Interwar Highways and the Demise of the General Store

Fan Fei

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Abstract

In the 1920s, the U.S. federal government strongly encouraged state highway construction with its Federal-Aid Highway program, resulting a dramatic increase in highway spending. The same decade saw a 32 percent decrease in general stores. Using a new county-level dataset, this paper offers evidence that highway construction may have accelerated the displacement of general stores. Specifically, a one standard deviation increase in highway spending would reduce the number of general stores by 13 percent. General stores in rural communities exhibit greater sensitivity to highway spending. To address non-random route placements, I propose an instrumental variable strategy based on a straight line minimum spanning tree network. The results speak to the decline of rural trade centers in the early twentieth century.

* Department of Business and Economics, Northwestern College. Email: fan.fei@nwciowa.edu. I thank Paul Rhode, Jim Hines, and Joshua Hausman and for their invaluable advice. I also thank Hoyt Bleakley, Gaurav Khanna, and Ben Thompson for helpful discussions at various stages of this project. In addition to seminar participants at the University of Michigan, I am grateful for organizers and participants of the Economic History Association 2015 Annual Meeting and the 42nd Annual Economic and Business History Society Conference for platform and comments. Glen Vargo, Lingfeng Li, and Xinyuan Zhang provided exceptional research assistance. This project is generously supported by the Department of Economics at the University of Michigan through MITRE research grants and the Economic History Association Data Grant. All errors remain my own.

I. Introduction

America experienced a transportation revolution during the interwar period. In 1921, Congress passed a Federal-Aid Highway Act to build a national network of highways, commonly known today as "U.S. Routes." During the 1920s, the states and the federal government spent 0.22 percent of GDP on road building, a number that would double during the 1930s under the New Deal. In two decades, over 90,000 miles of roads were built or improved.[1] By 1939, a national network of highways was almost complete. These massive infrastructure investments shaped developments in many sectors of the economy (Smiley 2004) and contributed significantly to the growth of total factor productivity (TFP) in the 1930s (Field 2012). These highways also played a pivotal role in the rise of Greyhound and large-scale intercity trucking, making the United States a nation on wheels that it is today. Yet the regional and sector-specific impacts of interwar highways are not well-understood due to a lack of microdata.

During the interwar years, retail trade shifted away from small stores at crossroads to outlets located in larger cities. Independent mum-and-pop retailers called general stores were displaced by chain grocery and department stores (Bucklin 1972, Berger 1979). This transformation in retail trade is another example of transportation infrastructure altering the spatial distribution of economic activities (Baum-Snow 2007, Michaels 2008, Atack et al. 2010). Specifically, I hypothesize the reduced transportation costs caused by improved roads enable consumers to travel further for lower prices and broader selection, leading to a precipitous reduction of general stores.

To test my hypothesis empirically, I collected retail trade data from contemporary commercial magazines and highway construction data from state highway department reports. This county-level dataset is quite unique and were assembled for the first time for this project. To my knowledge, my study is the first to utilize microdata to evaluate the impact of interwar highway construction. Reduced form results suggest that more highway spending is strongly correlated with sharper decline of general stores.

[1] National aggregates cited in this study come from *Historical Statistics of the United States, Millennium Edition* (2006) unless otherwise noted.

One may worry about taking the reduced reform results at face value because highway spending may be a response to economic conditions, therefore endogenous. To address this concern, I use a county's location relative to a virtual highway network as well as the presence of bodies of water as instruments for highway spending. The preferred point estimate from instrumental variable regressions suggests that a one-standard-deviation increase in total spending on highway construction in the 1920s would lead to a 13 percent decrease in the number of general stores. General stores in rural communities exhibit greater sensitivity to highway spending. My findings are consistent with contemporary observations as well as previous studies, which suggests reducing travel costs reinforces agglomeration economies and pulls economic activities away from peripheral regions (Chandra and Thompson 2000, Michaels 2008, Faber 2014). They strongly suggest that highway building may have accelerated a creative destruction process from general stores to chain grocery or department stores.

II. General Stores and Highway Construction in the 1920s

2.1 The Historical Significance and the Decline of General Stores

At the beginning of the twentieth century, except in a few big metropolises, small, independent retailers dominated the retail landscape. If an independent retailer is non-departmentalized, carries both food products and general merchandise, with annual sales less than $100,000 (1929 dollars), I refer to them as a "general store" in this paper.[2] Figure 1 provides a list of products carried by the general store that Earl Carter, President Jimmy Carter's father, operated in the early 1930s. Vance and Scott (1994)'s list of popular items in general stores also looks strikingly similar:

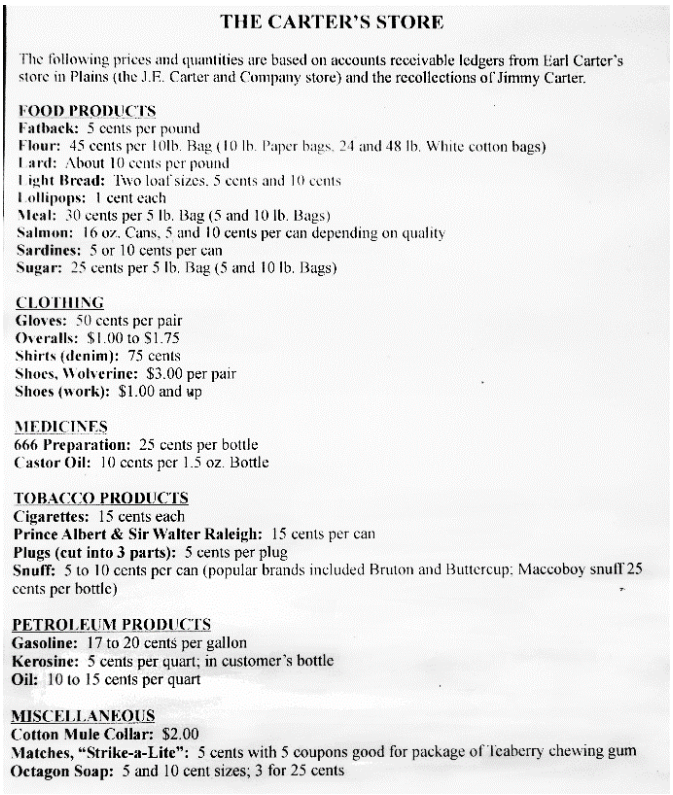
> Food products: salt, sugar, coffee, tea spices, and dry meat, among others
> Tobacco and cigars
> Lanterns and kerosene
> Dry goods: linens, piece goods, and notions
> Farm equipment: ropes, harnesses, and yokes, among others

[2] This definition is a characterization used in the 1929 Census of Distribution. See pages 104 to 107 of the summary.

Household essentials: pins, needles, toiletries, and soaps, among others.[3]

Barger (1955) estimates in 1919, roughly 11% of retail sales were generated by general stores, and a significant percentage of manufactured food products (salt, sugar, dry meat, and others), products, and textiles ("dry goods and notions") were sold at general stores.

Figure 1: A list of Goods and Prices at Earl Carter's General Store



THE CARTER'S STORE

The following prices and quantities are based on accounts receivable ledgers from Earl Carter's store in Plains (the J.E. Carter and Company store) and the recollections of Jimmy Carter.

FOOD PRODUCTS
Fatback: 5 cents per pound
Flour: 45 cents per 10lb. Bag (10 lb. Paper bags, 24 and 48 lb. White cotton bags)
Lard: About 10 cents per pound
Light Bread: Two loaf sizes, 5 cents and 10 cents
Lollipops: 1 cent each
Meal: 30 cents per 5 lb. Bag (5 and 10 lb. Bags)
Salmon: 16 oz. Cans, 5 and 10 cents per can depending on quality
Sardines: 5 or 10 cents per can
Sugar: 25 cents per 5 lb. Bag (5 and 10 lb. Bags)

CLOTHING
Gloves: 50 cents per pair
Overalls: $1.00 to $1.75
Shirts (denim): 75 cents
Shoes, Wolverine: $3.00 per pair
Shoes (work): $1.00 and up

MEDICINES
666 Preparation: 25 cents per bottle
Castor Oil: 10 cents per 1.5 oz. Bottle

TOBACCO PRODUCTS
Cigarettes: 15 cents each
Prince Albert & Sir Walter Raleigh: 15 cents per can
Plugs (cut into 3 parts): 5 cents per plug
Snuff: 5 to 10 cents per can (popular brands included Bruton and Buttercup; Maccoboy snuff 25 cents per bottle)

PETROLEUM PRODUCTS
Gasoline: 17 to 20 cents per gallon
Kerosine: 5 cents per quart; in customer's bottle
Oil: 10 to 15 cents per quart

MISCELLANEOUS
Cotton Mule Collar: $2.00
Matches, "Strike-a-Lite": 5 cents with 5 coupons good for package of Teaberry chewing gum
Octagon Soap: 5 and 10 cent sizes; 3 for 25 cents

Source: On display at the Jimmy Carter National Historic Site in Plains, GA. Ledgers were from the early 1930s. Photo credit: Author, August 2015

Figure 2 depicts a typical rural general store from this era. "The store was usually a two-story frame building… and fronted by a raised porch for convenient loading and unloading. When visitors entered the store, they were met with dim light, long counters, rounded glass show cases, and side walls lined with shelves, drawers, and bins. …Sitting on the counter tops, shoppers might find merchandise that included stacks of overalls, denim and khaki pants, candy jars, tobacco, and all manner of other products. Also sitting

[3] Vance and Scott (1994), page 17.

on the counter, one would usually see the cash register, a coffee mill, scales for weighing grocery items, and a wrapping paper unit with string attachment."[4]

Figure 2: The Exterior of a Country General store in South Carolina

Source: Rural Commerce in Context: South Carolina Country Stores: 1850-1950, New South Associates (2013), page 6.

The business practices of these general stores were very different from any modern retailer. First, a counter divided the customer and the shopkeeper with his merchandise, which meant there was no self-service. A storekeeper or an assistant would fetch goods for shoppers. Second, prices were often not transparent. Transactions involved haggling with the storekeeper; favored customers were offered discounted prices. Third, it was common for shoppers not to pay in cash when the transaction took place. For instance, a storekeeper would take the shopper's crops as an in-kind payment and then sell them an urban market. In the South, tenant farmers typically used next year's cotton crop as credit to purchase needed goods during the year, though the implied interest rate under this crop-lien credit system could potentially exceed 25%.[5] Lastly, general stores acquired almost all their merchandise (98 percent) from a wholesaler, not directly from producers

[4] This vivid webpage description of the ambience in a country general store in the early twentieth century is from the webpage http://www.legendsofamerica.com/ah-countrystores.html.

[5] This crop-lien credit system is discussed extensively in Chapter 7 of Ransom and Sutch (2001).

(Barger 1955). Contemporary accounts such as LeBoutillier (1930) suggest that general stores had higher mark-ups because of their local market power.

General stores served important social functions. It was not uncommon for the general store building to house the local post office. In many rural communities and small towns, people not only went to a general store to shop but to also exchange information, see notices, and discuss politics, making it a "third place" of the community. As mentioned above, general stores in the postbellum South were pillars in the financial system. They provided many sharecroppers and tenant farmers their only access to credit, albeit at high rates of interest.

