Sprouting Cities: How Rural America Industrialized*

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Abstract

We study the joint process of urbanization and industrialization in the US economy between 1880 and 1940. We show that only a small share of aggregate industrialization is accounted for by the relocation of workers from remote rural areas to industrial hubs like Chicago or New York City. Instead, most sectoral shifts occurred within rural counties, dramatically transforming their sectoral structure. Most industrialization within counties occurred through the emergence of new "factory" cities with notably higher manufacturing shares rather than the expansion of incumbent cities. In contrast, today's shift towards services seems to benefit large incumbent cities the most.

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1. INTRODUCTION

In his Nobel Prize acceptance speech, Simon Kuznets highlighted the systematic reallocation of resources across sectors and the "closely related and extremely important" process of urbanization as two of six key characteristics of modern economic growth (Kuznets, 1973). Urbanization and sectoral change are naturally linked: since the sectoral structure of cities typically differs dramatically from that of the rural hinterland, the reallocation of workers from the latter to the former induces sectoral change. However, to date, most work in macroeconomics has focused on studying the process of sectoral reallocation, or *structural change*, without reference to its spatial dimension.

This short paper studies the co-movement of workers across sectors and space during a pivotal period of the US economy: its second wave of industrialization between 1880 and 1940. We show that industrialization was primarily a local phenomenon, with most sectoral reallocation happening not through long-distance moves towards industrial hubs but within counties. Moreover, within counties, the most significant sectoral shifts did not occur via the expansion of incumbent cities but rather through the birth of new cities and towns in the rural hinterland. Interestingly, the new urban structures had a much higher employment share in manufacturing than incumbent cities, which specialized more in providing non-tradable services. In other words, "factory towns" sprouting across Rural America were central to both US industrialization and urbanization.

Our work is made possible by the rich geographic information available for the universe of Americans in the publicly-available full-count US Decennial Census files (Ruggles, Fitch, Goeken, Hacker, Nelson, Roberts, Schouweiler, and Sobek, 2021). The data contain information on each worker's state, county, and city of residence. For workers outside incorporated cities, the data additionally reports whether the worker lives in an "urban" area, i.e., in small towns or the suburbs of a city.

FIGURE 1: The Industrialization of Rural America, 1880-1940

Notes: Panel A shows the aggregate agricultural employment share and the interquartile range of agricultural employment shares across counties. Panel B presents a decomposition of the decline in the agricultural employment share between Census years attributed to reallocation across- and within- counties, commuting zones, and states (cf. equation 1). In Panels C-F, we restrict attention to Rural America: the most agricultural-dependent counties that jointly accounted for 50% of the national population in 1880. Panel C plots the decline in agricultural employment for rural America and, separately, for workers in cities and outside cities ("Hinterland"). Panel D depicts the number of cities (bars) and the share of the population living in cities (light line) and urban areas (dark line). In Panels E and F, we examine the sectoral composition of Rural America. Panel E focuses on three mutually exclusive spatial categories: the hinterland, "old" cities (i.e., cities incorporated before 1880), and "new" cities (i.e., cities formed after 1880). Panel F focuses on the hinterland, comparing the sectoral compositions among urban and non-urban workers.

2. LOCAL INDUSTRIALIZATION

Between 1880 to 1940, the US transformed from a largely agrarian to an industrialized economy. As shown in Panel A of Figure 1, the agricultural employment share fell from 47% in 1880 to 15% by the onset of the Second World War.

The vertical bars in Panel A depict the interquartile range of the distribution of agricultural employment shares across counties, the most granular spatial unit one can consistently track in the US Census.[1] In 1880, counties differed substantially in their employment structure: whereas counties in the top quartile had more than 70% of their workforce in the agriculture sector, 80% of workers already earned their living outside of agriculture in the most industrialized counties (bottom quartile).

These regional differences in sectoral specialization imply that *spatial reallocation* of workers from rural to industrialized counties could be responsible for part of the observed aggregate shift away from agriculture. We contrast such migration-induced structural change with sectoral shifts due to within-county changes in industrial structure, which we refer to as *local transformation*. Panel A suggests that within-county changes played an important role because the entire distribution of agricultural employment shares shifted downwards over time.

To formally quantify the importance of the local transformation of counties, we decompose the aggregate decline of the agricultural employment share (μ) into a "Within" and "Across" component:

$$\Delta\mu_t = \underbrace{\sum_{c=1}^{C} l_{ct}\Delta\mu_{ct}}_{\text{"Within"}} + \underbrace{\sum_{c=1}^{C} \left(\mu_{ct}\Delta l_{ct} + \Delta l_{ct}\Delta\mu_{ct}\right)}_{\text{"Across"}}. \tag{1}$$

Here $\Delta x_t = x_{t+1} - x_t$ and we denote county c's agricultural employment share by μ_{ct} and its share of national employment by l_{ct}. The "Within" component represents the decline in the agricultural employment share

[1] We use the crosswalk provided by Eckert, Gvirtz, Liang, and Peters (2020) to create constant county boundaries over time. Furthermore, we restrict our analysis to states that were part of the Union by 1880; excluded are the Dakotas, Montana, Washington, Idaho, Wyoming, Utah, Oklahoma, New Mexico, Arizona, Alaska, and Hawaii.

that would have resulted had relative county populations been fixed, but county-level agricultural employment shares evolved as in the data; the "Across" component captures aggregate declines due to changes in the population distribution across counties through migration, immigration, or regional differences in birth rates.

