capital away from consumer goods to the more urgently necessary war industries, such as iron and steel. She contends that taxation alone could not have achieved this scale and scope of reallocation or met the government's dual goals of financing government debt *and* shifting production.

The third and final chapter assembles a massive and promising new data resource, fully digitizing for the 1920s the directory of the New York Stock Exchange, whose member firm branches expanded rapidly throughout the U.S. South and West over this period. Trotter then uses these data to study the association between stock market access and the development of the local economy. Her empirical analysis suggests that, whereas banks and brokerage firms had previously been complements, they evolved into competing institutions over the decades preceding the Great Depression. The advent of NYSE member firms in a locality initially raised local economic growth, in part by opening up opportunities outside of farming during the agricultural crises of the 1920s. While a first branch office likely increased a locality's financial sophistication and produced educational spillovers, Trotter finds evidence suggesting that additional offices may have had extractive effects on local capital.

As Trotter mentions in this chapter, this work raises as many questions as it answers—or even more. This is not a weakness, but an exciting prospect. New data to study historical stock market accessibility is both urgently welcome and especially relevant in the context of recent work on local financial development, financial literacy gaps, portfolio choice (including engagement with non-traditional finance), and inequality. Through her dissertation, Trotter has not only identified a promising pipeline of research, but she has also developed a tremendous new public good through which to explore the origins, consequences, and distributional properties of broadening financial participation.

LUKAS ALTHOFF

Our third finalist is Lukas Althoff, with the dissertation "The Modern and Historical Roots of Inequality." In this project, Althoff works at the intersection of gender and race to chart the evolution of disparities in access to opportunity in the United States over nearly two centuries. This is exciting work that showcases the possibilities of large-scale linked microdata, pushes beyond traditional data limitations, and makes a strong case for research that substantively engages with groups that have been historically difficult to measure and track over time. The dissertation consists of three chapters.

In the first chapter, joint with Hugo Reichardt, Althoff studies the long-run effect of anti-Black institutions on Black Americans' economic outcomes. Crucially, the chapter focuses on individual family histories, allowing the geographic mobility of cohorts to attenuate the ongoing effects of institutions on localities, and thereby identifying the role of intergenerational transmission of a poor start. Here, the poor start is a function

of *historical* institutions rather than the current local environment per se. To measure a family line's historical exposure to racist institutions, they adopt an identification strategy that classifies families based on the duration of exposure to slavery and the location in which a family member was first freed. The chapter finds that families with ancestors freed after the Civil War had lower education, income, and wealth than families with ancestors freed earlier. Importantly, this chapter illustrates that within-group differences arising from family enslavement histories are both large and practically significant. These intra-Black disparities have been largely overlooked in prior research, dwarfed as they are by Black-white differences in outcomes.

The authors' approach throughout this chapter is both clever and creative—for instance, their main linked strategy leverages the non-enumeration and therefore unlinkability of most Black households prior to 1870 to determine the timing of a family's Emancipation. Likewise, acknowledging the potential limitations arising from link-based longitudinal data, the authors later supplement this main approach with a cross-sectional strategy that infers early- versus late-freed status by characterizing surnames unique to these groups. These are excellent solutions to the study of a population for whom data are fragmentary precisely because of the systemic discrimination the authors seek to investigate.

Yet another compelling piece of evidence arrives in the form of a border-discontinuity design that starkly illustrates the role of Jim Crow in perpetuating disadvantage among those whose families were freed in the Deep South. The authors contend that Jim Crow was an extractive institution benefiting the wealthiest decile of whites, and that it depressed Black outcomes primarily by barring access to education—indeed, roughly a third of these anti-Black laws pertained to schooling. This turned out to be an effective means of creating a permanently separate underclass: to the extent that human capital was an important determinant of geographic, social, and economic mobility, targeting education was a brutally efficient way to throttle Black progress at the root.

The second and third chapters are more descriptive, establishing important facts about the contribution of women to broader trends in inequality and socioeconomic mobility.

The second chapter, joint with Harriet Brookes Gray and Hugo Reichardt, studies the role of American women in patterns of social mobility. To do so, the authors leverage millions of administrative records containing both women's unmarried and married names. Importantly, these new data allow them to overcome the marital surname changes that have largely stymied prior attempts to include women in studies based on standard historical linking methods. Linking Census microdata with the aid of administrative information on women's surname changes, the authors find that social mobility was higher for women than for men over the period 1850–1940, and that a person's socioeconomic status is better predicted by their maternal than their paternal background. Trends in assortative mating are a key mechanism shaping these results.

The third chapter extends the focus on women, examining the evolution of Black-white disparities in women's household income from 1950–2019. Noteworthy here is Althoff's focus on household income, which not only more realistically reflects the actual material circumstances of women in America at this time, but also accounts for the way that this income is shaped by race, period, and race-by-period differences in both female labor force participation and family formation. Althoff finds that despite progress in narrowing Black-white gaps among women across all parts of the income distribution up until around 1980, this movement has stalled, and in some cases, even

reversed since then. His analysis also shows the importance of considering both rank-based and income-based measures, given the large differences in income between ranks at different points in the distribution within and across races, and given phenomena like wage compression occurring over this period. Accordingly, Althoff centers these distributional considerations in his analysis, finding that the average results obscure continued progress among the very top percentiles of Black women.

Together, Althoff's chapters highlight the sorts of insights that the new and rapidly increasing base of linkable historical microdata can generate. As his work demonstrates—particularly with respect to data allowing for the long-run linkage of women—these new resources are allowing for greater rigor, comprehensiveness, and inclusion in economic history research. The substantive inclusion of women is still extremely rare in historical cohort studies or in other work drawing on large-scale longitudinal microdata in the United States. Althoff's work in this space is an exciting step forward, showing that there is both intrinsic and instrumental value to studying women using these long-run approaches.

Once again, it has been a great privilege to dig into all the exciting new research coming out of dissertations in economic history. I'd like to thank the EHA audience for sharing in this celebration of emerging talent, and I hope that these remarks will encourage you to seek out and engage with this work first-hand.

Vellore Arthi, *University of California, Irvine*

Records of Exclusion: Chinese Immigration in Historical Perspective

In 1875, the United States enacted its first-ever federal immigration restriction. The Page Act effectively banned all Chinese women from entering the country and was quickly followed by a series of Chinese Exclusion laws sequentially restricting other types of immigration from China. Legally in force until 1943 (and effective until 1965), these policies were the culmination of years of violent backlash against Chinese immigrants in the American West.

Chinese Exclusion laid the groundwork for the contemporary U.S. immigration system, in fact serving as "the main catalyst that transformed the United States into a gatekeeping nation" (Lee 2003, p. 9). With illegal immigration now deemed a criminal act, the federal government needed to enforce its borders. Now-widespread measures such as visas and registration documents, entry interviews, detention, and deportation were designed with the Chinese in mind. "Chinese inspectors" patrolling the United States' land borders were the Border Patrol's direct antecedents (Lee 2002). Over a century later, the Supreme Court upheld the federal government's right to ban immigration based on national origin (*Trump v. Hawaii* 965 U.S., 2018).

In both practice and rhetoric, the Chinese became the prototypical "illegal alien," whose unassimilability could only be solved by removal (Lew-Williams 2018).

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Documentation status was, and continues to be, crucial to migrant outcomes—economic, social, and otherwise (see, e.g., Massey and Pren 2012; Menjívar and Abrego 2012; Gonzales 2016). As the first truly "excludable" minority group in the United States, early Chinese communities experienced unique precarities. Though other immigrant groups faced discrimination from native-born white Americans, they had the option to jumpstart their own socioeconomic assimilation through naturalization (Catron 2019). These other immigrants were also white, and their race protected them from the severe legal restrictions and racialized violence experienced by groups of color (Fox and Guglielmo 2012).

As the first major non-white, deportable immigrant group in the United States, the Chinese are an important case for academic analyses of racial boundary formation, immigrant incorporation, and the effects and effectiveness of immigration policy. However, here too, they have been excluded. This omission has been longstanding; for example, a seminal account of American nativism dismissed Asian exclusion movements as "tangential" (Higham 1955). My dissertation attempts to remedy this longstanding omission by re-centering the historical Chinese experience in the study of racial formation and immigration policy in the United States.

