

Responding to Railroad Hubs: State-Level Coordination and American Political Development

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State policy theories primarily emphasize diffusion, or the spread of new policy innovations across local governments. But, state-level policies' impact on national capacity depends upon more than the diffusion of a particular developmental policy across multiple states. In order to operate efficiently across state lines, state developmental policies must be coordinated. While the diffusion of railroad promotion built national capacity through a bottom-to-top process, the actual value of local infrastructure depends on how well local projects interact with neighboring rail systems.

To be coordinated, state policies must segue relatively smoothly from one state to another, rather than adjusting abruptly. In effect, when states coordinate, they purposefully alter their policies to work better with the neighbor's programs. Without coordination, state policies do not effectively interconnect, limiting their value beyond local borders. Though states are competitive, autarky is not a practical ideal towards which states strive. Even in the best case scenario, where a state requires no resources from other locations, a state would still be interested in moving internally produced products outside of its borders. More realistically, every state requires imports from other states in addition to a means to transfer exported products beyond its own borders. Interactivity is especially relevant to

developmental policies, which are aimed at economic growth (Peterson 1981). Essentially, states seeking to maximize their own positions must produce developmental policies that are compatible with other states, leading to decentralized regional coordination of policies.

Interstate coordination of developmental policies is a general problem that complicates the evolution of local policies, ranging from education to land use policies. States aim to develop programs that serve their own needs, but still allows smooth exchanges with economic partners. Further, coordination efforts actually improves a state's competitiveness. By developing programs that interact well with other states, businesses and citizens that relocate or operate in multiple states face minimal costs in altering their current practices. Coordination is especially salient for transportation infrastructure programs. Transportation networks aim to move goods and people not only around the interior of a political jurisdiction, but must provide external connections to other states. Without interconnections, state transportation systems are unable to transmit goods through their interior as part of a national transportation system, much less move their own goods to distant markets or obtain products and raw materials from geographically distant sites for local manufacturing. Inherently, modern transportation infrastructure is just as concerned with external connectivity as it is with internal access.

The centrality of interconnectivity in transportation infrastructure makes it an ideal lens through which to study the state coordination of local developmental policies. Additionally, though private interests were fundamental to antebellum railroad constructing, state aid programs were a central and highly prevalent aspect in the development of rail networks (Goodrich 1960). Further, rail construction required a charter, which designated the railroad's route and was obtained from the state legislature. Between approving all internal rail routes and regularly funding rail projects, it can be assumed that antebellum rail projects within a state reflect dominant social and political interests, and not merely

the economic concerns of railroad investors. Therefore, railroads are an exceptional case for examining state-level regional coordination.

The process of decentralized transportation infrastructure coordination is salient to American political development since local policies provided numerous services during the antebellum period, which in turn enhanced national capacity despite their local origins (Novak 1996). For spatial development, local coordination is particularly relevant, given that local governments' actions generally preceded national gestures (Larson 2001). Even in the contemporary period, state and local governments continue to heavily fund local roads, state toll-ways, and regional mass transit systems (Rae 1971). In coordinating transportation infrastructure, states are pulled between the need to coordination in order to be successful and economic competition with rivals that leads them to prefer self-interested policies.

State coordination raises three central questions. The first important coordination question is whether states coordinate their local infrastructure programs in conjunction with locally directed improvements. Further, if states are coordinating with one another, not all states necessarily coordinate to same degree. Thus, the second salient question in analyzing coordination is what internal factors persuade a state to pursue coordination. Further, in a more practical vein, decentralized coordination issues raise questions of the quality of local coordination efforts. In the case of railroads, coordination is measured by a state's attempts to improve its connections with the regional hub, the transportation center where the bulk of goods enter and leave the region. Generally, due to economic demands, states pursue regional connectivity. For instance, manufacturing states require strong connections with other locales. Manufacturing is a complex process, involving the exchange of raw materials and finished products. The exchange-based structure of manufacturing leads states with greater manufacturing interests to pursue regional connectivity.