In Panel B, we implement this decomposition for each decade between 1880 and 1940. Structural change was mainly about the transformation of local economies: the "Within" component, shown in orange, explains between 45%-85% of the decline in agricultural employment in each decade and 63% over the entire period.

The "Across" component could reflect moves within the local labor market or long-distance migration across states. To quantify the importance of these different types of reallocations, we further decompose the across-county component into reallocations across counties within commuting zones, across commuting zones within states, and across states.

Panel B shows this decomposition of the across-county component in various hues of blue. Long-distance, cross-state moves from remote rural locations towards large industrial centers such as Cook County (Chicago) or New York County (Manhattan) played a minor role in the aggregate structural change. The within-state component accounts for at least 80% of aggregate structural change every year. Interestingly, the era of the Great Migration toward Northern States between 1910 and 1920 is the only decade for which cross-state migration accounts for a non-trivial part of sectoral reallocation.

We want to stress that our findings do *not* mean that there was no spatial reallocation. Instead, our findings highlight that migration between industrialized and rural states was not systematically related to sector switching. In fact, lifetime cross-state migration rates were high in this period, with 40% of workers in 1880 residing outside their birth state.

3. The Emergence of New Cities

The previous section showed that, in an accounting sense, most sectoral reallocation out of agriculture occurred within counties. Next, we ex-

plore the spatial reallocation within counties and the role of existing and new cities. We exploit two additional variables in our data that provide information about workers' locations within counties. The city variable provides the name of an individual's city of residence if the city is incorporated. The urban dummy indicates whether the individual resides in a city *or* in unincorporated towns, villages, or dense areas around existing cities.

We focus our within-county analysis on the initially most agricultural counties in the US, which we refer to as *Rural America*. Formally, we define Rural America as the union of counties with the highest agricultural employment shares that collectively accounted for 50% of total employment in 1880. Each Census year, we divide Rural America into two mutually exclusive parts: incorporated cities and the hinterland.

In Panel C of Figure 1, we depict the dramatic fall in agricultural employment in Rural America: between 1880 and 1940, the size of the agricultural sector *halved* from 72% to 36%. Panel C also shows that agricultural employment shares differed vastly between cities and the hinterland. For example, in 1880, 73% of individuals in the hinterland worked in the agricultural sector, while Rural America's cities had already almost fully industrialized.

Panel C highlights that the industrialization of Rural America occurred in two ways. First, workers moved to its industrialized cities: over time, the gap between the aggregate employment share (green line) and the employment share in the hinterland (red, dashed line) widens. Second, within the hinterland, the importance of the agricultural sector also declined swiftly. In an accounting sense, the second channel is much more important for the industrialization of Rural America than the first since the hinterland accounted for a much larger share of Rural America's population.

In Panel D, we focus directly on rural America's urbanization. The bars indicate the number of incorporated cities in Rural America, and the light line is their share of the population. The rise of urbanization in Rural America was predominantly a story about the creation of *new cities*. In 1880, Rural America had only four incorporated cities identified in the

US Census.[2] By 1940, there were almost 250 cities, and their population share had risen by a factor of 50 from 0.3% in 1880 to 16.8%. Crucially, the *entirety* of this increase is accounted for by new cities sprouting in the hinterland: the incumbent "old" cities that already existed in 1880 only accounted for 0.5% of Rural America's population in 1940.

Panel C showed that agricultural employment in the hinterland dramatically fell even as its most urban parts gradually got incorporated as cities, and their employment counted into the "cities" line instead. The dark line in Panel D shows the share of people living in urban areas, including villages, smaller towns, and the outskirts of existing cities. It makes clear that the number of city dwellers underestimates the number of workers living in urbanized surroundings, likely because workers congregated around factories faster than cities could be incorporated. Moreover, the urban share leads the share of the population living in incorporated cities, indicating the gradual transformation of parts of the hinterland into towns and, from there, into incorporated cities.

Panels C and D highlighted that new cities were at the heart of expanding non-agricultural employment opportunities in Rural America. Panel E shows new cities' role as hubs of non-agricultural employment more directly. Specifically, we report employment shares in agriculture, manufacturing, and services for the hinterland, old and new cities in 1880 and 1940. New cities are cities incorporated after 1880 (hence absent in 1880). Moreover, within the service sector, we distinguish *consumer services*, such as retail trade or personal services, from other services.[3], highlighting the different functions of cities as consumption and production cities (Gollin, Jedwab, and Vollrath, 2016).

Panel E vividly shows the importance of newly founded cities for the industrialization of Rural America. Interestingly, the manufacturing sector played a minor role in either cities or the hinterland in 1880. The few people living in cities were primarily employed in service industries

[2]These cities are Bloomington (IL), Columbia (SC), Jacksonville (IL), and Montgomery (AL).