GHETTOIZED IN GOLD MOUNTAIN? CHINESE IMMIGRANT SEGREGATION IN NINETEENTH-CENTURY CALIFORNIA

The first empirical dissertation chapter challenges the widespread conception that Chinese immigrants typically clustered in segregated urban "Chinatowns," instead demonstrating a wide range of residential outcomes across the state of California. It details how both public perceptions of highly clustered Chinatowns and major segregation theories fall short in explaining Chinese residential outcomes.

The paper uses full-count census data for California in 1870 and 1880, with most analyses conducted at the township level. Townships were sub-county designations approximately commensurate with Minor Civil Divisions; they are the smallest geographic aggregation in the 1870 data (Berkes, Karger, and Nencka 2023).

I first show that while there was a large Chinese community in San Francisco (approximately 25 percent of the total population), the majority of Chinese immigrants lived in rural areas. Though Chinese populations were quite small in some places, 9 out of 10 townships had at least one Chinese resident. These overall population figures suggest that Chinese residence patterns were not simply the outcome of concentrated "chain migration" to large cities. If this were true, Chinese immigrants would neither live (1) in predominately rural areas nor (2) in relatively small communities with few co-ethnics.

Since nearly all quantitative analyses of Chinese residential patterns have focused on urban areas (see, e.g., Li 1998; Zhou 1992), I further investigate the characteristics of rural Chinese residence locations. A k-means cluster analysis drawing on a range of socioeconomic variables identifies three major types of non-urban townships: "diversifying," mining, and agricultural. Between 1870 and 1880, Chinese immigrants shifted from being more concentrated in the mining cluster into other types of areas, consistent with the general economic shift at the time (Chan 1986).

Next, I test the widespread claim that Chinese immigrants were less likely to live in traditional single-family households and more likely to live in larger "group housing" contexts like boarding houses and work camps (Shah 2001). Though Chinese lived in

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group housing settings at almost double the rates of other groups, regression analysis shows that marital status—not race or national origin—was by far the strongest correlate of living in these group quarters. These findings are substantively important given that Chinese women were largely prohibited from immigrating to the United States, and anti-miscegenation laws precluded Chinese men from marrying white women (Peffer 1986).

Having shown that Chinese immigrants were widely dispersed across the state of California yet tended to live in higher-density housing, next I calculate two classic indices of residential segregation. For both measures—isolation and dissimilarity—I show that segregation levels were high in San Francisco and other urban areas. However, Chinese immigrants were much more integrated elsewhere, particularly in the agricultural cluster. These findings challenge theoretical predictions of high Chinese segregation across the board.

Finally, I conduct a multilevel logistic regression to assess the individual- and township-level determinants of Chinese segregation outcomes. The results underscore the importance of place. Not only are two of the most quantitatively important predictors at the township level (share Chinese and sex ratio), but township-level characteristics account for much of the remaining variance in outcomes. Drawing on evidence from the following dissertation chapter, I suggest local policies may have played a role in shaping Chinese segregation outcomes across space.

Taken together, these findings suggest that economic conditions and legal structures were central to Chinese residential patterns. In particular, a federal ban on the immigration of Chinese women led Chinese men to live in more segregated group housing settings. The results also highlight the importance of considering the *interaction* among groups and places in producing residential clustering (Fox and Guglielmo 2012) and supplement a recent literature studying segregation in non-urban areas (Eriksson and Ward 2019; Logan and Parman 2017). The importance of economic and legal structures in shaping Chinese residential patterns echoes evidence from other Asian-American social outcomes (Lee and Zhou 2015, 2017) and suggests a limited role for cultural exceptionalism.

BEYOND EXCLUSION: THE ANTI-CHINESE POLICY DATABASE

The following chapter (joint with Beth Lew-Williams) presents a novel, comprehensive database of state- and local-level policies regulating Chinese immigrants in the American West between 1850 and 1920. Beginning in the mid-nineteenth century, Chinese migrants in the Pacific states and territories encountered a growing number of discriminatory laws. Local and state governments attempted to regulate what jobs the Chinese could perform, who they could marry, where they went to school, whether they could own property, and what civil rights they possessed. Historians have cataloged some of these policies in particular places and industries (see Courtney (1956) and Janisch (1971) on San Francisco; Chin and Ormonde (2018) on fishing; Chin and Chin (2022) on restaurants). However, archival challenges have made it difficult for scholars to develop a broad view of these laws and their implications.

In an attempt to understand this anti-Chinese legal regime more systematically, we conduct computational text analysis on full-text charters, ordinances, and statutes from 182 municipalities across the three Pacific Coast states. This process involves (1) identifying, collecting, and cleaning full-text policies at both the state and municipal level;

(2) compiling a set of relevant search keywords; and (3) narrowing the resulting policies to those with likely anti-Chinese intent and/or effect. A preliminary analysis of 45 townships and California state identifies 564 policies that targeted Chinese immigrants either explicitly or implicitly. This database allows us to consider the geographic and temporal scope of these social measures and to develop a typology outlining how they affected Chinese migrant lives.

These laws and their enforcement forged a unique racial regime that regulated nearly every aspect of Chinese life in the American West. We argue that state and local governments' main goals were to restrict access to resources, public services, and civil rights; limit cultural practices; and promote social distance. Moreover, these policies did not cease with federal immigration restrictions against the Chinese; instead, they became the blueprint for the racial policing of other groups throughout the twentieth century.

RECORD LINKAGE FOR CHARACTER-BASED SURNAMES: EVIDENCE FROM CHINESE EXCLUSION

The final substantive chapter proposes a novel pre-processing technique to improve record linkage for historical Chinese populations. Record linkage attempts to find the same individual in two or more datasets using characteristics such as names, birthplaces, and ages. Creating linked panel data improves our understanding of important social topics like immigrant integration, intergenerational mobility, and demographic behavior. Over the past decade, multiple automated algorithms have been developed to maximize the *accuracy*, *efficiency*, *representativeness,* and *feasibility* of such efforts (Abramitzky et al. 2021).

This chapter addresses the challenge of low match rates for Chinese immigrants in historical census data. A standard matching approach links only 3.6 percent of Chinese men living in the United States between 1880 and 1900, compared to 10–20 percent for European immigrant groups. The inability to link this group both precludes learning about Chinese experiences in economic history and biases overall linked samples.

I argue that there are extensive errors in three areas of Chinese name enumeration: segmentation, name order, and standardization. I attempt to solve each in turn. To deal with names that are improperly segmented into "first" and "last" name columns, I consistently delimit name fragments, segmenting each fragment into its own column. Second, I attempt to remedy inconsistent name order enumeration by matching not just first-to-first and last-to-last names, but also first-to-last and last-to-first names. Finally, I conduct name standardization customized for Chinese names by mapping Romanized spellings to their equivalent Chinese characters. These processes raise the match rate to 9.6 percent—on par with many European immigrant groups—and eliminate many of the inaccuracies introduced by other record linkage approaches.

Not only does this approach improve match rates and accuracy for Chinese immigrants, but it also suggests the promise of conducting group-specific name pre-processing for record linkage. Given comparatively low match rates for immigrant groups more broadly, using linguistically tailored matching approaches can both facilitate research on previously unanswerable questions and increase minority representation in overall linked data.

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Essays in U.S. Financial History

In my dissertation, I incorporate my interests in history and macroeconomics by studying financial economics in a historical setting. Specifically, I analyze the effects of expanding access to financial markets and securities during the early twentieth century and study how the expansion was affected by the Great Depression and vice versa. The mechanisms for increasing access to financial markets in my dissertation take three main forms: employee stock ownership programs, government bonds, and stock brokerage offices.

The first chapter of my dissertation studies early employee stock ownership programs that emerged in the 1920s and their effects on firms during the Great Depression. My main research question is the following: how does having an employee stock ownership program during a financial crisis, specifically the Great Depression, affect wages and firm productivity?

The Great Depression era provides an interesting natural experiment in which to study employee stock ownership programs (ESOPs) due to the long-term nature of company contracts during this period. These early company stock offerings to rank-and-file employees typically ranged from two to five years, depending on the contract, and their length was determined when the program initially took effect. Upon their set expiration, they could then be renewed for another predetermined length of time. Given that the stock market crash in October 1929 was largely unanticipated, I am able to show that the timing of plan expiration is uncorrelated with observable establishment characteristics leading up to the crash. I then exploit the plausibly exogenous timing of the expiration of programs to identify the causal effects of employee stock ownership programs on productivity.