The exception to a preference for connectivity among states is commercially oriented communities, where shipping and the exchange of goods is more central to the economy. Commercially-oriented states, perceiving themselves as viable shipping centers in their own right, tend to avoid linking with hubs. More commercially interested states stand to lose advantage by connecting to major hubs, as shipping and commercial capital could then more easily shift to their larger rivals. The varying rail strategies of states, combined with the lack of central oversight, results in rail systems that are reasonably efficient in terms of regional connectivity, but lack the direct connectivity of national programs. Beyond state cooperation, analyzing antebellum coordination displays the importance of space in state building as well as offering new insights into institutional learning. Specifically, state coordination suggests that institutional development requires supportive spatial connections. Furthermore, the presence of coordinating institutions support arguments of rational, highly responsive institutional structures.

1 Limits of Diffusion Theory

Present diffusion theories focus primarily on the adoption of policy innovations by states, examining factors such as internal politics, local resources, and neighbors' policy decisions in explaining why states choose to pursue new policy initiatives. For diffusion studies, the primary focus is on the factors that result in a state adopting a new policy. However, how policies evolve beyond the original adoption, particularly in response to neighbor states' changing policies, is poorly understood. Regional policy coordination is an important aspect of local policy development, especially for development projects such as transportation infrastructure. Regional coordination decisions are unique from social learning processes, where states borrow strategies and initiatives from their rivals. In policy coordination, states are not necessarily lifting policy structures from other states. For example, the

funding or implementation of the policy may differ significantly between the states. However, in pursuit of their own success, states may shift aspects a policy's operation in order to ease its interaction with potential collaborators in neighboring states. Ultimately, coordination is less about the dissemination of a new policy form. Rather, coordination addresses decentralized adjustments to local policies in pursuit of greater regional interactivity as a function of states pursuing their own local development agendas.

Temporality is present in diffusion analyses, though the specific aspect of coordination remains unexplored. As a policy diffuses, each states makes a decision about when to adopt the spreading innovation. A state's placement in the chronology of adoption predicts the scope of the new program within the state. For instance, states that adopt laws later in the process of policy diffusion tend to produce laws that are larger in scope and generally provide greater benefits than states that adopted the program earlier (Glick and Hays 1991). The adoption pattern may also be U-shaped, with the earliest and latest adopters developing the most robust programs, while states working in median period establish more anemic policies (Clark 1985). State preferences are thus expressed both through the type of program adopted as well as in the chronology of the adoption process.

Beyond the act of diffusion, analyses of state policy evolution also consider the impact of time on internal policy changes. With policy expansion, states increase the scope of an already existing policy occurs due to both internal experience with the policy as well as competition with other states (Boehmke and Witmer 2004). However, policy expansion is treated as primarily an internal process in policy diffusion arguments. Policy expansion theories stress how state's balance insight from other states against their own political and economic situation as a means to improve local policy operations. State *responses* to other states, whether coordination or competitive thwarting, are not factored into policy expansion theories. Further, expansion is defined in a minimal way, examining the expansion or

shrinking of a policy's budget, failing to capture fully the policy's changing scope across time. In sum, state interaction and coordination is not incorporated as an essential part of the local policy development.

Coordination, as distinct from innovation or diffusion, is an important element in policy development, particularly for developmental projects. Specifically, transportation infrastructure theories require coordination theories in order to effectively explain policy evolution. The standards, resources, and infrastructure produced by developmental projects must first serve local needs, in order to maximize growth, attract outside interests, and maintain current populations. But, the commercial and manufacturing processes that benefit from and utilize developmental projects are not isolated. Goods and services developed within the state are not only exported beyond the state's borders, but also require components that are moving into the state from other localities. To operate at their best, developmental policies must be compatible, though not necessarily identical, with processes, standards, and outputs in other states. More than a theoretical possibility, coordination is an empirical puzzle. In the antebellum period, states attempted regional compacts to build significant infrastructure projects. While these projected tended to fall apart, their existence raises questions about local coordination more broadly (Phillips 1908). More recently, interstate projects such as the New York Port Authority stress that regional cooperation is a persistent feature of American federalism (Caro 1975). At the same time, anecdotal evidence such as states purposefully adopting track gauges that differed their neighbors or writing charters that discouraged internal railroads from serving rivals in other states, underscores the competitive impetus within states that discourages expectations of local coordination (Burgess and Kenedy 1949). A theory of developmental policy coordination addresses how states balance local concerns with regional pressures from major trading partners.