Since the late nineteenth century, general stores have been on a steady down trend for decades. The rising standard of living called for specialty stores (for example, drug stores, shoe stores, and dry good stores) as well as department stores that offered more selection and sometimes more fashionable items. After rural free delivery (RFD) was adopted nationwide in 1902, mail-order businesses took advantage and began to deliver durable goods advertised through magazines.

The fall of the general store was markedly accelerated during the interwar years. As seen in Figure 3, the "market share" of general stores fell from 10.6 percent to 5.9 percent during the 1920s, a remarkable 36 percent reduction. In the retail dataset I collected for this project, the total number of general stores decreased by 44 percent nationwide. The fall of general stores continued during the Great Depression; by the end of World War II, general stores carried only 1 percent of total retail sales.

Contemporary researchers attributed the significant reduction of the general store during the 1920s mainly to the adoption of automobiles and improved roads. For example, Melvin Copeland, a contributing author to *Recent Economic Changes* (1929), observes

> "The chief feature of this change (in buying habits of consumers) was a major shift in retail trading areas away from crossroads stores, village stores, to stores located at county seats and other trading centers.… The

> primary causes for the change in trading areas that has occurred have been the increased use of automobiles and the construction of good roads."[6]

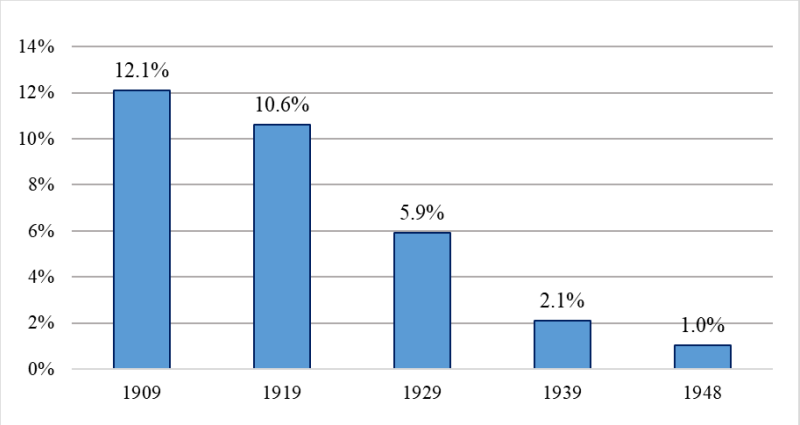
Berger (1979) cites this observation from a 1925 publication,

> "When the automobile and good roads brought us into competition with the outside world, the town was dazed. Then stores modernized and prices were reduced. A few of the inefficient places gave up. There was consolidation."[7]

Vance and Scott (1994) seems to agree with this narrative as well:

> "The greater mobility of rural shoppers due to the increasing use of the automobile and the expansion of improved roads shaped major changes (in retail trade) in the 1920s."[8]

Figure 3: The Share of Retail Sales Through General Stores, 1909-1948



Source: Barger (1955), pp. 121-124.

2.2 Federal-Aid Highways in the Interwar Years

"The construction of good roads" mentioned in contemporary accounts was the nationwide construction of highways, especially the construction of Federal-Aid Highways. There were a number of catalysts for this national movement. First and foremost, the exponential growth in passenger cars as well as the emerging trucking

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[6] *Recent Economic Changes*, page 331 and 336.

[7] Berger (1979), page 112. Berger cited a 1925 study published by the Houghton Mifflin Company in Boston named *A Study of Rural Society: Its Organization and Changes*. The quote was attributed to an unnamed small-town editor.

[8] Vance and Scott (1994), page 21.

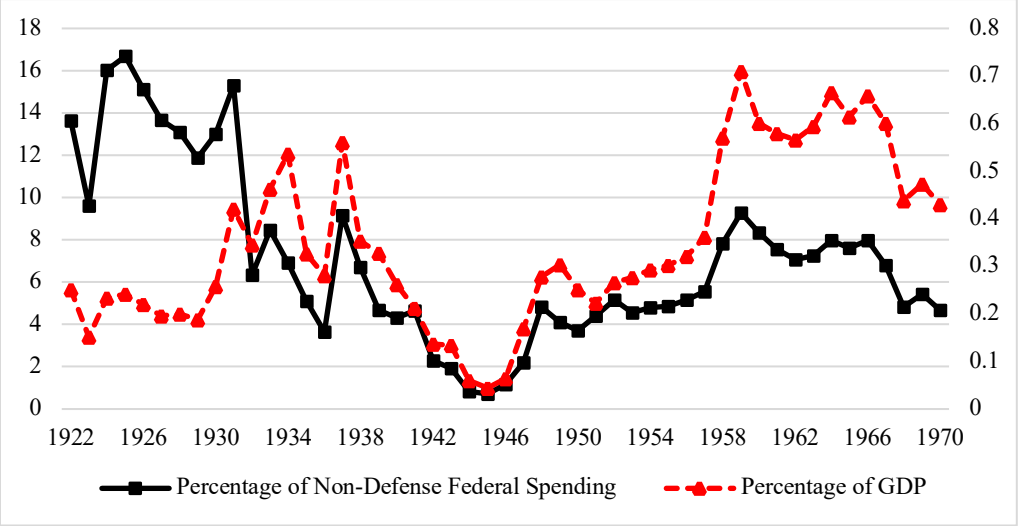
industry in the 1910s called for better roads between large cities. According to a United Federal Highway Administration publication, the number of registered cars grew 1,360% to 6.7 million, and the number of registered buses and trucks grew 8,890% to almost 900,000 during the 1910s.[9] Second, Portland cement, which had a much shorter curing time, was excellent for road building and became increasingly available due to technological progress (Kaszynski 2000). This development made the large-scale construction of all-weather, hard-surfaced roads more feasible. Third, during World War I, Congress realized that the railroad system was not sufficient for the rapid movement of personnel and equipment. Beginning in 1920, Congress authorized the U.S. army to transfer approximately 22,000 idle World War I trucks and over 20,000 tons of left-over explosives to state governments. The trucks were used to haul gravel, stones, and explosives to blast rocks. This large capital injection from the federal government boosted the states' highway building effort (Kaszynski 2000, *America's Highways* 1977).

Congress then passed the Federal-Aid Act of 1921, which appropriated $75 million of annual federal funding for highway construction for the next ten years. This landmark legislation kick-started the highway boom of the 1920s. From 1921 to 1930, the average federal spending on highways was $85.56 million per year. The average total (federal and state) government spending on highways was $197.38 million per year, which amounted to 0.22 percent of U.S. GDP and 13.6 percent of non-defense federal government spending over this period (*America's Highways* 1977). Total highway spending as a share of GDP went up by 368 percent from 1921 to 1930 compared to the five years leading up to the passage of the Federal-Aid Act of 1921. Figure 4 compares the relative magnitude of highway spending from 1921 to 1970. During the peak of Interstate Highways construction (1957-70), total highway spending was around 0.56 percent of GDP and 7.02 percent of non-defense federal spending. In 2014, government spending on highway construction amounted to about 0.35 percent of GDP. [10] These highways formed a

[9] See Table MV-200 in U.S. Federal Highway Administration's *Highway Statistics* (1997).
[10] Highway expenditure statistics come from the U.S. Federal Highway Administration's *Highway Statistics* (1967) and annual issues thereafter. They report both federal and state expenditures. Numbers include both construction and maintenance costs. Non-defense federal spending data come from the U.S. Department of Treasury's *Statistical Appendix to Annual Report of the Secretary of the Treasury*. GDP and GDP deflator series are from BEA: http://www.bea.gov/iTable/ (Table 1.1.5 and Table 1.1.9). All figures are in 2016 dollars.

complete national highway network by 1939 (Field 2012). With improvements after WWII, they have become today's U.S. Routes.

Figure 4: Relative Magnitude of Highway Spending, 1921 to 1970



Sources: See footnote 10 for details. The scale for the percentage of non-defense spending series is on the left. The scale for the percentage of GDP series is on the right.

There are several reasons to focus on Federal-Aid Highways among all the roads built or improved.[11] First, at the turn of the twentieth century, any intercity road regardless of surface or width could be referred to as a "highway". Federal-Aid Highways are subject to higher engineering standards compared to state highways. By focusing on these projects, I can make sure the projects under consideration represent a more significant reduction in transportation costs and are more comparable across states. Second, the Federal-Aid Act of 1921 required that states used federal money on no more than 7 percent of existing intercity roads. The Bureau of Public Roads (the predecessor of the Federal Highway Administration) coordinated between different states and made sure that these highways would form a national highway network. This makes Federal-Aid Highways more comparable to "trunk highway systems" in previous studies (e.g. Faber 2014, Banerjee et al. 2020).

[11] My study is therefore different from Nguyen (2015), which studies all state highways and investigates the interaction between automobile ownership, road building, and mortality rates.

Compared to modern superhighways like the Eisenhower Interstate Highway System, interwar Federal-Aid highways were subject to much lower engineering standards. For example, the Interstate is controlled-access, while interwar highways were typically open-access. Most Interstates have twelve-foot-wide lanes, at least two lanes in each direction, and wide shoulders. Interwar highways outside big cities almost always had only two lanes ten to twelve feet wide, narrow shoulders and medians, and sometimes steep grades. More importantly, however, these hard-surfaced, all-weather roads were a drastic improvement from the dirt or macadam roads they replaced, making traveling by road much faster and more reliable.[12] A telling testimony of this improvement is how much faster transcontinental road travel became in a span of ten years. In the summer of 1919, a group of army men spent 62 days and six broken trucks driving across America from Washington D.C. to Oakland, California.[13] By 1930, a trip from Los Angeles to New York on a Greyhound bus took about seven days, and buses accounted for a quarter of intercity passenger miles.[14]

The Interstate Highway routes are few and far between, whereas interwar Federal-Aid Highways are more widespread and penetrate more areas. In my sample, only 230 out of 946 counties have an Interstate, but 840 counties had at least one Federal-Aid Highway project by 1930.[15] It is very plausible, therefore, that these highways changed the market access of many areas and brought changes to economic sectors used to local, such as retail trade.

[12] Not all Federal-Aid Highways built were paved. This is because the network of Federal-Aid Highways was more far-reaching than the Interstates. For many remote counties, there was not enough demand for more expensive paved roads.

[13] Future president Dwight Eisenhower participated in this Army transcontinental motor convoy. His experience from this trip and his witness of the *Reichsautobahn* inspired him to champion the Interstate Highway System. For more information about this trip, see http://www.eisenhower.archives.gov/research/online_documents/1919_convoy.html.

[14] See on http://greyhoundhistory.com/ and in Walsh (2000), page 27.

[15] The count of number of counties having Interstate(s) is based on data used in Michaels (2008). The count of number of counties having Federal-Aid projects in the 1920s comes from my own data.

III. Highway and Retail Data

Railroads in the nineteenth century and the Interstate Highway System in the mid-twentieth century are heralded as transportation revolutions. Their impacts on the economy have been extensively studied (e.g. Fogel 1962, Chandra and Thompson 2000, Baum-Snow 2007, Michaels 2008, Atack et al. 2010, Donaldson and Hornbeck 2016). Interwar highway construction had a significant contribution to the TFP growth in the 1930s. It was also pivotal in the transition from railroads to roads as the dominant mode of transportation on land in the United States. Despite its significance, our existing empirical knowledge regarding this topic is limited due to a constraint on available data.