With this quasi-experimental setup, a difference-in-differences regression with individual establishment, industry-by-year, and Federal Reserve district-by-year fixed-effects captures the causal estimates of employee stock ownership on productivity and wage growth. The Census of Manufactures provides the establishment-level outcome

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and control variables and allows me to study these effects at a micro-level since each company in the dataset has multiple establishments. I collect data on the duration of ESOPs and the institutional details of the programs from reports by the National Industrial Conference Board, annual company reports, newspaper articles, and other primary sources. I merge these data by hand along with historical stock market data from the Center for Research in Security Prices to form the main panel dataset.

The results show that branches of companies with active, broad-based programs had significantly lower real output and real wages than firms with inactive programs after the 1929 stock market crash. When I break down the treatment based on the length of time the program was active, the productivity results show that the longer the program is in effect following the stock market crash, the greater the decrease in output growth.

The results suggest that price appreciation is a key mechanism that incentivizes employees. Thus, for these programs to have the desired effect they require more than simply bonding employees to the company and to each other through ownership. These results are consistent with an efficiency-wage-type theory. When worker earnings were substituted for stock that rapidly lost its value, the employees' real return to working fell. Instead of traditional "efficiency wages," which are believed to encourage worker effort, the employee faced below-market wages in this setting, and productivity fell.

Interestingly, when isolating the effects in smaller firms, the decrease in productivity was still present, but it was more muted. The results align with the existing theory on ESOPs leading to stronger group identity and incentive compatibility when the company can effectively reduce the free-rider problem. The free-rider problem in this context is that if an individual employee does not feel that they can affect the stock price or return, they have an incentive to shirk and free-ride off of the increased effort of others. However, these results show that ESOPs during the Great Depression did disincentivize productivity less in smaller firms, which is consistent with studies on ESOPs in more modern settings.

I also included data on stock prices and returns from CRSP and re-estimated the main productivity regression. Having a worse stock return is negatively related to productivity. Again, this is consistent with employees being disincentivized by the value of their stock deteriorating.

Overall, by exposing the negative consequences of these programs in an economic downturn, this paper suggests that the effects of employee stock ownership are possibly more nuanced than previously thought. As the first paper to study ESOPs in this environment, it also emphasizes the importance of studying these programs outside of the traditional economic expansion setting.

My second chapter analyzes the often-overlooked Liberty Loan Program of WWI, which was the first large-scale government-sponsored saving initiative in which middle- and working-class households were encouraged to participate. I used the exogenous shock of the U.S. joining WWI and the extraordinary government spending that ensued to develop a vector autoregression model. I collected monthly data on the value of liberty bonds issued and tax revenue data from the U.S. Treasury. I also used the NBER macro-history database to obtain information on industrial production as well as iron and steel production. Initial conditions are met, which allow me to empirically study the short-run effects of issuing public debt versus increasing taxation. About two-thirds of war spending was financed through liberty bonds while the remainder came from increased taxation. In this analysis, liberty bonds are characterized both as a major component of government debt and as a type of intermediated asset.

The results imply war bonds were successful at channeling capital into the productive war industries, such as iron and steel. The VAR results also imply that war bonds were a better choice than funding the war completely through taxation. The theoretical motivation presented suggests that increased productivity through bond issuance comes from households foregoing spending on consumption goods and reallocating savings from cash and deposits to investments in the war sector. Thus, liberty bonds functioned as productive assets and were an essential component of public finance during the unprecedented upheaval of WWI.

My third chapter documents the rapid expansion of New York Stock Exchange (NYSE) member firms during the 1920s. A major contribution of this project is the NYSE directory data, which has never been fully digitized or studied empirically. I collected brokerage locations throughout the 1920s and into the 1930s from various NYSE directories by hand and constructed a novel, county-level dataset. These data reveal patterns of member firm expansion concentrated in the Midwestern and Southern United States up until the Great Depression. The cross-sectional data suggest that banks and brokerages were complementary entities during the early phase of office expansion before shifting to substitute financial services.

While this project cannot make causal conclusions, a preliminary growth regression analysis shows the first member firm in a county is positively related to local manufacturing output growth and negatively related to the farming sector. Overall member firm growth, however, is significantly negatively related to manufacturing output. Taken as a whole, the results imply that brokerage firms may have offered farmers an alternative during the agricultural depression of the 1920s, but they may have also had extractive effects on the local economy. Overall, this chapter lays the groundwork for future research about the significance of stock market access in the 1920s and its role in the economic depression that followed.

Lillian Gaeto Trotter, *Vanderbilt University*

The Modern and Historical Roots of Inequality

This dissertation studies racial and gender inequality in access to opportunity in America over the past 150 years, including the impact of pivotal policies and institutions.

CHAPTER 1. JIM CROW AND BLACK ECONOMIC PROGRESS AFTER SLAVERY

Black Americans have long experienced economic oppression in the United States, from legal slavery to post-Civil War Jim Crow regimes that curtailed economic progress. The first chapter studies whether and to what extent Black families' historical exposure to slavery and Jim Crow continues to shape their economic status (Althoff and Reichardt 2023).

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We trace family histories from 1850 to 2023 using automated record-linking to measure exposure to slavery and Jim Crow. First, to measure a family's exposure to slavery, we leverage that the 1850 and 1860 censuses did not record enslaved people. We identify families freed before the Civil War as those having ancestors recorded in the 1850 or 1860 census; others are classified as enslaved until the Civil War. We develop a complementary surname-based approach to determine how likely a family was to have been enslaved until the Civil War. Second, to measure a family's exposure to Jim Crow, we use our linked sample to observe where a family's ancestors were freed from slavery. We measure a state's Jim Crow intensity using various proxies, including information from a newly constructed dataset of 800 Jim Crow laws.

While exposure to oppression under slavery and Jim Crow was correlated, the two institutions' different geographies allow us to disentangle their effects. As a result of the rapid southern expansion of the U.S. plantation economy, the longer a family was enslaved, the more likely they were to be concentrated in the southernmost states, which would become the epicenter of Jim Crow. State-specific laws formed Jim Crow regimes; in contrast, slavery was an institution that transcended state borders. Thus, even families who had been enslaved close to each other sometimes began to experience drastically different institutions of racial oppression under Jim Crow.

Firstly, we find that Black families enslaved until the Civil War still lag in education, income, and wealth compared to those freed earlier. While immediately after slavery, the Free-Enslaved gaps were even larger, their narrowing has been much slower than one would expect under standard levels of intergenerational mobility.

Secondly, we find that state-specific factors drive the long-run persistence of the Free-Enslaved gap. First, gaps due to direct exposure to slavery itself dissipated by 1940. In 1870, five years after the end of slavery, the socioeconomic status of recently freed families was far below that of families freed earlier, even for individuals from the same state. By 1940, those large Free-Enslaved gaps vanished conditional on the state in which their ancestors lived during slavery. Second, families enslaved until the Civil War were concentrated in the states where Black Americans fared worse after slavery. The difference in the two groups' geographic distribution fully explains the persistently lower socioeconomic status of families enslaved until the Civil War.

Lastly, we find that Black families freed in states with more oppressive regimes experienced sharply lower rates of economic progress starting in the Jim Crow era (1877–1964). The resulting differences in socioeconomic status increase with differences in Jim Crow intensity across a border. The magnitudes of those border discontinuities are virtually identical to the general state differences in how families fared after slavery, suggesting that Jim Crow single-handedly shaped the geography of Black economic progress. We find that Jim Crow laws targeting education were likely among the most impactful institutional aspects detrimental to Black economic progress.

CHAPTER 2. TWO STEPS FORWARD, ONE STEP BACK: RACIAL INCOME GAPS AMONG WOMEN SINCE 1950

The economic disparities between Black and white women in the United States remain a significant but understudied issue. While existing research largely focuses on men, the little evidence that does exist may be perceived to imply that Black women have faced small income gaps since 1980. This contradicts data showing stark racial disparities in poverty, unemployment, and eviction rates among women.