Policy coordination as a unique phase in developmental policy evolution is consistent with the diversity of the policy diffusion process. Distinct policy arenas, such as tort reform, welfare legislation, and technological innovations, diffuse at distinct rates and are driven by particularist processes (Gray 1973; Canon and Baum 1981). Further, diffusion policies often possess unusual wrinkles. For instance, social learning may actually slow diffusion processes, as states observe negative outcomes, resulting from poor policy choices, in neighboring states (Mooney 2001). Thus, coordination, a process where states do not borrow policies from their rivals but rather adjust their existing systems to work better with key neighbors, is a significant addition to state diffusion processes. In particular, coordination analyses move beyond the diffusion stage into a phase of careful policy adjustment raising questions in regards to the factors that influence state policy adaptations across time.

2 Minimal State Coordination and Railroads

To enhance the value of their own transportation infrastructure systems, states first emphasize connecting internal commercial sites, such as key manufacturing or farming centers with local ports of entry. However, states share borders with one other, and there are minimal barriers to capital or populations moving across borders (Peterson 1981; Hwang and Gray 1991). Furthermore, no state is economically autonomous, and all states rely on other states as both markets to which they can export their own products as well as necessary trading partners from which raw materials and manufactured goods that cannot be locally produced are obtained. The reality of state competition for limited capital and population reserves leads to questions of whether states will coordinate at all in regional projects. However, states rely on connectivity with other states for their own economic success, forcing states to evaluate their infrastructure programs not just in terms of local

service but also regional compatibility.

Transportation infrastructure policy formation is driven by local economic interests, seeking their own growth at the cost of competitors in other states. In fact, many early railroads were promoted and invested in by local commercial and manufacturing interests, who were more interested in the access railroads provided for their prior businesses rather than the actual profits generated by shipping (Heath 1954; Phillips 1908; Derrick 1930; Wilson 1899). Local economic interests success is determined by the capabilities and resources, including raw materials and human capital, in their own state. Further, local interests are tightly linked to state-level policies, since the state is a significant governance structure that provides benefits and regulation. Competition across borders with similar economic actors combines with a reliance on local governments to lead local economic interests to prefer policies that aid local development, rather than allying with comparable, regional economic interests in other states. At the same time, business prospects in neighboring states encourage local interests to pursue greater regional connectivity. Ultimately, the dependence of local interests on external materials determines the regional coordination the state pursues. For infrastructure expansions, it is practical features of the state, such as economy, that dictate policies. Elements such as partisanship are secondary to the demands of growth, which tend to be universally agreed upon by dominant interests.

Local infrastructure development, which favors improving connections to the local port of entry, is favored by all states. Local ports, the primary internal site for moving goods in and out of the state, are central to any local development strategy. In the antebellum period, local ports are generally located on waterways, including both ocean harbors and rivers. Without strong connections to the local port, moving goods from the hinterland to the key commercial site of the state and beyond to national and international markets becomes exceedingly difficult. However, regional connectivity to the major hub is more

complex. Hubs are major exchange centers, with connection to national and international markets. Hubs occur at the center confluence of multiple transportation routes, such as a major sea port and overland trading routes. Generally, most states pursue connections with the hub, challenging arguments that local competition stalls cooperation. In fact, states pursue interdependent, coordinated policy programs.¹ In particular, when a state's economy is heavily dependent on exports and imports, hub connectivity is more aggressively pursued.² Thus, states that contain high levels of industrial manufacturing, which requires access to fuels, raw materials, component parts, and markets for final products, prefer greater hub connections. Effectively, economic interests within manufacturing states push infrastructure projects that build to the local port and improve connections with the regional hub.