Unlike the records on the Interstate Highway System, which were compiled and digitized by the Federal Highway Administration, highway-related records in the interwar years are scattered in state highway department reports as "internal improvements" were considered a "state issue" during this era.[16] States bore the bulk of the fiscal burden of building and maintaining these highways and, therefore, did their own record-keeping. Besides their different formats, frequencies, and levels of detail, the greatest challenge of data collection lies in the lack of uniformity in these documents. (Snapshots of state highway reports can be seen in the Appendix A-1.) For instance, judging by total mileage, type of surface, and cost of construction per mile, "state highways" or "state trunk lines" in one state may be very different compared to "state highways" in another state. Thus, one reason for focusing on federal projects is to make my subject of analysis more comparable across states.

I compiled a county-level dataset of Federal-Aid highway construction from 1921 to 1930 for eight states: Indiana, Michigan, Wisconsin, Missouri, and Kansas in the Midwest, and Georgia, Texas, and Alabama in the South. I select states in regions where highways made a bigger difference (a lot of "dirt-to-hard-surface" upgrades). I also prioritize states that have numerous counties, which offers greater variation. The

[16] As requested by the Federal-Aid Highway Act of 1921, states established highway departments to administer Federal Aid money. State highway departments or commissions reported to state legislature annually or biennially.

coverage of the dataset is greatly constrained by data availability.[17] The data collection process involved sorting through more than 11,000 pages of state highway authority reports. The dataset contains information on highway construction including total expenditure, expenditure by type of surface, completed highway mileage, and mileage by type of surface on annual or biennial basis.[18]

Table 1 gives an overview of highway activity in the eight states that I study. Echoing Figure 5, the evidence indicates the coverage of Federal-Aid highways was broad: 89 percent of counties (840 out of 946) reported having a Federal-Aid project, whereas only 24 percent (230 out of 946) are on one or more primary Interstate route(s).[19] 53 percent of counties reported having at least one paved federal highway (i.e. highways paved with concrete or asphalt. Many more roads were paved during the 1930s.). The Midwest was much more industrialized and more affluent compared to the South. Hence, this may explain the sharp contrast between the South and the Midwest when it comes to the percentage of counties with paved highways and the share of spending on paved highways.

Figure 5 below shows the geographical variation of highway spending during the 1920s. Most counties in Wisconsin and Michigan, two of the most industrialized and prosperous states in my sample, had very high levels of highway spending. The eastern part of Texas and counties along the I-70 corridor in Missouri also showed a high level of highway construction. On the other hand, underdeveloped and sparsely populated regions, such as western Texas, western Kansas, and some hilly counties in Missouri, had little or no highway activity.

For regression analysis, I use total expenditure on highway construction from 1921 to 1930 as the preferred measure of highway activities. I aggregate highway

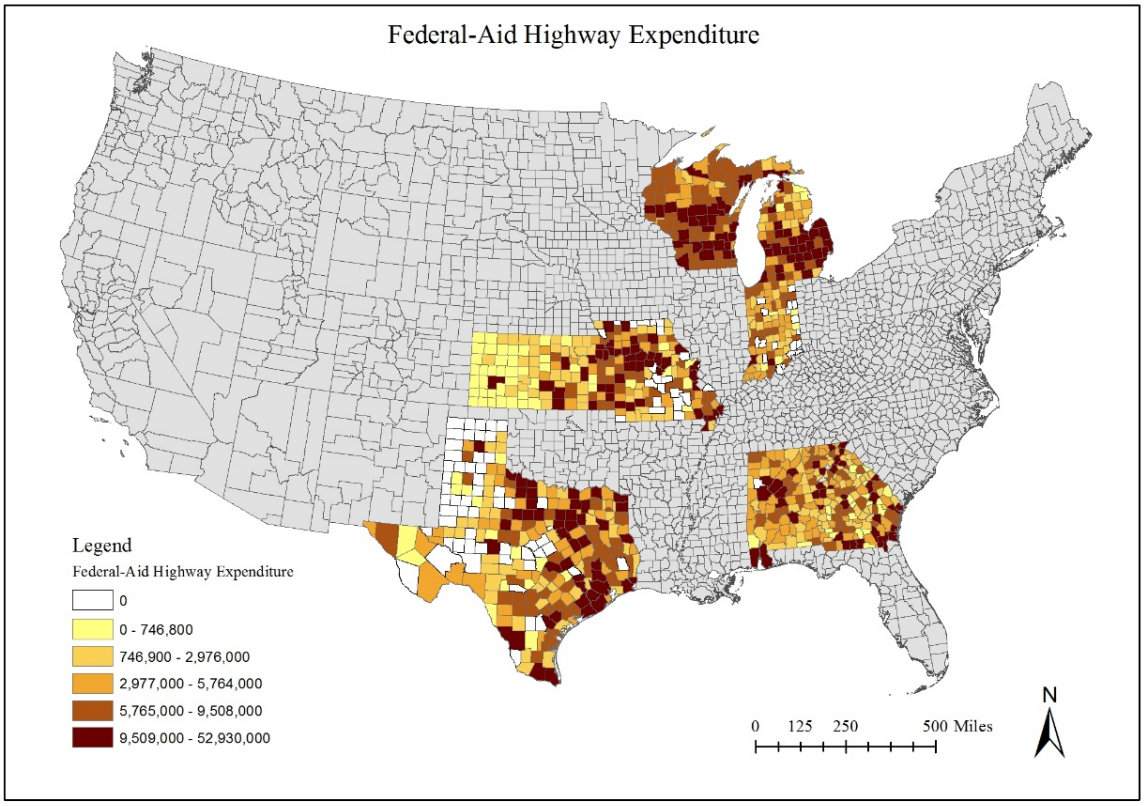
[17] For example, some states did not separate federal-aid projects from state highways. For many states, data is only available at the state level, township, or "highway construction district" (that spanned several counties) level. For a more comprehensive discussion on this, see Appendix A-1.

[18] Of the eight states, Indiana, Georgia, and Alabama published highway reports annually; Texas and Michigan issued reports biennially but annual data is available; only biennial data is available for Missouri, Wisconsin, and Kansas for this period.

[19] Primary Interstate Highways are those that have one- or two-digit designations. These are thoroughfares, to be distinguished from those auxiliary three-digit Interstates in and around urban areas.

expenditure to ten-year totals primarily because the outcome variables are only available in two years (1922 and 1930). Also, the noisy, year-to-year fluctuation in highway spending might reflect political friction and budgetary constraints rather than explaining structural changes in the economy. I prefer expenditure to mileage because of concerns about double-counting. For example, suppose three miles of roadway were improved from dirt to gravel in 1924 and then turned into a section of concrete-surfaced highway in 1928. Then the mileage recorded for 1921-30 would be six miles whereas only three miles were actually improved.

Figure 5: Geographical Distribution of Spending on Highway Construction, 1921-30



Source: Author's calculations. Except for those with no highway expenditure, the remaining counties are equally divided into five bins based on highway spending level. They are then represented by five colors, with the darkest color representing counties with the highest level of highway spending.

The first national census of retail trade was the Census of Distribution of 1929, which recorded the number of retail establishments and sales by category in 1930. Therefore, to obtain retail data in the early 1920s, I need to resort to new, non-Census

sources. Fortunately, during the 1920s, major publishing companies produced statistical summaries of the economy in commercial magazines, which was meant to help manufacturers, advertising agents, and salesmen to "secure the most efficient and economical distribution of merchandise."[20] I chose the 1923 edition of *National Markets and National Advertising* published by the Crowell Publishing Company (hereafter Crowell), which recorded counts of retail outlets in 1922.[21] Among other data, they tabulated the number of retail establishments by category, which were broadly consistent with the categories in the 1930 Census. Both Crowell and the Census distinguished general stores by their locations. Following their categorization, in this paper, general stores in places with population less than 10,000 are referred to as "rural general stores", and those in places with population greater than or equal to 10,000 are referred to as "urban general stores". My primary outcome variables are the percentage change of the number of general stores between 1922 and 1930.

The description of other data used in this study can be found in Appendix A-1. After adjusting for county boundary changes, I compiled a dataset consisting of 946 historically consistent county units. The process of adjusting for county boundary changes is laid out in Appendix A-3. Table 1 presents a set of descriptive statistics. Table 2 presents descriptive statistics of these 946 county units in eight states. Counties in my sample were mostly rural in 1920, but experienced significant urbanization during the 1920s. About 32 percent of general stores disappeared. The decrease in urban general stores was much more pronounced.

[20] The quote is on the dedication page of the Women's World's County Hand Book of National Distribution published in July, 1923. In addition to data on the number of retail establishments, other economic statistics include agricultural outputs, wage in manufacturing, automobile ownership and sales, consumers of electricity and gas, bank deposits, the number of income tax returns, and circulations of various magazines.

[21] Crowell used R. L. Pol's Census of Retail Outlets of 1922. 1922 seems to be the earliest year for which such nationally-representative enumeration data is available. Information about the retail sector in earlier years were on small store surveys ($N < 200$) in few big cities. No data on general stores between 1922 and 1930. (The Curtis Publishing Company's publications in 1925 and 1927 only had information on big department stores, grocery, and drug stores.)

IV. Empirical Strategy

The data described in the previous section is used to estimate the effect of highway construction on general stores. The baseline estimation is a specification of the form:

$$g_{i,1922-30} = \beta_0 + \beta_1 \cdot \sum Hwy_i + \gamma X_i + d_s + \varepsilon_i \qquad (1)$$

where $g_{i,1922-30}$ measures the percentage change in the number of general stores, $\sum Hwy_i$ represents the (natural) logarithm of total spending on Federal-Aid highway construction from 1921 to 1930, X_i is a vector of county-level variables serving as controls, d_s represents the set of state dummies, and ε_i is the error term.

I include an extensive list of control variables to mitigate the omitted variable bias. First, a group of geographical variables are included as controls: access to major rivers—rivers that pass through more than 20 counties, the range in elevation within the county, coastal access dummy, and the number of lakes and swamps in the county.[22] These variables may affect how connected the county is to neighboring counties, which would therefore affect the level of competition faced by general stores. Separately, state dummies are added to capture unobserved state level variations such as anti-chain legislations.

Moreover, I control for pre-trend and pre-existing economic conditions by adding population growth rate from 1910 to 1920, value of farmland per acre in 1920, as well as log manufacturing output in 1920. The level of development and the prosperity for the local economy may affect buying habits or change in shoppers' access to other retail outlets. The log of the number of general stores in 1922 controls for "regression to the mean." Land area and population density are added because they were determinants of highway funding per the Highway Act of 1921. Demographic variables, such as percentages of black, foreign-born, and illiterate populations, are customarily included.