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This chapter employs empirical analysis to trace Black-white economic disparities among women from 1950 to 2019 (Althoff 2021). I use standard-wage income measures, extend them to account for non-employment, household structure, and non-wage income, and apply decomposition techniques to understand the gaps.

Significant and persistent income gaps existed between Black and white women from 1950 to 2019. Single Black women have had 30 percent less income than their white peers in recent years. Most progress occurred pre-1980, aligning with the Civil Rights Movement and the Great Migration, and has since stagnated. Even if they were observationally equal, Black women would still earn nearly 20 percent less across all income levels.

The median income for a single Black woman placed her at the 30th percentile within the white distribution in 1950 and only improved to the 35th percentile by 2019. However, high-income Black women have seen substantial gains in their relative positions.

Contrary to prevalent views, Black women face persistent economic disparities across the income distribution. Focusing solely on average or median income fails to capture the complexity of this issue. The gaps are increasingly hard to explain statistically, indicating an urgent need for further research.

CHAPTER 3. INTERGENERATIONAL MOBILITY AND ASSORTATIVE MATING

The United States is often viewed as a land of opportunity, with intergenerational mobility as a core measure of this ideal. Most long-term studies of intergenerational mobility exclude women due to difficulties in tracing their records after name changes upon marriage. Recently, substantial progress has been made in linking women's historical records by using the information of name changes from marriage certificates in some states (Craig, Eriksson, and Niemesh 2019; Bailey et al. 2022) or estimating mobility directly from survey data that asks women about their socioeconomic status and that of their parents (Jácome, Kuziemko, and Naidu 2021). However, these data make it difficult to zero in on minorities or study heterogeneity across space and some sources cover only a selected part of the population, such as married individuals.

In this chapter, we use high-quality administrative data to link women's historical census records from 1850 to 1940 and study intergenerational mobility (Althoff, Gray, and Reichardt 2022). We combine two data sources, full-count census records and information from 41 million Social Security Number (SSN) applications, to trace millions of men and women over time. SSN applications cover the near universe of applicants who died between 1980 and 2007 and include information on applicants' names and their maiden names. Importantly, they also contain the maiden names of applicants' parents, massively expanding the sample, extending the coverage back in time, and increasing representativeness by including people who never applied for an SSN.

Our new data ranges from 1850 to 1940 and consists of tens of millions of links, half of which are women. Our data is highly representative across all dimensions, including income, race, and geography. We link an unprecedented 18 million women from before to after marriage, uniquely equipping us to study the long-run evolution of intergenerational mobility and assortative mating. This data will become publicly available, opening many new opportunities to study women's role in the U.S. economy.

Our evidence suggests that intergenerational mobility rates have differed between men and women. Based on proxies for household income for parents and children, we

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find rank-rank elasticities of 0.3 to 0.4. Our estimates suggest that women tend to be more socially mobile than men, especially among cohorts born after 1870. Women born in the 1900s, for example, have a rank-rank elasticity in household income of 0.32—significantly lower persistence than 0.39 among men.

While father-child comparisons are the literature's standard measure of intergenerational mobility, they offer an incomplete picture of how interrelated a child's socioeconomic status is with that of their parents. In particular, unless mothers do not separately contribute to the future socioeconomic status of their children, father-child comparisons understate the persistence of socioeconomic status across generations. We extend the standard model of intergenerational mobility to flexibly allow fathers and mothers to co-determine the socioeconomic status of their children.

We find that mothers are as predictive of their children's outcomes as fathers. A mother's status is *more* predictive of their children's literacy status, but *less* predictive of their children's income. This result is consistent with mothers influencing their children's future socioeconomic status through direct human capital transmission, whereas fathers may tend to affect their children's status through transmission of occupation-specific skills or employment networks. To measure intergenerational mobility in the presence of proxies for the socioeconomic status of both parents, we propose using the variance in children's outcomes explained by both parents' socioeconomic status.

We examine assortative mating as a crucial factor influencing intergenerational mobility, especially given historical labor market constraints for women. Consistent with the importance of marriage markets, we document that intergenerational mobility and assortative mating levels are highly correlated over time and across space. In states with highly assortative marriages—that is, where wives come from a very similar socioeconomic background as their husbands—intergenerational mobility is low. Across time, birth cohorts that tend to be more assortatively mated are less mobile, too. These results suggest that the marriage market may play a key role in shaping the economic opportunities available to men and women.

Lukas Althoff, *Princeton University*

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The Dissertations of Vincent Delabastita, Vinzent Ostermeyer, and Lukas Rosenberger: 2023 Alexander Gerschenkron Prize Competition

The Alexander Gerschenkron Prize is awarded for the best dissertation in the economic history of the world outside North America. The prize definition reminds me of the much-parodied New Yorker cartoon of the View of the World from 9th Avenue, with everything of interest sitting on this side of the Hudson River. I am pleased to present the finalists of the prize competition, who have comprehensively demonstrated that the rest of the world has more to show us than a few bumps on a distant horizon.

As ever, the prize submissions as a whole reveal the scale and quality of doctoral research in this large part of the world. This year, I received 23 submissions. Ten were from students at U.S. institutions; 12 came from European universities, despite the exclusion of LSE graduates from the competition to avoid any conflict of interest; and 1 came from Chile. The topics of the dissertations were also dominated by Europe, with ten on Western Europe and four on Eastern Europe, including Russia.

Africa, China, Latin America, the Middle East, and India were the subjects of the rest, with none attracting more than three students. Most of the dissertations, moreover, centered on the nineteenth and twentieth centuries. As a discipline, we are perhaps not entirely keeping to the spirit of Gerschenkron's work and pushing out the boundaries of economic historical understanding into neglected areas.

But, as a judge, I am not either. The shortlist that I drew up is embarrassingly Eurocentric. That is not because the other 20 submissions were not good. In fact, a number were excellent. If we awarded honorable mentions, there are several I would be mentioning loudly. But whatever way I shuffled my notes and scores, I felt the three shortlisted contributors each richly deserved their place on this platform, and that it would be a disservice to replace any of them with one of the alternates, no matter how distinguished.

Before I turn to the finalists, I should say that I began the task by defining my selection principles. I wanted to reward dissertations that engaged with and contributed to the history of economic events as well as the economics that helps explain them. I wanted dissertations to engage with big questions and move our knowledge forward in ways that would matter beyond the specifics of their period or place. I wanted dissertations to be coherent. And, finally, I wanted them to largely be single-authored.

While my first two priors held firm, I had to abandon the last two early on in my reading as outdated relics of my own rose-tinted view of scholarship. In particular, all three of the finalists have worked collaboratively with other outstanding scholars. The coherence across their work left me in no doubt that they must have been at least equal partners in these enterprises, and we can see here that outstanding entrants to a field are often found working with outstanding people.

I will leave the details of each finalist's work to their summaries, but I want to explain what it was that drew me to their work. I highlight here selections from their research, not the whole thing.

VINCENT DELABASTITA

Let me begin with Vincent Delabastita of K.U. Leuven. Vincent is thinking hard about labor markets and particularly about how technological change affects workers.

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This is one of the questions of the moment, and one where insights from historical cases can be particularly fruitful in showing us the longer-run effects of change.

Vincent takes two main lines of attack. In the first, he looks at how technological progress affects real wages and inequality. This is the definition of a rounded paper, with a neat and powerful model that gives us a good way to think about technological change and wages through tasks alongside—what I particularly appreciated—a way to measure the way technology affects wage distribution across the entire economy. We are seeing here all of Belgian industry at two points in the nineteenth century in enough depth that we can observe how the adoption of steam led real wages to rise. So far, so predictable, perhaps. But Vincent also shows how it lowered wage inequality by expanding the tasks of low-wage workers, the opposite of deskilling. Technological change, tasks, wage inequality, and deskilling: Vincent stands out for integrating an array of big themes.

The second line of Vincent's attack is less optimistic, turning to employer collusion and worker exploitation in the industrial revolution. Again, the case is Belgium in the nineteenth century, and again, he brings something novel: an empirical technique to identify collusion using firm-level data on production, cost, and wages that allows him to estimate wage markdowns. This is not going to be easy to replicate exactly, but evidence for collusion is never easy to find. And the results are telling: collusion is modest but persistent until a coal cartel is formed around 1900, at which point things get nastier. I have picked on the two most outstanding papers, but the package has more—on the intergenerational mobility of daughters as well as sons, and on how medieval manors cooperate within networks.