[3]In terms of their ind1950 classification in the US Census, consumer services include Retail Trade (636-699) and Personal/Entertainment Services (826-859); "Other Services" refers to all remaining service categories.

catering to consumers, while most workers in the hinterland earned their living in agriculture. By 1940, the economic landscape of Rural America had changed profoundly. The newly founded cities were heavily specialized in manufacturing and corresponded precisely to the textbook idea of *factory towns*. While the manufacturing share also grew in old cities, by 1940, it was only half as large as in the new cities. Old cities continued to rely more on (consumer) services. However, despite the formation of new cities, the hinterland still accounted for more than 80% of the population in Rural America and contributed substantially to the fall in agricultural employment.

In Panel F, we break up the hinterland by workers' urban status. Even outside the proliferating cities, Rural America urbanized: the hinterland's share of urban workers increased from 4.9% to 17.6% between 1880 and 1940. Moreover, the rise in the hinterland's manufacturing employment share was particularly pronounced among urban workers, highlighting the general trend of "densification" in Rural America: workers came together in and around factory towns long before their incorporation as cities.

The development of Rural America shown in Figure 1 is consistent with a broad notion of catch-up growth whereby the rural hinterland industrialized, and small factory towns formed that subsequently turned into new cities. This description aligns well with the existing work on spatial structural change. In Eckert and Peters (2022), we use a quantitative model to show that Rural America prospered during industrialization by adopting advanced manufacturing technologies from the rest of the country, making it unnecessary to migrate long distances for a "modern" job. Nagy (2022) studies the formation of cities and advances a "hinterland hypothesis" that—in line with our empirical evidence—suggests that the areas surrounding incumbent cities were essential for industrialization. Our findings are also related to the work of Michaels, Rauch, and Redding (2012) who analyze the relationship between urbanization, population growth and structural change at the sub-county level, i.e. at the level of Minor Civil Divisions.

TABLE 1: Local Industrialization Around the World

		Number of Regions		Agri. Emp. Share Decline	
Country	Period	Total	w/ 50% Pop.	Total	Within Share
USA (Counties)	1880-1940	2348	329	-32%	0.63
Brazil	1980-2010	2040	159	-16%	0.86
India	1987-2009	435	100	-9%	0.88
Indonesia	1971-2010	265	56	-22%	0.87
China	1982-2000	197	30	-9%	0.94
USA (States)	1880-1940	38	8	-32%	0.92

Notes: The table shows the decline in the agricultural employment share for different countries and periods (Column 5). Column 3 shows the number of regions for each country. Column 4 provides the smallest number of regions that jointly account for 50% of total employment at the beginning of the period. Column 6 shows the share of the aggregate agricultural employment share decline accounted for by declines within each region (cf. equation (1)).

4. INDUSTRIALIZING COUNTRIES TODAY

The local nature of industrialization was an essential feature of US economic growth. It is also a feature of industrialization in many developing countries today.

In Table 1, we use microdata from IPUMS International (see Ruggles, Fitch, Goeken, Hacker, Nelson, Roberts, Schouweiler, and Sobek (2020)) for a variety of countries to compute the "Within" component of the change in agricultural employment based on equation (1).[4] Because differences in spatial granularity complicate the cross-country comparison, we also report the total number of regions in each country and the number of regions that account for 50% of a country's population and provide the same information for US counties and states as a comparison.

Like the US experience 100 years ago, the recent structural change in the developing world was primarily a local phenomenon. Changes in the local employment structure accounted for between 86-94% of the decline in agricultural employment shares in Brazil, Indonesia, India, and China. Interestingly, spatial reallocation plays the most negligible role in China, known for its stringent migration restrictions (e.g., "Hukou system").

[4]The underlying data come from the Institute of Geography and Statistics (Brazil), the National Bureau of Statistics (China), the Ministry of Statistics and Programme Implementation (India), and Statistics Indonesia (Indonesia).

5. IMPLICATIONS

The empirical regularities we documented have important implications for our understanding of structural transformation and long-run growth.

First, they highlight that long-distance migration was not very correlated with sector-switching. Instead, moves within counties towards newly-formed factory towns were a more popular way for workers to join the industrialized economy.

Second, they paint a nuanced picture of the role of spatial agglomeration forces. Such forces were essential because workers clustered in newly formed cities specialized in manufacturing. At the same time, agglomeration effects were not strong enough to attract workers from afar to existing industrial hubs.

Finally, the new cities in Rural America specialized in tradable manufacturing and offered notably fewer consumer services than incumbent cities. These patterns highlight the central role of tradable sectors in facilitating local growth and suggest that economic integration played a central role in helping to industrialize Rural America.

An important direction for future work is to study the differences between the rise of manufacturing and the more recent shift toward services. While our paper shows that small villages and new cities in Rural America prospered during the heyday of industrialization in the early 20^{th} century, the recent shift towards services primarily benefited large incumbent cities and increased spatial inequality (see Eckert, Ganapati, and Walsh (2022), Fan, Peters, and Zilibotti (2022), and Chatterjee and Giannone (2021)).

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