Counties are small geographical units, so the error term ε_i can be spatially correlated. To address this, the standard errors reported in all regression are clustered

[22] A coastal access dummy is equal to one if the county is on the coast of the Atlantic Ocean, the Pacific Ocean, the Gulf of Mexico, or the Great Lakes.

using economic regions defined by state-level economic development agencies as of November, 2015. Counties within an economic region are assumed to more inter-connected than counties between regions. By using regions as clusters, I essentially assume that (1) the spatial spillover effects between regions are negligible, and (2) the spatial correlation between counties have not changed fundamentally in the last 90 years. In the end, 946 county units are divided into 84 clusters. A more detailed discussion on clustering can be found in Appendix A-4.

Ideally, equation (1) would be a difference-in-differences specification where *change* in highway spending is regressed on *change* in the number of general stores. In treating highway spending during the 1920s as the *change* in highway spending from the 1910s to the 1920s, I essentially assume highway spending before 1920 was zero. It is not a serious concern because there was very little highway construction outside the Northeast and no Federal-Aid Highways built before 1920. Nevertheless, failing to include pre-1920 highway spending may render the regression results biased.

A more serious threat to identification may be that highway spending was not randomly distributed, but distributed in response to economic conditions. If the government prioritized connecting booming places—which also attracted significant chain stores and other retail outlets and led to a more rapid decrease of general stores—OLS regressions would overestimate the impact of highway spending. If instead the government treated the highway program as a stimulus package and allocated more funds to peripheral regions or to places experiencing economic hardship, OLS regressions might underestimate the impact of highway spending.

To address these concerns of endogeneity, I use a county's distance to a hypothetical minimum spanning tree highway network and some geographical features as instruments for actual highway spending. I first explain the virtual highway network instrument. This idea of using a virtual network as an identification strategy have been used previous studies such as Atack et al. (2010), Banerjee et al. (2020), Ghani et al. (2012), Gutberlet (2013), and Faber (2014). Essentially, a hypothetical network of straight lines or least-cost routes connecting some pre-determined nodes is thought to provide the needed exogenous variation that predicts the actual placement of highways.

In my context, because Federal-Aid Highways form a nationwide network and promote interstate commerce, these highways must connect the most populous cities and localities of strategic importance. Therefore, I choose (a) the top 100 most populous cities in 1920, (b) state capitals (if they were not on the top-100 list), and (c) permanent military forts established during the military build-up for World War I between 1914-1918 as "nodes" of the network.[23] I then connect all the nodes using straight lines and Kruskal's minimum spanning tree algorithm. This algorithm identifies the subset of routes that connect all nodes on a single continuous network subject to global construction cost minimization. To compensate for the loss of route precision caused by having too few lines, I add routes to ensure that each state is connected with all its neighboring states on land. Alternatively, I use only the top 100 cities as nodes and exclude those supplementary lines described above. Either alternative yields very similar results. The resulting straight line network can be seen in Figure 6 below.

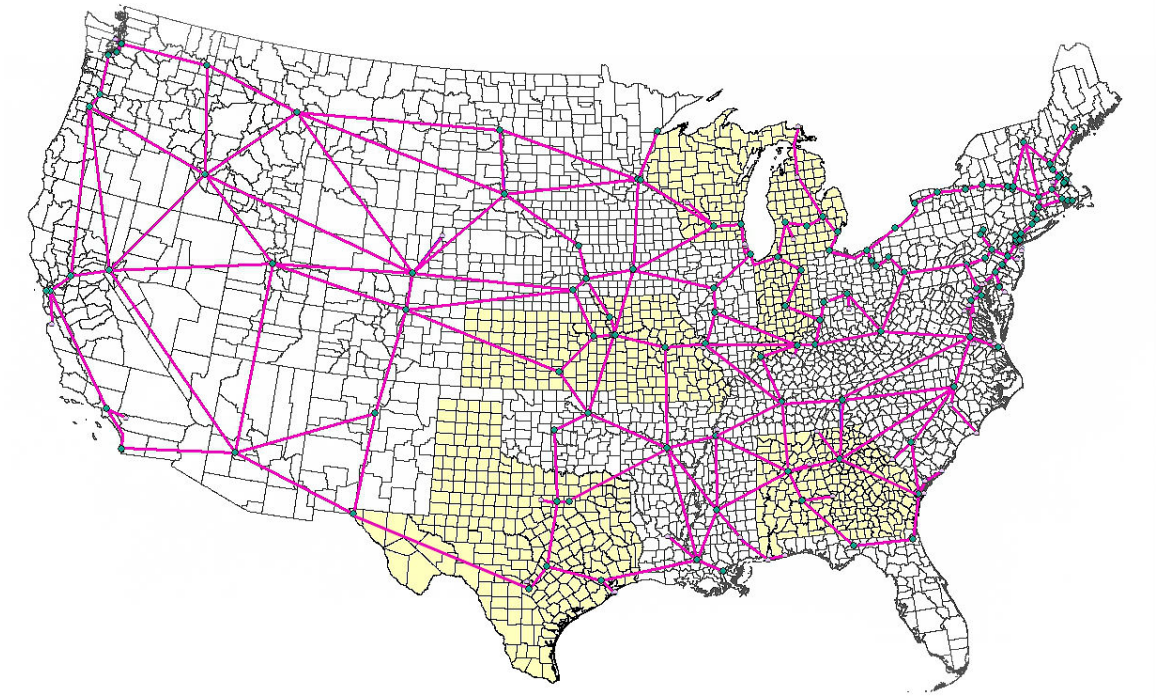
The exclusion restriction could be violated if locations along straight lines between major cities are correlated with economic characteristics that would, due to history and sorting, lead to the demise of the general store directly. I include a few controls to alleviate this concern. First, counties closer to major cities are mechanically more likely to lie on a least cost spanning tree path than counties situated farther away. Concerns about the exclusion restriction arise when the reduction of general stores happen earlier or faster in those counties. I therefore control for the log distance between counties and the nearest top 100 city or state capital.

Second, conditional on a county's distance to the targeted cities, its distance to the hypothetical highway network can be correlated with its economic characteristics due to pre-existing economic conditions. To address such concerns, I include the population growth rate from 1910 and 1920, urbanization rate in 1920, and railroad mileage in 1911

[23] The United States built many military facilities for World War I. Many of these "forts"—such as Fort Benning and Fort Sam Houston—eventually became huge permanent bases that still exist today. Given that World War I exposing the deficiency of U.S. transportation infrastructure was one of the major motivations of the passage of the Federal Aid Highway Act of 1921, it is very reasonable to assume Congress would prioritize connecting military bases using highways. "Permanent military bases" refer to military bases that were continuously occupied and operated until at least 1950. In doing so, I excluded temporary camps and training facilities that were only used during the two World Wars.

(Atack 2013) as controls. With these controls, the baseline identifying assumption is that the straight-line distance from a county seat to the virtual highway network affects the number of general stores only through actual highway spending, conditional on state fixed effects, distance to the nearest target city, and pre-existing county-level economic conditions.

Figure 6: A Straight-line Highway Network.



Note: On this map, big turquoise dots represent locations of city nodes. Smaller purple dots represent locations of military forts, which only are connected with the closest city. Pink represent this hypothetical network of highways. The distance from each county seat to the nearest segment of this straight-line network is the instrument. Highlighted in yellow are states in my sample.

Regressions presented in the main text use the "distance to virtual network" instrument discussed above. However, I also considered other instruments. For example, natural features such as elevation range (the difference between highest and lowest point) and the presence of bodies of water (rivers, lakes, and swamps) may predict level of highway spending: bumpy land requires more grading effort, and the presence of water requires building bridges, which are expensive. I use the following criteria in choosing geographical instruments. First, the chosen instruments have the expected signs and are strong enough in the first stage. Second, they have to pass the statistical test for the over-

identifying restriction. In the end, the *sum* of the number of lakes and swamps satisfy these criteria. Regressions using the two instruments are presented in Appendix B.

V. The Impact of Highway Spending on General Stores

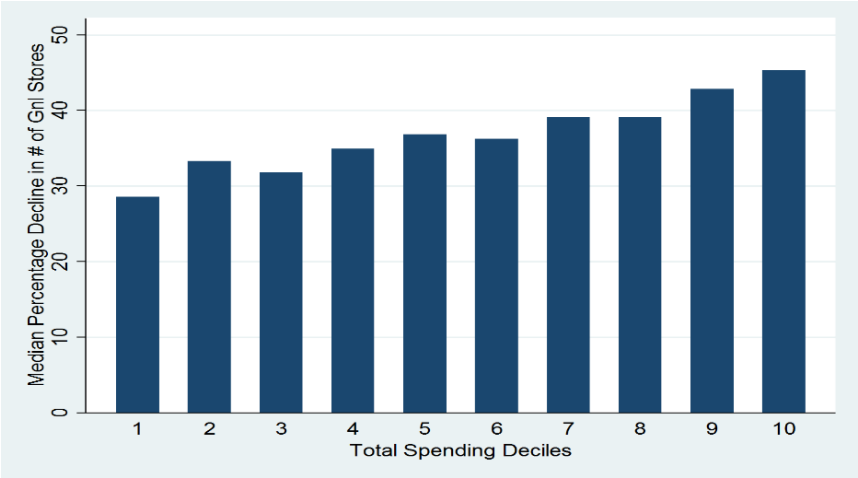
5.1 Descriptive Evidence

Figures 7, 8, and 9 provide descriptive evidence that more highway spending is associated with sharper decrease in the number of general stores. In each of these bar charts, counties are divided into ten groups of equal sizes, distinguished by their highway activities from 1921 to 1930. The leftmost bar represents the percentage change of general stores in the approximately 90 counties with the least spending on highway construction in the ten-year period; the rightmost bar represents the percentage change of general stores in counties that had the most spending on highway construction. Figure 7 depicts the median percentage change in the total number of general stores. It exhibits a gentle upward slope and indicates a positive correlation between highway spending and the reduction of general stores. Figure 8 depicts the median percentage change in the number of rural general stores and exhibits a pattern similar to Figure 7. On the other hand, Figure 9, which depicts the percentage change in the number of urban general stores, indicates the number of general stores falls sharply (more than 60 percent) across the board but seems to be unrelated with the level of highway spending. None of these charts weighs the observations or controls for other variables, but they are nonetheless suggestive. For the remainder of this paper, I focus on total general stores and rural general stores instead of urban general stores.