VINZENT OSTERMEYER

Vinzent Ostermeyer of Lund University reframes why some parts of the world are rich and some are poor into why some firms become big while others do not. Using yet *another* astonishingly rich Scandinavian dataset, a theme in the discipline, he can explore how industrialization and firms change together with unprecedented precision in the late nineteenth century, as Sweden experiences a period of rapid structural change and industrialization.

Three questions matter here: First, how did the organizational form of establishments affect their performance, or why did factories out compete smaller establishments? Second, what was it that explained why some firms grew and took on new technologies, looking at incorporation on the one hand, and tariffs on the other? And how industrialization affected services, showing that this helped services to grow through multiplier effects.

There is a coherence and subtlety to the dissertation that I found particularly compelling. The underlying dataset is evidently the work of a group, not an individual, but Vinzent played his part. But the test comes in what is done with this heap of novel data. And what Vinzent does is elegant and compelling. The rise of the factory is such a fundamental change that it deserves this degree of analysis and care. The story is convincing. Factories grow because they survive longer, but this is a slow process that does not stop small artisan shops from being set up. It is just that the artisans tend to fail. What enables factories to grow? In his second paper, Vinzent shows us that incorporation really matters, and the Swedes fortunately chose a general incorporation law that allows marginal firms to take on the risk and raise the funds they need to install steam technology and operate at a larger scale. Like many countries, Sweden raised tariff barriers at the end of the nineteenth century, and Vinzent shows us that if we look at the

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firm level, we can see that the effect varies depending on how productive they were to start with. So, the mix of firms can help us explain why the relationship between tariffs and growth varies, solving the paradox.

LUKAS ROSENBERGER

Questions do not get bigger or better known than the ones that Lukas Rosenberger of Ludwig-Maximilians-University Munich takes on. Why does growth first occur in the West? And was it a story of British divergence or a Northwest European process? Hats off for courage, but also for bringing in a series of clever ways to think through the question. The first paper, for example, gives us a set of insights into the relative inventiveness of France and England, showing that both led, but often in different industries. Behind this is Lukas's observation of a characteristic of the French patent system that allows foreign ideas to be "imitated" and protected, as well as new innovations, allowing good ideas from both England and France to be tracked and compared in the same data. It is a lovely research design and an elegant conceptualization around "revealed relative technological advantage" that should catch on, and suggests that innovation accelerated simultaneously in both countries. In his second paper, he goes further, arguing that Britain grows faster because it has the "right" inventors—those working in technologies that will affect the rate of growth. The idea of a "technology space" is appealing. Again, it is patent data, but looking at the distribution of inventors between sectors is a lovely touch. And they get to a nice piece of causal identification.

You could stop reading here, but Lukas goes further, using the Encyclopédie—not a novelty in itself, of course—to show a causal relationship between access to ideas via books and city growth, and between prior education in an area and books that give evidence about the interaction of types of human capital and knowledge. Again, big questions and clever strategies.

PATRICK WALLIS, *London School of Economics and Political Science*

Drivers of Labor Market Inequalities throughout Economic History

A vast literature in social sciences debates the roots and causes of labor market inequalities. Economic scholarship typically considers two important drivers of outcomes in labor markets. First, economists have unsurprisingly paid close attention to *market* forces in the form of the general shifts of labor supply and demand. Notably, the so-called "race between education and technology" is a framework with considerable explanatory power regarding the evolution of wage differentials over the past decades, if not centuries (Autor, Goldin, and Katz 2020). Second, the *institutional* context in which these economic forces play out are also to be taken into account. Observations on

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the wide international variation in labor market performance have shifted focus towards the legal and policy framework in which the aforementioned market dynamics play out (for an influential example, see Blau and Kahn 1996).

In the spirit of academic debate, *institutional* and *market* drivers have often been regarded as rivaling and exclusive explanations for inequality (e.g., see Autor, Katz, and Kearney 2008). In practice, however, it is safe to assume that both forces have a mutually enforcing, interconnected nature, which makes the search for the roots of labor market inequalities notoriously challenging. It is on this conundrum that this dissertation aims to shed light by exploiting a range of historical case studies. My choice for a historical perspective is not incidental: history provides us with a wide range of institutional and market variations to which economists can apply their toolkit. This variation is crucial to disentangling the interconnectedness of the drivers of inequality. Furthermore, a long-term perspective sheds light on the persistence and sustainability of inequalities in labor markets.

I. INTERGENERATIONAL MOBILITY OF SONS AND DAUGHTERS: EVIDENCE FROM NINETEENTH-CENTURY WEST FLANDERS

The first chapter is joint work with Erik Buyst (KU Leuven) and was published in the *European Review of Economic History* (Delabastita and Buyst 2021). Chapter 1 takes the first and crucial step in a dissertation attempting to explain historical labor market inequalities: the quantitative reconstruction of the latter. In particular, this chapter assesses a central measure of labor market inequality in the form of intergenerational occupational mobility. It does so by investigating the occupational attainment of not only sons, which is the most common metric of social mobility, but also daughters.

Studies on the intergenerational mobility of daughters are typically hindered by two issues. First, cultural norms often prescribe that women forego their maiden name at marriage, making them impossible to track across generations. We find a notable exception to this rule in the case of nineteenth-century West Flanders, a province in the northwestern area of Belgium.[1] This allows us to link civil marriage certificates from both sons and daughters to those of their parents.

Another challenge for research on female social mobility is the notorious underreporting of women's occupational attainment in the available historical sources. A common way to sidestep this challenge is to impute women's professional or social attainment with that of their husbands or fathers. We argue that, from a labor market perspective, this approach is unsatisfactory, as we know that female workers were ubiquitous in labor markets throughout economic history. Instead, we rely on another unique feature of the West Flemish civil registry: the extensive coverage of female occupations, a tradition that we can trace back to the region's proto-industrial bygone successes in the textile industry.

In summary, this chapter analyzes 40,703 parent-children pairs of occupational information. We do so by employing a wide range of odds-ratio-based statistics, such as the Altham statistic popularized by Long and Ferrie (2013). This chapter presents two key findings. First, daughters were more mobile than sons in nineteenth-century West Flanders. Second, this gender gap in occupational mobility remained persistent but decreased in size over the century. Daughters experienced less growth in terms of

[1] Other applications can be found in Craig, Eriksson, and Niemesh (2019) and Dribe, Eriksson, and Scalone (2019).

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intergenerational mobility than sons, against the background of a slowly industrializing economy. Moreover, we find that women were increasingly likely to end up in unskilled occupations, showcasing how the demise of Flemish textile industries ushered in an era of limited opportunities for female employment.

II. THE FEUDAL ORIGINS OF MANORIAL PROSPERITY: SOCIAL INTERACTIONS IN ELEVENTH-CENTURY ENGLAND

The second chapter of my dissertation is a joint work with Sebastiaan Maes (University of Antwerp) and was published in this *Journal* (Delabastita and Maes 2023). This chapter focuses on the institutional drivers of inequalities in factor markets, and it does so by examining one of the most striking and pervasive examples of institutional interference in economic life in European economic history: the feudal system. More specifically, we examine how agricultural wealth production was contingent on the position of land ownership within the feudal network. This chapter argues that connections throughout this feudal web of land ownership allowed for economic cooperation, interaction, and spillovers, casting new light on the integrated nature of High Medieval economies, about which we are still very much in the dark.