However, states that are themselves burgeoning commercial centers are reluctant to establish extensive ties with hubs. By building better regional ties, challenging commercial cities risk directing more traffic to hubs at their own cost. Thus, non-hub states with large commercial and shipping interests prefer local infrastructure development, as a means of pulling more business to their local port and thereby fulfilling the needs of their own commercial interests. Non-hub commercial states do not ignore the hub; their connections with the hub are just minimal and their preference remains for local development. While states produced rail networks that served both local and regional needs, states did vary in the regional connectivity of their programs, with commercial states avoiding hub connectivity.

Accounting for state-level coordination is a particularly relevant problem for American

¹In the antebellum period, numerous railroad publications and conventions existed. It was presumably through these sources that state officials and business interests could quickly identify hubs and build stronger connections with those sites.

²States may also pursue interconnectivity in general, without any real preference for hubs. Such general interconnectivity seems less likely, though, since non-hub states would have less to offer to their competitors. However, by measuring hub connectivity, the analysis captures the *coordination* aspect of state policy, at the minimum, sufficiently challenging notions of overly aggressive local competition.

political development theories. National capacity, which describes the nation-state's ability to fulfill its goals, can be enhanced not just by national programs, but also through local efforts. However, to incorporate state-level programs into analysis of national capacity, measures of how well local programs operate together is essential. Cooperation, or a lack thereof, is a vital aspect of governance in a federal system. By shifting from diffusion into coordination questions, scholarly understandings of American state building are pushed further.

While states do cooperate, their overall level of coordination remains imperfect. Internally, each state is directed by local political pressures and commercial interests. The result is a haphazard regional network. Instead of directly connecting key cities and points of interest, state routes veer to connect locally important towns. Though there is decentralized cooperation, state-supported railroads remain localist and particularistic in scope. Decentralized coordination is shaped by local interests, which seek to redirect major thoroughfares through their own towns and counties to promote local growth. Challenging arguments that local knowledge is always superior, decentralized railroad planning highlights both the possibilities and limits of decentralized planning (Scott 1998).

Local railroad coordination suggests three distinct hypotheses, which require testing:

1. States build both local hubs and regional ports simultaneously. State infrastructure decisions are not always solely focused on local development and competition with neighbors. Instead, local development is pursued alongside regional plans.
2. States pursuit of regional connectivity varies, as a reflecting of local economic interests. Expanding on the first hypothesis, it is insufficient to simply suggest that states favor local and regional development. It is necessary to also consider the factors that press states to attempt distinctive rail strategies. Industrial and agricultural states, driven by the realities of the manufacturing and shipping process, press for

connectivity, while commercial states tend to avoid greater hub connectivity.

3. Though coordination occurs, the lack of central planning affects the quality of decentralized coordination. Essentially, state-level coordination is less efficient than centralized planning, as a result of local interests having more opportunity to reorient state-level projects.

State railroad coordination offers new insight into local economic development policies, adding further nuances to local economic competition (Peterson 1981). While local competition is certainly a factor in local policy initiatives, the process of coordination adds a new degree of complexity to the process.

Additionally, local railroad coordination places local governments more centrally in the American political development literature. American state building accounts heavily favor explanations of the rise of the central state, often positing that the state capacity prior to centralization was “patchwork” and inefficient (Skowronek 1982; Bense 1995). But national capacity, the state’s ability to marshal and direct resources, was enhanced through alternate means. Though accounts of the central state as incomplete are correct, local governments were vigorous actors that built national capacity through local actions. Despite their active governance roles, local governments are generally not factored into most American political development accounts, leaving a substantial gap in explaining American state building. Increasingly, American political development theorists are turning to the importance of local actors, who in response to both local and national impetuses, mobilized to transform political institutions at multiple levels of governance (Clemens 1997; Valelly 1989; Skocpol 1992; Berk 1994; Sanders 1999). However, beyond the adoption of new policies, few of analyses of local action consider how decentralized actors adjust their policies in reaction other actors within the institutional field. Decentralized adjustments alter the shape of institutional fields, altering their effectiveness and capacity by refining

initial policy adoptions into a more complete, uniform structure. Through the coordinating process, states actually reconfigure the broader institutional field, which in turn exerts a much wider social impact. Hence, beyond influencing the institutions within them, fields are an importance factor in shaping external political and social processes.