Table 3 presents OLS results for the impact of highway spending on the percentage change in the number of general stores. Panel A examines the percentage change in the total number of general stores. Panel B focuses on rural general stores. All specifications reported in Table 3 include state fixed effects. The regressions reported in column 2 include the number of stores in 1922, population density in 1920, and log distance from county seat to the nearest city nodes on the straight-line network. Column 3 adds demographic and geographical control variables. Column 4 further controls for pre-trend (population growth rate from 1910-20) and economic conditions in 1920 (average value

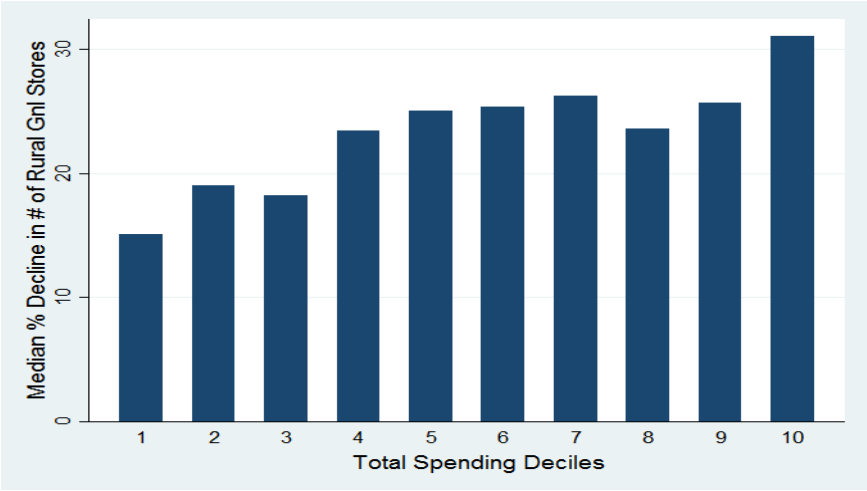
of an acre of farmland, log of manufacturing output, log railroad mileage in 1911). All regressions are weighted by county population in 1920 and have the standard errors clustered at the regional level.

Figure 7: Highway Spending and the Decline of General Stores, 1922-30



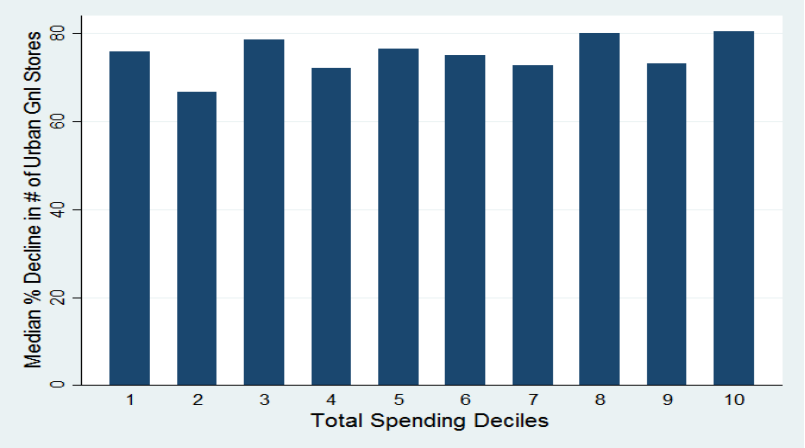
Source: Author's calculations. Counties in the first group from the left spent the least on Federal-Aid highways in the 1920s, whereas those in the rightmost group had the most spending on highways. The heights of the bars depict percentage change in the number of general stores from 1922 to 1930.

Figure 8: Highway Spending and the Decline of Rural General Stores, 1922-30



Source: Author's calculations. The only difference between Figure 7 and 8 is that now the heights of the bars depict percentage change in the number of rural general stores from 1922 to 1930.

Figure 9: Highway Spending and the Decline of Urban General Stores, 1922-30.



Source: Author's calculations. The only difference between Figure 7 and 9 is that now the heights of the bars depict percentage change in the number of rural general stores from 1922 to 1930.

Results from Panel A of Table 3 show that the construction of Federal-Aid Highways is associated with an economically and statistically significant decrease in the number of general stores. From columns 1 to 4, as more controls are added, the effect falls in magnitude but is still statistically significant. The -0.689 coefficient in column 4 means that an increase of one standard deviation in highway spending would result in a 3.3-percentage-point decrease of general stores, which amounts to 10.5 percent of the average rate of decline. Models such as Hotelling (1929) and Salop (1979) highlight the importance of travel costs in consumer choice. More market integration leads to more competitive pressure and some exits for general stores. Panel B of Table 3 reports the impact of highway spending on rural general stores. The coefficients in Panel B are similar to those in Panel A. Considering rural general stores experienced a milder overall fall during the 1920s (28% versus 64% for urban) and the higher R^2s, it seems that the reduction of rural general stores is more sensitive to highway activities. This result is consistent with Bresnahan and Reiss (1991) that predicts competition has a bigger impact on smaller and thinner markets. It is also consistent with contemporary commentaries on the decline of rural trade centers.

The specification used in Table 3 assumes that highway spending does not affect counties differentially. However, one may reasonably hypothesize that highways might have had differential effects on counties of different sizes. I explored heterogeneous

effects of highway spending among different counties, distinguished by their 1920 population density. However, it turns out that the interaction term is insignificant. Other omitted results show that highway spending could not predict the decline in the number of urban general stores with precision, which is illustrated by Figure 9.

5.2 Instrumental Variables Regressions

As discussed in Section 4, one may worry about the biasedness and inconsistency of the OLS results due to non-random placement of Federal-Aid highway projects. One way to address this concern of endogeneity and identify the causal effect of highway spending on general stores is to use the hypothetical straight-line highway network introduced in Section 4 as an instrument. Table 4 presents the first stage results. Recall that the distance from a county seat to the closest segment of the hypothetical highway network is intended to predict county level highway spending. Results suggest that log distance to the hypothetical highway network is negatively correlated with highway expenditure. The coefficients are highly significant and sizable, conditional on log distance to the nearest city and the full set of pre-existing demographical and economic county characteristics. The fact that the coefficients become more negative and stay significant as more controls are included is reassuring. The first-stage F-statistics are not huge but acceptable, considering the sample size.

Table 5 presents the 2SLS estimates of the effect of highway spending on the decline of general stores. Consistent with OLS results, highway spending causes a significant reduction in general stores overall, particularly for those in rural areas. The most flexible specification (column 4) in Table 5 suggests a one standard deviation increase in highway spending would lead to an additional 4.2 percentage point reduction in general stores and an additional 3.9 percentage point decline in rural general stores. To put these numbers into context, recall from Table 2 that the average rate of decline of general stores is 31.7 percent (28.0 percent for rural general stores). Therefore, a one standard deviation increase in highway spending would result in a further 7 to 19 percent

decrease in general stores.[24] Results in Panel B imply that a one standard deviation increase in highway spending would result in a further 9 to 21 percent decrease in rural general stores.

In Appendix B, I reran the regressions reported in Tables 4 and 5 with one additional instrument— the sum of the number of lakes and swamps. In the first stage, the bodies of water instrument strongly predicts more highway expenditure. With the additional instrument, the F-stats increase moderately compared to Table 4. The point estimates in the second stage are strikingly similar to those in Table 5 but a bit less precise.

Comparing Table 5 with Table 3, it is obvious that that the IV estimates are more negative than the OLS estimates. There are at least two ways to make sense of this discrepancy. First, it may be a result of not accounting for highway spending from the 1910s. It is conceivable that more highway spending in the 1910s means less need for "new" highway spending in the 1920s. On the other hand, it is reasonable to assume highway spending in the 1910s would contribute to the fall of the general store in the 1920s similar to highway spending in the 1920s. If both were true, we should expect the IV estimate being more negative than the OLS estimates.

The second explanation concerns the endogenous placement of highways. Table 6 offers suggestive evidence of the relationship between economic prosperity and its impact on highway spending, as well as the change in the number of general stores. I use growth of manufacturing output and change in land value as proxies for local economic conditions and run two separate sets of regressions. Column 1 suggests more funds are appropriated to counties that had slower growth in manufacturing or lower appreciation in land value. Columns 2 and 3 suggest that economic prosperity is negatively correlated with the change in the number of general stores. If the government puts more highways in less prosperous or periphery areas where the displacement of general stores happened

[24] The lower bound is calculated as [100%*(0.871-0.379)*4.8]/31.72; the upper bound is calculated as [100%*(0.871+0.379)*4.8]/31.72.

more slowly, we should expect OLS regressions to underestimate the true effect of highway spending.

VI. Discussions

The preceding section has presented empirical evidence suggesting that Federal-Aid Highway construction in the 1920s has led to fewer general stores. Many other factors could have accelerated the fall of the general store. This section discusses why highway construction is the most likely driving force behind the decrease. One potential concern is the effect of railroads. Highways from this era tended to be built adjacent to railroads. In fact, one frequently discussed highway safety issue in state highway department reports was the railroad crossing. However, it would be anachronistic to attribute the decline of the general store in the interwar years to the expansion of railroads. Aggregate time series suggest that national freight volume and mileage of the railroad system did not change in the 1920s.[25] Moreover, the 1920s did not witness significant technological innovations in equipment or in railroad operation. Therefore, a largely unchanged railroad sector is very unlikely to be a major driver of the reduction of general stores.

Another concern is the effect of the adoption of the automobile. One reason why highway spending accelerated the decline of rural trade centers was in part due to improved highways which enabled villagers to drive to and shop at county seats and even larger urban centers. People can take advantage of this increased market access only when they own automobiles. However, the growth in automobile ownership and this investment likely constitutes a feedback loop. Disentangling the automobile effect and the highway effect is challenging both theoretically and empirically. Thus, I purposefully omit the automobile in the regression analysis.

[25] *Recent Economic Changes* (1929), page 255 to 271. *Historical Statistics of the United States, Millennium Edition* (2006) series Df882-885, 927-955.

In 1925, Sears, Roebuck, & Company, America's largest mail-order company at that time, opened their first department store on the west side of Chicago.[26] Sears' outlets quickly expanded to more than 100 locations by 1930. Longstreth (2006) includes a list of Sears stores between 1925 and 1942, with opening dates and street addresses.[27] Most of those stores were set up in suburbs of big cities such as Chicago, Detroit, and Milwaukee. Only 16 stores nationwide were opened before 1928, 4 of which were located in the eight states that I study. From 1928 to 1930, 12 of the 49 stores that were opened were in one of the eight states included in the sample. The spatial spillover effect of a small number of big-box Sears stores should not be sufficient to affect general stores hundreds of miles away. Admittedly, Sears is just one company and may be a poor substitute for all chain stores. Unfortunately, chain store data is not available in any of the commercial magazines that I found. Furthermore, the number of department stores does not seem to be correlated with general stores or highway activity. In conclusion, it is conceivable that chain stores could take better advantage of vastly improved highways to expand and reduce general stores to ruin. However, it is challenging to test this hypothesis empirically.

VII. Conclusions

Economists long establish that large investments in transportation infrastructure connect densely populated urban centers, increase market access for small, peripheral marketplaces, and alter the spatial distribution of economic activity. The overall gains from trade are not the same as universal prosperity. The altered economic landscape may be further agglomeration (e.g. Michaels 2008, Holl 2016) or more diffusion (e.g. Baum-Snow 2007, Garcia Lopez et al. 2015). Oftentimes, the economic impacts are uneven for different types of business entities as well. Drawing on newly collected county-level data on interwar highway construction, the findings of this paper provide empirical evidence that Federal-Aid Highway construction may have contributed to a more precipitous fall of

[26] Sears Archives. http://www.searsarchives.com/stores/history_chicago_first.htm

[27] To be precise, Longstreth (2006) only documents "A stores", which were the biggest in size. According to Longstreth as well as a staff member at the Sears Archives, a complete list of Sears stores established in the 1920s and 30s is not available.

general stores during the 1920s, particularly in rural communities. The displacement of general stores draws an interesting analogy with the current decline of brick-and-mortar retailers in shopping malls. Both interwar highways and the Internet in the twenty-first century can be viewed as significant supply-side shocks, which reduce the trade barrier and result in some creative destruction.