To assess this hypothesis, we reinterpret the feudal system as a social network, which allows us to implement empirical strategies arising from the peer effects literature.[2] In doing so, we examine the plausibly causal effect of being connected to agriculturally productive landowners on a manor's own wealth production. This approach, however, requires comprehensive data on the structure of a feudal economy. To this end, we turn our attention to the Domesday Book, the remarkable 1086 survey by William the Conqueror, 20 years after his conquest of large parts of the British Isle. This source covers the lands of his new kingdom in terms of ownership, value, and resources.[3] We use the identification of land owners in this source to reconstruct a feudal network that stretched over a vast area of the British Isles. Crucially, manors connected through the feudal network were not necessarily geographically concentrated, which allows us to separately identify the distinct effects of being approximate to another manor from a geographic and land ownership perspective. We find that feudal neighbors, that is, manors that were closely connected through the feudal network of land ownership, shared similar levels of agricultural productivity. Moreover, a more structural econometric approach reveals the existence of cooperation and knowledge spillovers across feudal peers, leading to a rise in the prosperity of these manors relative to their unconnected counterparts. As such, this chapter documents the widespread economic impact of feudal institutions on factor markets and points to a level of market integration in eleventh-century economies arguably higher than previously thought.

III. DOES TECHNOLOGICAL PROGRESS EQUAL WAGE PROGRESS? NINETEENTH-CENTURY TECHNOLOGICAL CHANGE, REAL WAGE GROWTH, AND WAGE INEQUALITY

The third chapter of my dissertation, coauthored with Maarten Goos (Utrecht University), shifts from an institutional focus towards a more market-oriented perspective. Technological change is one of the most debated and important sources of labor

[2] For an overview from an economic history perspective, see Esteves and Mesevage (2019).
[3] We use the Hull Domesday Project data (Palmer 2010).

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market shifts. The impact of the early industrial steam technologies in particular has received widespread attention in our field. Nonetheless, there are still debates on how these technologies affect workers in different regions, sectors, and skill levels.[4] One reason for this is the reliance on occupational wage ratios to proxy labor market inequality, rather than evidence on the entire wage distribution, which leads to debates on which occupations are representative and how this translates into overall inequality across sectors and regions.[5] This project circumvents these discussions by examining the Belgian industrial censuses of 1846 and 1896, organized at the peak of the country's First and Second Industrial Revolutions, respectively. A unique feature of these sources is that they detail not only the industry- and region-level use of steam technology, but also the wages of *every* worker in Belgian manufacturing.[6]

This new evidence allows us to uncover a remarkable tightening of the wage distribution at the lower tails and, crucially, link this to the economy-wide spread of steam technologies. We interpret these findings in a new multi-sector task-based framework for predicting real wage growth and relative wage changes due to technological progress, regardless of the type of technological change. Opening up the black box of the origins of productivity gains from technological progress, this model allows us to think about how technology changes comparative advantages of capital and labor in doing certain tasks. This chapter shows that the introduction of steam-powered machines during the Industrial Revolution led to a decrease in wage inequality within sectors by expanding the tasks performed by low-wage workers.

IV. COLLUDING AGAINST WORKERS: EVIDENCE FROM BELGIUM, 1845–1913

The final chapter, which is a joint work with Michael Rubens (UCLA), investigates how the institutional setting can give rise to certain forms of (anti-competitive) market behavior, bridging the perspectives taken in the previous two chapters. Specifically, this chapter looks at a particular stylized fact of nineteenth-century labor markets, and the Belgian ones in particular, in which collective action by labor supply was heavily constrained while collusive practices on the demand side, such as employers' unions, were condoned. As such, we argue that employers were free to engage in collusive wage-setting and actually did so. This is an important observation, as it gives rise to another cause of labor market power held by employers, a feature of current-day labor markets that has attracted a lot of scrutiny, yet is rarely considered from a collusion perspective. This is surprising, given the ubiquity of attempts by employers to collaborate on keeping wages low throughout economic history.

This chapter proposes a new empirical strategy to identify collusive conduct by employers using production-cost data. We apply this to a newly collated dataset from the archives of the Belgian *Administration des Mines*, a government body that was in charge of supervising the country's coal industry. We present firm-level data on

[4] For a discussion, see De Pleijt, Nuvolari, and Weisdorf (2020).

[5] These concerns are not new; an early and notable example can be found in Feinstein (1988), whose criticism of Williamson (1985) illustrates the difficulties in constructing reliable and representative occupational pay ratios.

[6] Our core analysis pertains to male workers only, but we also illustrate that our findings are robust to the inclusion of child and female workers, thanks to the rich coverage of female labor in the industrial census of 1896 (Buyst and Delabastita 2023).

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production, employment, wages, mechanization, and finances for the universe of coal mines in the provinces of Liège and Hainaut. Our empirical framework reveals that, prior to the 1890s, Belgian coal firms colluded to set wages, which led to a moderate level of wage markdowns that employers could charge on the marginal product of labor. Around the turn of the century, however, the introduction of a coal cartel led to a strong and persistent increase in wage markdowns. This had real effects on both employment and wages, showcasing how an institutional setup conducive to collusive activities can affect labor market outcomes.[7] Crucially, this historical episode has ramifications for the role of antitrust policies on labor markets as it reveals that employer collusion is a credible driver of labor market power and inequality.

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Why Firms Grow: The Roles of Institutions, Trade, and Technology during Swedish Industrialization

Why are some countries rich and others poorer? A stylized fact holds that the large differences in economic wealth—and consequently the standards of living—observed today only emerged as some countries industrialized during the eighteenth and nineteenth centuries. Consequently, a lot of previous work analyzes how some countries managed to industrialize, whereas others failed to do so. While this work highlights important factors explaining the emergence of modern economic growth—for example, institutions (e.g., Acemoglu, Johnson, and Robinson 2005), the interplay of scientific advances and artisanal skills (e.g., Mokyr 2016), geography (e.g., Pomeranz 2000), or trade and industrial policy (e.g., Allen 2017)—it is generally restricted to analyzing the development of economies as a whole. Therefore, we generally do not observe the actual units where industrial production took place and which ultimately shaped the growth process: manufacturing firms.

In four chapters, this dissertation studies why firms started growing during industrialization as well as the broader consequences industrial growth subsequently had. The thesis focuses on Sweden, an important late-industrializing country in the nineteenth century. Furthermore, detailed data covering the development of late-nineteenth-century Swedish manufacturing establishments are available in the *Historical Manufacturing Census of Sweden* (*Fabriksberättelserna*), which forms the backbone of the thesis. These individual yearly establishment-level observations have recently been digitized and linked over time by a bigger research project in which I took part (Almås et al. 2023).[1] The following sections briefly summarize each chapter of the dissertation, and the concluding discussion puts the findings into a broader perspective.

FIRM SURVIVAL AND THE RISE OF THE FACTORY

The first chapter is coauthored with Thor Berger and analyzes how and why the organization of manufacturing production changed during industrialization. Historically,

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[1] Also, see https://www.historicalmanufacturingcensus.se/.

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manufacturing was undertaken in artisan shops, which were eventually replaced by factories during industrialization. While factories leveraged a higher division of labor and new technologies to mechanize production, a long-standing debate in economic history discusses the extent to which artisan shops could compete with factories (Landes 1969; Marglin 1974; Laurie and Schmitz 1981; Goldin and Sokoloff 1982; Sokoloff 1984; Atack 1985; Berg 1994).

Using Fabriksberättelserna, the chapter shows how the factory eventually replaced both smaller and larger non-mechanized production units in Sweden during the nineteenth century, which is similar to the experience of other countries. However, this happened relatively slowly and only in relative terms; that is, the number of artisan shops did not necessarily decline during industrialization. The observed pattern was driven by a relatively longer survival of factories relative to artisan shops and not by entry or conversion dynamics. Moreover, the differences in survival became more pronounced as industrialization progressed.

What gave factories their survival advantage? Using Cox proportional hazards models, we attribute this primarily to scale and technology use. The observation that using steam and water power contributed to establishment survival, especially in later phases of industrialization, resonates with arguments stressing the technological side of industrialization (Landes 1969; Atack, Bateman, and Margo 2008). However, the finding that scale also mattered shows that establishments could leverage some efficiency gains even in the absence of mechanization (e.g., Sokoloff 1984). Other establishment characteristics did not directly contribute to survival, however. As such, we find that, for example, ownership (Landes 1969; Gregg 2020) or workforce characteristics (Goldin and Sokoloff 1982; Eriksson and Stanfors 2015) contributed to survival only insofar as they increased the size or technology use of establishments. Consequently, why establishments grew and adopted new technologies forms the basis of the other chapters of the dissertation.