3 Methods

To measure state coordination, travel times to local ports and regional hubs are compared. State coordination is evaluated in three different geographic regions, as a means of testing the theory across multiple, disparate contexts. Further, by considering more than one set of cases, the influence of contextual factors on coordination is brought to light. The first region is the American south, specifically the states of Georgia, Alabama, and South Carolina. Regional coordination faces a problem of endogeneity; cities that became regional rail hubs were generally already port cities and major commercial centers. However, in the Atlantic south, the major rail hub was Atlanta in Fulton County, which was a city specifically built in the mid-19th century to serve as a railroad hub (Heath 1954). Thus, the American south is a relatively clean slate where state coordination unfolds with minimal prior influence.

In the north, the focus is on New England and Mid-Atlantic states. For the north, more states were included into the analysis. In New England, the primary hub is Boston, Massachusetts in Suffolk County. The other New England states includes are Maine, New Hampshire, Vermont, Rhode Island, and Connecticut. In the Mid-Atlantic states, the hub is New York City, in New York County, and other states includes are Pennsylvania, New Jersey, Maryland, and Delaware. Table 1 summarizes the counties marked as ports for each state. Some states contained multiple local ports, and the fastest connection from the origin to a local port was always utilized. For the analysis, each state was restricted solely to travel times to its regional hub, and not to other hubs.

3.1 Geographic Analysis

In order to analyze state coordination, network analyses performed in ArcGIS were performed. A network analysis computes the fastest route between two points, determining the travel time between those two points along existing transportation routes. To perform the network analysis, transportation routes for the period were obtained. Rail, river, and canal routes for the years of 1830, 1840, 1850, and 1860 were utilized (MacGill 1917). Since accurate, historical maps of rail routes are difficult to obtain for the antebellum period, the decennial maps were the best option for obtaining route accuracy. The maps were scanned from a paper source, and converted into digital shapefiles, geographic forms readable by the software, through hand tracing. Network analyses are based on costs, measuring the distance or time required to travel a given route. To account for speed disparities between various modes of transportation, travel time was utilized as the measure of state railroad coordination. To determine minutes of travel, each transportation mode was supplied a speed. Railroads were set at 25 miles per hour, and rivers and canals at 12 miles per hour (Nye 1994).³

To compare changes in travel time, origin and destination points must be inputted. The Historical United States County Boundary Files provides county maps for the United States for the relevant period (Carville, Cao, Heppen, and Otterstrom 1996). The maps were projected in USA Contiguous Albers Equal Area Conic, with distance set to U.S. miles. In the south, the central meridian was set to -83.0 W, and standard parallels were 30.0 N and 35.0 N. For the north, the central meridian was 94.0 W, with standard parallels at 29.5 N and 45.5 N. The dependent variable is travel time to the regional hub, compared against travel time to the local port to provide a point of comparison. To determine travel time to the regional hub and local port, the travel time to the relevant point was determined

³Travel times for rivers and canals is set at 12 MPH to compensate for steam travel in the mid-19th century. Under the power of just the current, travel times could be significantly slower, as low as 4 MPH.

for each county in a state. The subsequent travel times were then averaged, and performed for each decade. The network analysis function utilized was the closest facility analysis, which seeks out the fastest route between two points. The origin and destination points within each county were the geographic center of the county. While arbitrary, it provides a convenient measure of the county's access to transportation infrastructure, particularly since other geographic markers such as largest city or county seat are difficult to obtain. To connect the county center points to the transportation network, the river, canal, and rail networks were transformed into their vertex points. Using the near command, the rail, river, and canal vertex closest to the county centroid were determined.⁴ Coordinates for the county centers and the nearest vertexes were obtained, and using Hawth's Tools, straight lines drawn from the county points to the nearest rail, river, and canal points (Beyer). Since local road data is also difficult to obtain for this period, the straight lines were assumed to be "roads" that placed the counties on the transportation network. Road speed was set at 7 miles per hour (Southerland and Brown 1989).