It is important to note that while the findings emphasize the "destruction" aspect of the "creative destruction" process, the decline and eventual demise of the general store does necessarily mean welfare loss. Most general stores acted like local monopolies. General stores in the South put sharecroppers into perpetual indebtedness through the crop-lien credit system. Increased market competition may indeed be a blessing for most consumers previously trapped in small, peripheral marketplaces. On the other hand, general stores in the early twentieth century served as "the third place." Local oriented capitalism is important to local economic structure and civic community (Crowley and Stainback 2019). Even though it is hard to measure or quantify, one has to acknowledge the potential negative impact on social capital when local general stores were replaced by chain stores. Finally, the presented analysis has many limitations due to data availability constraints. For example, unlike contemporary studies such as Aghion et al. (2019) or Paruchuri et al. (2009), I do not observe entry and exit dynamics so I do not know how many of those unaccounted-for general stores went out of business or how many were converted into another type of establishment by 1930. This study invites more research on the impacts of highway construction during the interwar years.

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Tables

Table 1: Overview of Federal-Aid Highway Construction, 1921-30

	All	South	Midwest
Number of Counties	946	480	466
Number of Counties Having Federal-Aid Highways	840	420	420
Share of Counties Having Federal-Aid Highways	89%	88%	90%
Number of Counties Type of Surface Information	726	480	246
Number of Counties Having Paved Federal-Aid Highways	385	186	199
Shared of Counties Having Paved Federal-Aid Highways	53%	39%	81%
Total Highway Expenditure (in millions of 2009 dollars)	5,402	2,446	2,957
Share of Expenditures on Paved Highways	49%	33%	69%
Number of Counties that Had U.S. Route in Rand-McNally (1939)	824	407	417
Number of Counties Having Primary Interstate Highways	230	114	116

Note to Table 1: This table gives an overview of Federal-Aid Highway construction in the sample that I study. Southern states include Texas, Georgia, and Alabama; Midwestern states include Michigan, Indiana, Wisconsin, Missouri, and Kansas. Kansas and Missouri do not have type of surface information in most years. Therefore, "share of counties having paved highways" and "share of expenditures on paved highways" calculations exclude Kansas and Missouri. "Paved highways" are highways paved with asphalt or concrete. Rand-McNally Road Atlas (1939) data come from Paul Rhode. Primary Interstate Highways data come from Michaels (2008). All other variables are from state highway department reports from 1921 to 1930.

Table 2: Summary Statistics

	All Counties N = 946	
	Mean	S.d.
Highway Construction		
Total Expenditures (1921-30), in millions	5.71	5.96
Log Total Expenditures (1921-30)	13.56	4.80
Log Distance to Straight-line Network	3.05	1.44
Log Distance to The Nearest Big City	4.14	0.97
Number of General Stores		
No. of General Stores in 1922	54.41	72.56
No. of Rural General Stores in 1922	37.81	29.1
No. of Urban General Stores in 1922	16.6	63.31
No. of General Stores in 1930	31.15	23.67
No. of Rural General Stores in 1930	27.75	21.09
No. of Urban General Stores in 1930	18.09	41.98
% Change in the No. of General Stores	-31.72	37.35
% Change in the No. of Rural General Stores	-28.03	36.52
% Change in the No. of Urban General Stores	-63.68	42.41
Natural Characteristics		
No. of Lakes	17.17	45.08
No. of Swamps	1.29	4.87
No. of Rivers that Pass Through 11-20 Counties	0.2	0.43
No. of Rivers that Pass Through 21-50 Counties	0.15	0.35
No. of Rivers that Pass Through 51+ Counties	0.07	0.28
Difference between Highest and Lowest Elevations, in feet	643.7	786.4
Demographic Characteristics		
% of White Population	86.8	20.4
% of Foreign-born White Population	5.7	8.0
% of Black Population	13.1	20.4
Share of Illiterate Population	7.5	8.2
Socioeconomic Characteristics		
Total Population	25,704	56,186
Share of Urban Population	17.05	22.99
Population Growth Rate (1910-20), in %	8.29	29.08
Population Growth Rate (1920-30), in %	15.28	64.28
Growth Rate of Urban Population (1920-30), in %	15.53	37.99
Value of Farmland, per Square Mile	50.54	44.76
Log Manufacturing Output	12.58	4.93
% of Workforce in Manufacturing	3.76	5.16

Note to Table 2: This table presents summary statistics for variables used in the regression analysis of this paper. The two distance variables in the first panel respectively measure distances from each county seat to

the nearest top-100 city and the nearest straight line on the virtual highway network. See Section 4 of the paper for more. Rural general stores are general stores in places with population less than 10,000. Urban general stores are general merchandise stores in places with more than 10,000 people. “Urban population” counts number of people living in places with more than 2,500 other people. The other variables are self-explanatory. Highway variables are from state highway department reports. General store variables in 1922 are from Crowell. General store variables in 1930 are from the 1930 Census. Natural characteristics variables are Fishback et al. (2005, 2007). Demographic and socioeconomic characteristics variables are from Haines and ICPSR (2010). All monetary variables are converted to 2009 dollars using the GDP deflator established in Kendrick (1961). All time-varying variables are measured at their 1920 levels unless otherwise noted.

Table 3: OLS Estimates

	(1)	(2)	(3)	(4)
Panel A: Percentage Change in the Total Number of General Stores				
log(Expenditure)	-1.369***	-1.022***	-0.959***	-0.689***
	(0.226)	(0.210)	(0.206)	(0.227)
Observations	946	946	946	940
R-squared	0.229	0.262	0.269	0.287
Panel B: Percentage Change in the Number of Rural General Stores				
log(Expenditure)	-1.148***	-0.703**	-0.619**	-0.678**
	(0.429)	(0.292)	(0.275)	(0.270)
Observations	946	946	946	940
R-squared	0.370	0.402	0.413	0.434
State FE	Y	Y	Y	Y
No. of stores in 1922, pop density, log distance to city	N	Y	Y	Y
Demographic + geographic controls	N	N	Y	Y
Economic controls	N	N	N	Y
Clustered S.E.	Y	Y	Y	Y

Notes to Table 3: The table presents estimated coefficients from OLS regressions in which the dependent variables are percentage changes of the number of total/rural general stores, which is defined as 100 times the change in the number of stores divided by the number of stores in 1922. The dependent variable in Panel A is the percentage change in the total number of general stores. The dependent variable in Panel B is the percentage change in the number of rural general stores. The key independent variable is log of total highway expenditures on Federal-Aid Highways from 1921 to 1930. The first column only includes state fixed effect as controls. The second column adds in the number of stores in 1922, population density in 1920, and log distance from county seat to the nearest city nodes on the straight-line network. The third column adds in demographic and geographic controls, which include percentage of black population, percentage of foreign-born population, percentage of illiterate population among people aged 20 or above, all measured in 1920; number of swamps, lakes, number of rivers of different lengths, coastal dummy, and difference in altitude between the highway and lowest points. Finally, the fourth column adds in pre-trend (population growth rate from 1910-20), economic conditions in 1920 (average value of an acre of farm land, log of manufacturing output, log railroad mileage in 1911). Observations are weighted using log 1920 population. Standard errors are clustered at the regional level. See Appendix A-4 for clustering details.
*** p<0.01, ** p<0.05, * p<0.1

Table 4: First Stage Regressions

	(1)	(2)	(3)	(4)
First Stage of Panel A. DV: log(Expenditure)				
log(d_Network)	-0.124***	-0.306**	-0.328***	-0.389***
	(0.0488)	(0.137)	(0.115)	(0.122)
Observations	946	946	946	940
1st-stage F-stat	7.300	8.153	9.061	9.312
First Stage of Panel B. DV: log(Expenditure)				
log(d_Network)	-0.177***	-0.289***	-0.391***	-0.482***
	(0.0621)	(0.105)	(0.120)	(0.109)
Observations	946	946	946	940
1st-stage F-stat	7.487	8.711	9.258	10.701
State FE	Y	Y	Y	Y
No. of stores in 1922, pop density, log distance to city	N	Y	Y	Y
Demographic + geographic controls	N	N	Y	Y
Economic controls	N	N	N	Y
Clustered S.E.	Y	Y	Y	Y

Notes to Table 4: The table presents estimated coefficients from the first-stage of IV regressions, where the dependent variable is log highway expenditures, and the excluded instrument is the log distance from each county seat to the nearest segment of the straight-line network. For each column, the same set of controls as Table 3 are included. From column 1 to 4, more controls are added in the same order as they do in Table 3. Observations are weighted using log 1920 population for all regressions. Standard errors are clustered at the regional level. See Appendix A-4 for clustering details. Because observations are weighted and standard errors clustered, the F-stat I used here is Kleibergen-Paap Walk rk F-stat. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Second Stage Regressions

	(1)	(2)	(3)	(4)
Panel A: Percentage Change in the Total Number of General Stores				
log(Expenditure)	-1.529***	-1.373***	-1.139**	-0.871**
	(0.575)	(0.456)	(0.517)	(0.379)
Observations	946	946	946	940
Panel B: Percentage Change in the Number of Rural General Stores				
log(Expenditure)	-1.701***	-1.571***	-1.135**	-0.855***
	(0.567)	(0.629)	(0.528)	(0.360)
Observations	946	946	946	940
State FE	Y	Y	Y	Y
No. of stores in 1922, pop density, log distance to city	N	Y	Y	Y
Demographic + geographic controls	N	N	Y	Y
Economic controls	N	N	N	Y
Clustered S.E.	Y	Y	Y	Y

Notes to Table 5: The table presents estimated coefficients from the first-stage of IV regressions, where the dependent variables are percentage change in the number of general stores, and log highway expenditure is instrumented by the log distance from each county seat to the nearest segment of the straight-line network. For each column, the same set of controls as Table 3 are included. From column 1 to 4, more controls are added in the same order as they do in Table 3. Observations are weighted using log 1920 population for all regressions. Standard errors are clustered at the regional level. See Appendix A-4 for clustering details. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Endogenous Placements of Highways

Dependent Variables	log(Expenditure)	% Change, General Stores	% Change, Rural General Stores
	(1)	(2)	(3)
Growth of Manufacturing	-0.137***	-1.179**	-0.285**
	(0.0355)	(0.580)	(0.141)
Observations	940	940	940
R-squared	0.131	0.196	0.282
Change in Land Value	-0.0242**	-0.171***	-0.103**
	(0.00708)	(0.0573)	(0.0491)
Observations	940	940	940
R-squared	0.175	0.115	0.298
State FE	Y	Y	Y
Geographical controls	Y	Y	Y
Clustered S.E.	Y	Y	Y

Notes to Table 6: This table presents estimated coefficients from OLS regressions on the effect of economic prosperity on the placement of highways as well as the decline of general stores. The key variables are defined as follows: “growth in manufacturing” is the change in log manufacturing output from 1920 to 1930; "change in land value" is change in the value of an average acre of farmland from 1920 to 1930; "log(expenditure)" is the log of total expenditures on Federal-Aid Highways from 1921 to 1930. "% change in general stores" and "% change in rural general stores" are the same variables used in previous tables. All monetary variables are properly converted to 2009 dollars using Kendrick (1961). All regressions include state fixed effects and those geographical controls used in previous tables and are weighted by log 1920 county population. All standard errors are clustered at the regional level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