INSTITUTIONAL INNOVATION AND THE ADOPTION OF NEW TECHNOLOGIES: THE CASE OF STEAM

The adoption of new technologies often has the potential to increase output and productivity. Yet, barriers to technology diffusion exist, so these gains might not (immediately) be realized. The second chapter (coauthored with Thor Berger) studies to what extent an institutional innovation—the limited liability corporation—enabled firms to profitably adopt steam power, which was the paradigmatic technology underlying industrialization.

Industrial policy has been highlighted as a key driver of the industrialization process, with the passing of general incorporation laws as one example (Allen 2011, 2017). Yet, while incorporation offered firms certain advantages in raising capital and driving technological changes (Gregg 2020), the role of the corporation in industrial development is not universally accepted (e.g., Hilt 2006). Moreover, data availability has largely restricted previous research to study technology diffusion at the national or regional levels but not within firms (Atack, Bateman, and Weiss 1980; Nuvolari, Verspagen, and von Tunzelmann 2011; Gutberlet 2014; Bogart, Satchell, and Taylor 2017).

Sweden liberalized its incorporation system during the late nineteenth century, essentially allowing all firms to incorporate if they wished to do so and fulfilled a set of basic criteria (Nilsson 1959; Schön 2012). The chapter leverages Fabriksberättelserna in a two-way fixed effects and event study setting following recent advances in the

difference-in-differences literature (Callaway and Sant'Anna 2020; Sant'Anna and Zhao 2020). It shows that firms that incorporated subsequently saw an increased probability of adopting steam. This relationship is robust when, for example, controlling for initial differences in firm size or using the relative timing of incorporation among firms that incorporated. Crucially, incorporation raised the probability of adopting steam mainly among marginal establishments, that is, small firms located in rural areas where capital access to banks was restricted. Moreover, the relationship was stronger in earlier periods of industrialization when capital was generally scarce.

WINNERS AND LOSERS: THE ASYMMETRIC IMPACT OF TARIFF PROTECTION ON LATE-NINETEENTH-CENTURY SWEDISH MANUFACTURING FIRMS

Another key example of industrial policy pursued by states to industrialize was the levying of import tariffs (Juhász and Steinwender 2023). Countries began to increase import tariffs in the late nineteenth century, and some studies link this development to a faster industrialization process (e.g., Bairoch 1972; O'Rourke 2000; Lehmann and O'Rourke 2011), though others disagree (e.g., Irwin 2002; Tena-Junguito 2009; Schularick and Solomou 2011). As the tariff-growth relationship seemingly differs across countries, presumably more can be learned by focusing on individual countries rather than using cross-country growth regressions (Lampe and Sharp 2013). Contemporary trade theory indeed highlights that tariffs can have heterogeneous effects across firms (Melitz 2003; Iacovone 2012; Shu and Steinwender 2019; Chen and Steinwender 2021), which may explain the contradictory findings in the previous literature. However, it has largely not been possible to study the firm-level impact of tariffs in a historical context.

Sweden drastically increased its import tariffs in the late nineteenth century while simultaneously experiencing rapid economic growth (Schön 2012; Persarvet 2019). To study the effect of import tariff protection on firm performance, I combine industry-level tariff data by Persarvet (2019) with Fabriksberättelserna. While I find that import tariffs did not contribute to economic growth at the aggregate level, I show that this is because tariffs had a heterogeneous impact across firms: Whereas initially low-productivity establishments profited from tariff protection and increased their productivity, I find that the opposite holds for initially high-productivity firms. These results are consistent with two effects postulated in the contemporary trade literature, arguing that tariff protection encourages/discourages innovation for initially low-/high-productivity firms so that their productivity increases/decreases, respectively (Shu and Steinwender 2019). Indeed, the fact that the observed results are stronger in more innovative industries is suggestive evidence regarding the historical presence of such channels.

LOCAL MULTIPLIERS AND THE GROWTH OF SERVICES: EVIDENCE FROM LATE NINETEENTH CENTURY UNITED STATES, GREAT BRITAIN, AND SWEDEN

While the first three chapters analyze how industrialization started, the fourth chapter studies its broader consequences. A standard model of economic development maintains that first industry and then the service sector grow (Kuznets 1973; Aghion, Antonin, and Bunel 2021). However, this stylized picture overlooks that the service

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sector was already growing during historical periods of industrialization (Lee 1979, 1984; Broadberry, Cain, and Weiss 2018). In this chapter, I study whether industrialization in the late nineteenth century had a causal impact on the rise of the service sector across countries.

To that end, I use census data recording employment (Minnesota Population Center 2019; Ruggles et al. 2021) to reconstruct the sizes of the industrial and service sectors at the local level for the United States, Great Britain, and Sweden. Drawing on the model developed by Moretti (2010), I find that each new industrial job created about one service job in cities. This effect was especially pronounced when skilled industrial employment was created and occurred across a range of different types of services.

CONCLUSIONS

Today, a key barrier to economic development is that firms in low-income countries generally remain smaller and less efficient than their counterparts in high-income countries (Hsieh and Klenow 2009, 2010). Consequently, the development of large-scale manufacturing firms has been emphasized as a key to economic development (Kuznets 1971; Chandler Jr. 1977, 1990). This thesis follows this tradition. It forms part of an emerging research field that leverages firm-level data to study how some countries grew rich, whereas others remained poor(er). The thesis focuses on Sweden in the late nineteenth century and uses Fabriksberättelserna, a unique and newly digitized source tracking individual manufacturing establishments over time.

A common theme throughout the thesis is the continuous existence of small manufacturing firms. The chapters document that while Sweden industrialized at a fast pace in aggregate terms, most industrial establishments remained small throughout the late nineteenth century. Thus, industrial growth was not an equal process occurring across all manufacturing establishments. On the contrary, a relatively smaller subset of manufacturing establishments accounted for much of the Swedish industrial development.

The thesis then looks at why manufacturing firms started growing. It does so by primarily considering two public policies that have previously been highlighted as instrumental in driving late-nineteenth-century industrial growth: general incorporation laws and import tariffs. The main insight is that these policies were successful at promoting the growth and development of smaller and more marginal establishments. General incorporation laws enabled a wider range of establishments to adopt steam power and grow, and import tariffs encouraged innovation and learning among initially less-productive firms. As such, the thesis highlights the positive roles development policies can have.

Yet, such policies are seldom conducted in a vacuum, so it begs the question of whether Sweden was a peculiarity. Overall, nineteenth-century Sweden was in a fortunate position, as it was a relatively poor but literate country that was not involved in any major conflicts (Sandberg 1979). This is consistent with the interpretation that institutional innovations such as the corporate form could provide benefits to a wider set of firms, enabling them to grow and develop. In contrast, while the corporate form also promoted growth in, for example, Imperial Russia, institutional frictions there meant that fewer firms profited (Gregg 2020). Additionally, the third chapter shows that industrial policy is not necessarily beneficial, as relatively more productive establishments were hurt under tariff protection. Thus, the thesis shows that while it is possible to conduct successful industrial policy, this task is not straightforward, and policies need to be carefully designed.

Overall, the thesis underscores the importance of the industrial sector for economic development, as it has the capacity to promote broader economic changes, for example, by contributing to the growth of (also skilled) service jobs. Conversely, this result highlights that if countries experience premature industrialization today (Rodrik 2016), the implications are likely more far-reaching going beyond the industrial sector itself. Overall, industrial growth is at the heart of how countries grew rich, and this thesis presents novel micro-level evidence highlighting the concrete underlying channels of how industrialization started.

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Enlightenment, Industrial Revolution, and the Knowledge Economy

The question of why modern economic growth began has intrigued economic historians for generations. However, approaching such a broad question directly poses a challenge. Where should one even start looking for evidence? For instance, can the answer be found by studying why the Industrial Revolution was British and not French? Or should the answer be sought by studying why it began in Northwestern Europe but not elsewhere?

To make progress, I focused on the *how,* instead of the *why*, asking what happened to technological progress during the Industrial Revolution.

The first part of my thesis compares technological creativity in Britain and France, the classical comparison for the Industrial Revolution. Two chapters present novel, stylized facts: Chapter 1 quantifies the relative technological leadership between Britain and France at the technology level. Chapter 2 shows that the technologies that Britain specialized in were more central in the innovation network, resulting in faster aggregate technological progress in Britain.