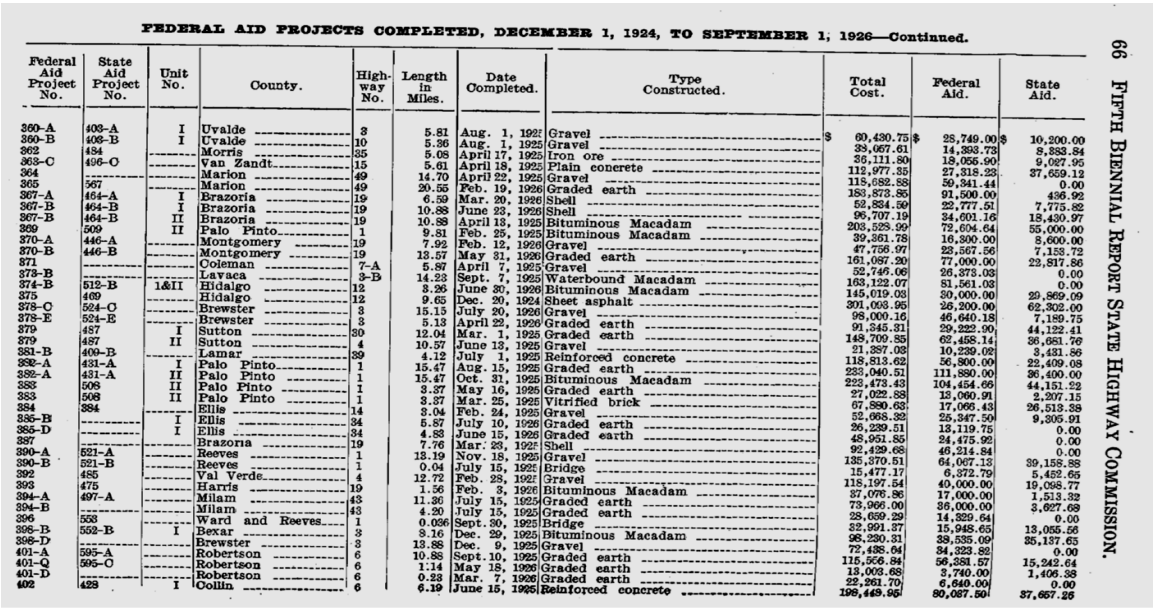
Appendix A: Data Appendix

Appendix A-1: Data Sources

I collected highway data from the following government reports: Biennial Reports of State Highway Commission of Texas, 1920–30, Annual Reports of the State Highway Engineer to the State Highway Board of the State of Georgia, 1921–30, Annual Reports of the State Highway Commission of Alabama, 1921–30, Annual Reports of the State Highway Commission of Indiana, 1921–30, Biennial Reports of the State Highway Commissioner of Michigan, 1921–30, Biennial Reports of the Wisconsin Highway Commission, 1924–30, Biennial Reports of the Kansas Highway Commission, 1920–30, Biennial Reports of the State Highway Commission of Missouri, 1920–30. They are stored at the Buhr Shelving Facility of the University of Michigan Library under the call number group "TE 24."

Among Southern states, county level Federal-Aid highway data is not available for the following states: Virginia, Delaware, North Carolina, Arkansas, Louisiana. Data are scarce and incomplete for Oklahoma and Florida. South Carolina does not distinguish Federal-Aid projects from state highways clearly. Data from Tennessee and Mississippi was gathered but not included due to time constraint. Among Midwestern states, county level Federal-Aid highway data is not available for the following states: Ohio, Nebraska, and Illinois. Records are scarce and incomplete for North and South Dakota. Other states are skipped due to time constraint. Below are a couple of scans of these highway reports. As one can clearly see, these reports are very heterogeneous from wording to format, making building a consistent database time-consuming.

Figure 1: A Snapshot of Highway Reports from Texas



FEDERAL AID PROJECTS COMPLETED, DECEMBER 1, 1924, TO SEPTEMBER 1, 1926—Continued.

66 FIFTH BIENNIAL REPORT STATE HIGHWAY COMMISSION.

Federal Aid Project No.	State Aid Project No.	Unit No.	County.	Highway No.	Length in Miles.	Date Completed.	Type Constructed.	Total Cost.	Federal Aid.	State Aid.
360-A	403-A	I	Uvalde	3	5.81	Aug. 1, 192	Gravel	$ 60,430.75	$ 25,749.00	$ 10,200.00
360-B	403-B	I	Uvalde	10	5.36	Aug. 1, 1925	Gravel	33,057.61	14,393.73	8,883.84
362	484		Morris	35	5.08	April 17, 1925	Iron ore	36,111.80	18,056.90	9,027.95
363-C	496-C		Van Zandt	15	5.61	April 18, 1925	Plain concrete	112,977.35	27,318.23	37,659.12
364			Marion	49	14.70	April 22, 1925	Gravel	118,682.88	59,341.44	0.00
365	567		Marion	49	20.55	Feb. 19, 1926	Graded earth	183,873.85	91,500.00	436.92
367-A	464-A	I	Brazoria	19	6.59	Mar. 20, 1926	Shell	52,884.59	22,777.51	7,775.82
367-B	464-B	I	Brazoria	19	10.88	June 23, 1926	Shell	96,707.19	34,601.16	18,430.97
369	509	II	Palo Pinto	1	9.81	Feb. 25, 1925	Bituminous Macadam	203,529.99	72,604.64	55,000.00
370-A	446-A		Montgomery	19	7.92	Feb. 12, 1926	Gravel	39,361.78	16,300.00	8,600.00
370-B	446-B		Montgomery	19	13.57	May 31, 1926	Graded earth	47,756.97	23,567.56	7,159.72
371			Coleman	1	5.87	April 7, 1925	Gravel	161,087.20	77,000.00	23,817.86
373-B			Lavaca	3-B	14.23	Sept. 7, 1925	Waterbound Macadam	52,746.06	26,373.03	0.00
374-B	512-B	1&II	Hidalgo	12	3.26	June 30, 1926	Bituminous Macadam	163,122.07	81,561.03	0.00
375	469		Hidalgo	12	9.65	Dec. 20, 1924	Sheet asphalt	145,619.03	30,000.00	29,969.09
378-C	524-C		Brewster	3	15.15	July 20, 1926	Gravel	301,093.95	26,200.00	62,302.00
378-E	524-E		Brewster	3	5.13	April 22, 1926	Graded earth	98,000.16	46,640.18	7,189.75
379	487	I	Sutton	30	12.04	Mar. 1, 1925	Graded earth	91,345.31	29,222.90	44,122.41
379	487	II	Sutton	4	10.57	June 13, 1925	Gravel	148,709.85	62,458.14	36,051.76
381-B	499-B		Lamar	39	4.12	July 1, 1925	Reinforced concrete	21,387.03	10,239.02	3,431.86
382-A	431-A	I	Palo Pinto	1	15.47	Aug. 15, 1925	Graded earth	118,813.62	56,800.00	22,409.08
382-A	431-A	II	Palo Pinto	1	15.47	Oct. 31, 1925	Bituminous Macadam	233,040.51	111,880.00	36,400.00
383	506	II	Palo Pinto	1	3.37	May 16, 1925	Graded earth	223,473.43	104,454.66	44,151.22
383	506	II	Palo Pinto	1	3.37	Mar. 25, 1926	Vitrified brick	27,022.88	13,060.91	2,207.15
384	384		Ellis	14	3.04	Feb. 24, 1925	Gravel	57,880.63	17,066.43	26,513.33
385-B		I	Ellis	34	5.87	July 10, 1926	Graded earth	52,668.32	25,347.50	9,305.91
385-D		I	Ellis	34	4.83	June 15, 1926	Graded earth	26,239.51	13,119.75	0.00
387			Brazoria	19	7.76	Mar. 23, 1925	Shell	48,951.85	24,475.92	0.00
390-A	521-A		Reeves	1	13.19	Nov. 18, 1925	Gravel	92,429.68	46,214.84	0.00
390-B	521-B		Reeves	1	0.04	July 15, 192	Bridge	135,370.51	64,067.13	39,158.88
392	485		Val Verde	4	12.72	Feb. 28, 192	Gravel	15,477.17	6,372.79	5,462.65
393	475		Harris	19	1.56	Feb. 3, 1926	Bituminous Macadam	118,197.54	40,000.00	19,098.77
394-A	497-A		Milam	43	11.36	July 15, 1925	Graded earth	37,076.86	17,000.00	1,513.32
394-B			Milam	43	4.20	July 15, 1925	Graded earth	73,966.00	36,000.00	3,627.68
396	538		Ward and Reeves	1	0.036	Sept. 30, 1925	Bridge	28,659.29	14,329.64	0.00
398-B	552-B	I	Bexar	3	9.16	Dec. 29, 1925	Bituminous Macadam	32,991.37	15,948.65	13,055.56
398-D			Brewster	3	13.88	Dec. 9, 1925	Gravel	98,230.31	39,535.09	35,137.65
401-A	595-A		Robertson	6	10.88	Sept. 10, 1925	Graded earth	72,488.04	84,323.82	0.00
401-Q	595-C		Robertson	6	1.14	May 18, 1926	Graded earth	115,956.84	56,381.57	15,242.64
401-D			Robertson	6	0.23	Mar. 7, 1926	Graded earth	13,003.68	3,740.00	1,406.38
402	423	I	Collin	6	6.19	June 15, 1925	Reinforced concrete	22,261.70	6,640.00	0.00
								198,449.95	80,087.50	37,657.25

Note to Figure 1: This page shows some completed Federal-Aid Highway projects for Fiscal Years 1925 and 1926, in Texas. Courtney of the Buhr Facility of the University of Michigan Library.

Figure 2: A Snapshot of Highway Reports from Wisconsin

TABLE III

STATUS OF FEDERAL AID CONSTRUCTION FUNDS AS OF JUNE 30, 1924

Detailed by counties to show projects completed and under way, source of funds provided, cost of completed projects, amounts allotted to projects under construction, and balance available for future construction.

ADAMS COUNTY

Funds Available—Act of Congress July, 1916, and February, 1919:		
Federal government		$69,008.77
State of Wisconsin		69,008.77
County of Adams		69,008.77
Funds Available—Act of Congress November, 1921, and June, 1922:		
Allotted under Sec. 84.03(3) (a) Wisconsin Statutes (State and federal)		64,984.62
Total funds available		$272,010.93
Expended on Completed Projects:		
Project No. 54—Kilbourn-Friendship road, 5.75 miles—Grading, draining and surfacing with topsoil	$51,053.95	
Project No. 54-S—Kilbourn-Friendship road, 5.75 miles—Reshaping and surfacing with gravel	15,301.97	
Project No.131—Kilbourn-Friendship road, 6.21 miles—Grading, draining and surfacing with topsoil	57,792.06	
Project No. 182—Friendship-Arkdale road, 7.30 miles—Grading, draining and surfacing with topsoil	44,539.60	
Project No. 250—Arkdale-Wisconsin Rapids road, 3.08 miles—Grading, draining and surfacing with topsoil	12,470.48	
Project No. 279—Friendship-Kilbourn road, 3.73 miles—Grading, draining and surfacing with topsoil	23,019.14	
Sub total	$204,177.20	
Allotted to Projects Under Construction:		
Project No. 1039—Kilbourn-Plainville road, 3.6 miles—Surfacing with gravel	18,151.08	
Total expenditures and allotments		$222,328.28
Balance available for construction		$49,682.65

Note to Figure 2: This page shows some completed Federal-Aid Highway projects for Fiscal Years 1923 and 1924, in Wisconsin. Courtney of the Buhr Facility of the University of Michigan Library.

Sources for retail establishment data used in this study: *National Markets and National Advertising,* published by the Crowell Publishing Company in 1923 and *Census of Distribution Reports: Volume 1: Retail Distribution,* published by United States Government Printing Office in 1933. County-level economic and demographic variables are from "Historical, Demographic, Economic, and Social Data: the United States, 1790–2002" (ICPSR 2896). County level geographical variables are those used in Price Fishback et al. (2005, 2007). Paul Rhode generously shared the coordinates of county seats. See Appendix A-3 for information on the "nodes" of the hypothetical highway network.

Appendix A-2: A Note on County Boundary Changes

Data used in this study ranged from the years 1910 to 1930. In those two decades there were a number of county boundary changes which, if not taken into account, would render regression results problematic. In my analysis, I use 1930 county boundaries and adjust for county boundary changes using the procedures described in this note.

I ignore all county boundary changes that did not lead to new counties being created, or existing counties becoming defunct. This should not be a serious problem because no big cities changed jurisdiction during these twenty years. That leaves us with two types of changes: (1) splits that resulted in the creation of new counties, and (2) mergers that resulted in defunct counties. In situations where new counties were created out of one or several older counties, I impute the new county information in 1910 and 1920 through apportionment using the 1930 populations as weights. In situations where older counties were merged into a new county, I combine their 1910 and 1920 information to the county in existence in 1930.

The following are all county boundary changes in the 1910s that resulted in new counties being created. Each case is separated by a comma. For each case, new county/counties come first and pre-existing county/counties are in parentheses.

Texas: Hudspeth and Cuberson (El Paso), Kleberg and Jim Wells (Nueces), Brooks and Jim Hogg (Hidalgo and Starr), Real (Edwards and Bandera), Willacy (Cameron).

Georgia: Bleckley (Pulaski), Atkinson (Coffee and Clinch), Bacon (Ware, Pierce, and Appling), Barrow (Gwinnett, Walton, and Jackson), Candler, Evans, Wheeler, and Treutlen (Bulloch, Emanuel, Tattnall, and Montgomery).

The following are all county boundary changes in the 1920s that resulted in new counties. Again, for each case, newly-created county/counties come first and pre-existing county/counties are in the parentheses.

Texas: Kenedy (Willacy).

Georgia: Brantley (Wayne, Pierce, and Charlton), Lamar (Pike and Monroe), Lanier (Berrien, Lowndes, and Clinch), Long (Liberty), Peach (Houston), Seminole (Decatur).

Milton and Campbell counties were the only two defunct counties in this period. They merged into Fulton County in 1931, but their data was missing for 1930. For all pre-1930 variables, I added Milton and Campbell figures into Fulton's before dropping them.

Appendix A-3: A Note on Nodes in the Straight-Line Virtual Highway Network

As explained in Section 4 of the paper, I use (a) the top 100 most populous cities in 1920, (b) state capitals (if they are not already on the top-100 list), and (c) permanent military forts established during 1914-1918 to be the "nodes" of the minimum spanning tree hypothetical highway network. This appendix lists the sources for those nodes.

The list of top-100 most populous urban places in 1920 can be found here: https://www.census.gov/population/www/documentation/twps0027/tab15.txt. (Note that "Lynn, MA" is incorrectly listed as "Lynn, LA" in that document.)

The list of state capitals can be found here: https://en.wikipedia.org/wiki/List_of_capitals_in_the_United_States#State_capitals

An official comprehensive list of military fortifications built between 1914 and 1918 was not included in Annual Reports of Secretaries of War or Annual Reports of Secretaries of Navy. So I relied on information from the following webpages: https://en.wikipedia.org/wiki/List_of_United_States_military_bases, https://www.fortwiki.com/World_War_I, http://www.fortwiki.com/Category:World_War_I_Forts

I find the list of military bases built between 1914 and 1918 out of all the currently active military bases using the first link. I then add to that list those inactive bases using the second and the third links. In the second step, I did not include temporary training camps facilities that were only used during one of the World Wars. Below is the list of military bases included as nodes. (In cases of name changes and mergers, I only list merged bases under current names.)

Alabama: Fort McClellan, Fort Gaines, Maxwell AFB;
California: Fort Ord, Fort Winfield Scott, March ARB, NB San Diego, MCRD San Diego, MCAS Miramar;
District of Columbia: Joint Base Anacostia-Bolling;
Delaware: Fort Saulsbury;
Florida: NAS Pensacola;
Georgia: Fort Oglethorpe, Augusta Arsenal, Fort Benning (partially in Alabama), Fort Screven;
Iowa: Fort Des Moines, Camp Dodge;
Illinois: Fort Sheridan, Scott AFB, Naval Station Great Lakes;
Indiana: Fort Benjamin Harrison, Jeffersonville Quartermaster Depot;
Kentucky: Fort Knox;
Louisiana: Camp Beauregard;
Massachusetts: Fort Devens, Fort Duvall, East Point MR;
Maryland: Fort Meade, Aberdeen Proving Ground, Edgewood Arsenal;

Michigan: Fort Brady, Fort Wayne, Camp Grayling, Fort Custer;
Missouri: Jefferson Barracks;
Mississippi: Camp Shelby;
North Carolina: Fort Bragg, Fort Caswell;
Nebraska: Fort Robinson, Offutt AFB;
New Jersey: Highlands MR, Fort Monmouth, Joint Base McGuire-Dix-Lakehurst;
Ohio: Fort Hayes, Wright-Patterson AFB, Camp Sherman;
South Carolina: Fort Jackson, Fort Moultrie, Fort Sumter, MCAS Beaufort;
Tennessee: NSA Mid-South;
Texas: Camp Stanley, Camp Bullis, Fort Sam Houston, Leon Springs MR, Fort Crockett, Fort Travis, Fort San Jacinto, Fort Wolters, Fort Bliss;
Virginia: Fort Lee, Fort Story, Langley AFB, Naval Weapons Station Yorktown, Naval Surface Warfare Center Dahlgren Division, NS Norfolk, MCB Quantico, Fort Belvoir;
Washington: Fort Lewis, NB Kitsap;
Wisconsin: Fort McCoy.

Geographical coordinates are from Wikipedia, verified by Satellite images on Google Maps.

Appendix A-4: Current Economic Regions as Clusters

Taking into account spatial correlation, the standard errors reported in all regression are clustered using economic regions defined by economic development agencies or organizations. Current state-level agencies assume that counties within a region are more inter-connected than counties between different regions. By using these regions as clusters, I essentially assume that (1) the spatial correlation between counties in different regions is negligible and (2) the spatial correlation between counties today is not radically different from 90 years ago.

Texas: 13 regions, the list of which can be found at: http://txsdc.utsa.edu/Reference/GeoCountyCER.aspx
Alabama: 12 regions, the list of which can be found at: http://ceds.alabama.gov/wp-content/uploads/2011/05/Statewide-Strategic-Plan-2-19-07.pdf
Georgia: 12 regions, the list of which can be found at: http://garc.ga.gov/latest-news-information/

Michigan: 10 regions, the list of which can be found at:
http://www.michiganbusiness.org/cm/Files/Collaborative_Development_Council/EDC-Map.pdf
Wisconsin: 9 regions, the list of which can be found at:
http://www.forwardwi.com/map.php
Indiana: 11 regions the list of which can be found at:
http://www.stats.indiana.edu/maptools/maps/boundary/economic_growth_regions.pdf
Kansas: no economic regions defined. 8 road districts defined at:
https://www.ksdot.org/district_areas.asp
Missouri: 9 regions, whose information can be found at:
https://www.missourieconomy.org/regional/index.stm

These links above were accessible as of July 31, 2016. There are altogether 84 regions/clusters.

Appendix B: Supplementary Tables

Table 1
First-stage Regressions, with Two Instruments

	(1)	(2)	(3)	(4)
First Stage of Panel A. DV: log(Expenditure)				
log(d_Network)	-0.0994***	-0.232***	-0.241**	-0.291**
	(0.0345)	(0.097)	(0.109)	(0.131)
Number of Bodies of Water	0.0418***	0.0615***	0.0549***	0.0579**
	(0.0154)	(0.0172)	(0.0201)	(0.0280)
Observations	946	946	946	940
1st-stage F-stat	8.041	8.576	9.647	10.901
First Stage of Panel B. DV: log(Expenditure)				
log(d_Network)	-0.108***	-0.202**	-0.251***	-0.316***
	(0.0448)	(0.099)	(0.101)	(0.122)
Number of Bodies of Water	0.0404***	0.0730***	0.0624***	0.0637***
	(0.0127)	(0.0202)	(0.00181)	(0.0229)
Observations	946	946	946	940
1st-stage F-stat	8.140	9.301	10.612	12.151
State FE	Y	Y	Y	Y
No. of stores in 1922, pop density, log distance to city	N	Y	Y	Y
Demographic + geographic controls	N	N	Y	Y
Economic controls	N	N	N	Y
Clustered S.E.	Y	Y	Y	Y

Notes to Appendix B Table 1: The table presents estimated coefficients from the first-stage of IV regression. The only difference compared to Table 4 is that I add another instrument the sum of the number of lakes and swamps in a county. *** p<0.01, ** p<0.05, * p<0.1

Table 2
Second stage Regressions, with Two Instruments

	(1)	(2)	(3)	(4)
Panel A: Percentage Change in the Total Number of General Stores				
log(Expenditure)	-1.645***	-1.401***	-1.188**	-0.867**
	(0.568)	(0.464)	(0.540)	(0.400)
Observations	946	946	946	940
p-value of Overid Test Stat	0.469	0.396	0.553	0.572
Panel B: Percentage Change in the Number of Rural General Stores				
log(Expenditure)	-1.810***	-1.589***	-1.095**	-0.902**
	(-0.610)	(0528)	(0.497)	(0.447)
Observations	946	946	946	940
p-value of Overid Test Stat	0.515	0.601	0.675	0.511
State FE	Y	Y	Y	Y
No. of stores in 1922, pop density, log distance to city	N	Y	Y	Y
Demographic + geographic controls	N	N	Y	Y
Economic controls	N	N	N	Y
Clustered S.E.	Y	Y	Y	Y

Notes to Appendix B Table 2: The table presents estimated coefficients from the second stage of IV regressions. The only difference compared to Table 5 is that I add another instrument the sum of the number of lakes and swamps in a county. Because observations are weighted and standard errors clustered, the over-identification test statistic used here is Hansen's J statistic. *** p<0.01, ** p<0.05, * p<0.1