Considering the commonalities, however, these differences in technological creativity between Britain and France seem not very large. Both were technological leaders in some technologies and maintained their leadership over the period. Both experienced a gradual acceleration of innovation during the eighteenth century and a substantial surge in the early nineteenth century. Thus, it appears they may have shared the fundamental conditions enabling technological creativity. What were those mutual factors that sparked the surge of technological creativity leading to the Industrial Revolution?

The second part of my thesis, again comprising two chapters, provides empirical evidence on two determinants of technological creativity related to the European Enlightenment. To analyze the determinants, the chapters use city-level data and variation. Chapter 3 focuses on access to the knowledge frontier and shows that the sale of pivotal encyclopedias increased city growth. Chapter 4 explores the determinants of upper-tail human capital in ancien-régime France, highlighting how science education in secondary schools created an educated class that was important for the "Industrial Enlightenment."

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The factors I analyzed, access to knowledge and human capital, were certainly not the only ones that mattered. And how they were provided varied across countries. Nevertheless, a basis of useful knowledge emerged, which much of Europe shared. Taken together, the evidence presented here indicates that differences in technological creativity between Britain and France may have been more about degree rather than kind.

CHAPTER 1: TECHNOLOGICAL LEADERSHIP
with Carl Hallmann and Emre E. Yavuz

Britain is widely considered as "leader" during the first Industrial Revolution. What constituted British leadership in that period? This chapter specifically focuses on Britain's *technological leadership in invention*.[1] In light of this definition, however, it is far from obvious whether Britain truly was the "the leader" and other countries "followers."

In fact, there are two contrasting views in the literature on British technological leadership, but no systematic empirical evidence to test them. The first proposes that Britain created new technologies while the European continent, especially France, imitated British technology (e.g., Landes 1969; Allen 2009). The second view, in contrast, proposes that Britain and France specialized in different sectors or types of inventions, with both leading in some areas (O'Brian and Keydar 1979; Mokyr 1990).

These views have starkly different implications for explaining and modeling the surge of technological creativity during the Industrial Revolution, yet key questions remain open: How large was the British technological leadership at the sectoral level? Was France also leading Britain in some sectors? And which paradigm better characterizes the situation on the aggregate?

This chapter addresses these questions from the perspective of France by comparing the rate of imitation (of British invention) to domestic invention across sectors. We introduce a concept called *revealed relative technological lead* and measure it using imitation and invention patents in France. We then combine the quantitative estimates of relative leadership with historical case studies to bound Britain's aggregate technological lead relative to France.

The comparison of imitation to invention is feasible within France due to specific features of French patent law and the high quality of available patent data. Notably, the French patent law allowed "importation patents" from 1791 to 1844, enabling imitators to claim property rights on foreign ideas. Furthermore, unlike in Britain, French records include the full name and address of all patentees, allowing us to identify British inventors who patented their original ideas in France.

The revealed relative technological lead is computed as a sector's ratio of the imitation–invention rate over the average imitation–invention rate. Calculating it for broad industries and detailed technology classes and adjusting for patent quality, our estimates reveal several interesting facts. For instance, France imitated about three times as many ideas from Britain than on average in focal technology classes like "spinning" and "steam engines." (Bob Allen was right!) In contrast, in other technologies like

[1] Technological leadership in invention is commonly defined as having the highest rate of invention. Another concept, economic or industrial leadership, is commonly defined as having the highest total factor productivity.

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"hydraulic pumps" or "distillation," France imitated between two and two and a half times fewer ideas from Britain than on average. (Joel Mokyr was also right!)

But what about *absolute* technological leadership? Combining the estimates of relative lead with history, we show how to obtain plausible bounds for the absolute lead. Suppose we were confident based on historical case studies that Britain was absolutely leading in "railways and rails" and France in "papermaking." Then, the absolute aggregate leadership must fall between the estimates for these technologies. As a result, our estimates would imply that Britain was possibly equally inventive but not more than 25 percent more inventive than France.

In conclusion, we document that while Britain held technological leadership, France did so as well, albeit in different sectors. Moreover, Britain may not have been substantially more inventive than France on the aggregate.

CHAPTER 2: THE RIGHT PLACE IN TECHNOLOGY SPACE
with Walker Hanlon and Carl Hallmann

Britain's higher output growth during the Industrial Revolution, despite not being substantially more inventive than France on the aggregate, raises a key question: Were the technologies Britain specialized in more influential for growth than those France specialized in?

This chapter explains the puzzle by considering the innovation network. This network maps technologies as nodes and knowledge flows as edges. We show that Britain's advantage stemmed from her inventors focusing on technologies that were central in the innovation network, including mechanical technologies like steam engines. In contrast, French inventors focused on less central technologies, such as chemicals. Consequently, the British economy was positioned more favorably to benefit from knowledge spillovers.

Our argument proceeds in several steps, offering several contributions. First, we introduce a novel method to recover the innovation network from patent data without citation links. Second, using patent data for Britain and France up to the mid-nineteenth century, we document that their national networks were noticeably similar. Third, we examine macroinventions as shocks arriving at certain nodes at certain times, demonstrating that patenting increased differentially in closely connected technologies. Fourth, we show that British inventors who patented abroad patented more centrally than their French counterparts. Finally, we parametrize a multi-sector endogenous growth model to show that the shape of the innovation network, combined with the location of inventors within it, can explain the gap between Britain and France in industry growth circa 1810–1850.

In sum, this chapter presents a fresh perspective on why certain technologies like steam engines, which economic historians typically associate with the Industrial Revolution, were of exceptional importance during that period.

CHAPTER 3: ACCESS TO USEFUL KNOWLEDGE

The Industrial Revolution was fueled by a gradual acceleration of innovation during the eighteenth century and a substantial surge of technological creativity in the early nineteenth century. One intriguing hypothesis suggests that the Enlightenment facilitated this acceleration and eventual surge by systematically sharing the knowledge frontier through books, journals, and encyclopedias (Mokyr 2005).

This chapter empirically examines this hypothesis by studying how differences in the supply of Enlightenment encyclopedias across cities influenced city growth between 1750 and 1850.[2] I introduce a new dataset on European booksellers in 1781 based on the *Almanach de la librairie*, which cataloged booksellers dealing in French-language books across European cities. This data is combined with city-level sales data from two pivotal encyclopedias of useful knowledge, printed and shipped from Lyon and Neuchâtel, respectively.

Motivating my empirical strategy, I document that Encyclopedia sales were higher in cities with more local booksellers and in cities more proximate to the publisher. For identification, I propose using the *interaction* of local booksellers and proximity to the publisher as a supply-shifting instrumental variable. Controlling for each factor independently sidesteps potential concerns with the exclusion restrictions. I find that the interaction of local booksellers and their wholesale access strongly increased encyclopedia sales in the first stage and city growth in the second stage.

CHAPTER 4: FROM SCIENCE EDUCATION TO SCIENTIFIC SOCIETY
with Uwe Sunde

Upper-tail human capital is increasingly seen as a pivotal factor in the rise of the West. Existing evidence points to the Protestant Reformation as a key determinant. Reformed cities and territories increased school investments, boosting human capital in places like Germany, whereas the Catholic Church focused on censorship, hindering knowledge production in places like Italy. This argument, however, does not explain how *Catholic France* became a leading scientific nation in the eighteenth century.

This chapter examines human capital formation in France through science education in public secondary schools, known as "collèges." We construct a new city-level dataset on the universe of collèges from 1500 to 1789, including data on curriculum and religious affiliation. Using the data, we document a strong and robust relationship at the city-level between science education (philosophy and physics chairs) and various measures of upper-tail human capital.

Turning to the origins of schools and science curricula, we show that both Reformation and Counter- (or Catholic-) Reformation contributed. Specifically, we document that bishop's seats predict the establishment of collèges and philosophy chairs, but *not* science education, consistent with the Catholic church's need for a better-trained clergy in a contested market for religion. Moreover, we show that the curriculum shifted to science in Jesuit collèges—but only in cities with a Huguenot community. This finding highlights that religious competition extended to the realm of natural philosophy, to which Jesuits responded by teaching mathematics and physics.

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[2] City growth is widely used as a proxy for local technological progress when more direct measures are absent.

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