In the analysis, the focus is on comparing the percent change in travel time to both hubs and local ports from the 1830 baseline, when travel was restricted to rivers and canals. Table 2 summarizes the network data used in the analysis, reporting the average, minimum, and maximum travel time to hub and port for each state across the time periods of interest. The table also identified the number of counties in each state in each time period. Percent change is utilized rather than raw travel times in order to account for geographic distance, which would always place states further from the hub at a disadvantage regardless of their internal improvements.⁵

⁴For the South in 1830 and 1840, minor rivers and canals were eliminated, since they would effectively "dead-end" the analysis by catching the program in a loop and unable to access destination points.

⁵Travel data were not weighted. Attempts to weight the data by population resulted in negative travel times. The negative result suggests that improved infrastructure did not follow increases in population. A more likely explanation is that simplified historical maps failed to account for improvements in technology, such as faster locomotives, or redundant lines that offered additional service. No other variable immediately

The model assumes no changes in technology that would have resulted in greater speeds. It also fails to incorporate different rivers speeds, particularly for expanding steam technology and upstream versus downstream differences. Further, the railroad routes do not consider multiple tracks along the same route. Finally, slowdowns due to traffic, rail yards, or “break and bulk” points, where goods shifted from one transport system to another, are not built into the model. The model is stylized, but the lack of details allows a focus on the network itself. Thus, extraneous issues of technology or geography are set aside, facilitating focus on network decisions relative to each state’s status own rail network. Further, since all of these confounding issues are ignored across all points, the basic relationship among the geographic points remains.

3.2 Statistical Models

The sets of data obtained from the network analysis, percent change in travel to time to ports and hubs for 1840-1860, is then incorporated into two statistical models. In each model, the data from across the decades is pooled into a single data set. Network data is supplemented with historical census data (ICPSR Code: 2896) (Haines). Both models utilize ordinary least squares regression, performed both with fixed effects for year as well as without fixed effects. For the first model, the emphasis is on the relationship between states pursuing local port connection alongside connections to the regional hub. The dependent variable is the log of percent change in travel times to the hub, while the primary independent variable of interest is the percent change in travel time to the local port.

presented itself as consistent across time in the data set or theoretically relevant.

$$\begin{aligned} \text{Log}(\%ChangeHub) = & \alpha + \beta_1\%PortChange + \beta_2UrbanDensity + \\ & \beta_3ManufacturingCapital + \beta_4AgriculturalOutput + \epsilon \end{aligned} \tag{1}$$

The other variables included are manufacturing capital per capita, agricultural output per capita, and urban density, all derived from census data.⁶ These variables capture the economic nature of the state, reflecting the strength of various interests. Population density is a useful proxy for commercial activity, for which census measures are poor and vary across decades in the census. In effect, density accounts for the presence of larger cities, which would serve as commercial shipping hubs and potential rivals to other commercial states.

The value of urban density as a proxy for commercial activity in a state is supported by Table 3. In the historical census data, there are three measures for urban density: total population, urban population in cities with populations over 25,000, and urban population.⁷ All three variables, after being normalized by total state population, show a positive relationship with a state’s percentage of commercial workers in 1840. Population density exhibits an especially strong relationship. However, since there is only a measure of commercial workers in 1840, and the relationship among the measures of urban density and proportion of urban workers could change across time, all three measures of urban density were included in the analysis. In the regression, both fixed effects and standard regressions were run three times, each time with a different measure of urban density. As summarized in Table 4, when pooled across time, all three measures of urban density are strongly

⁶No measures of party strength were included. While party’s platforms may play a role in the initial adoption of a rail promotion policy, the role of partisanship in coordination is not necessarily evident. Further, rail policies were heavily favored by all political parties in all regions of the United States, suggesting such measures would provide little traction.

⁷While measures of population in cities with 25,000 or more people might be the best measure of how urban a state is, there were very few cities of that size during the antebellum period, making it a questionable metric.

positive related. Thus, including each measure in the model is theoretically justifiable.

The second statistical model directly measures the degree of coordination between state infrastructure systems. To obtain the dependent variable, which is coordination, the percent change in hub access for a given decade was subtracted from the percent change in local port access. One plus the minimum value resulting from the subtraction operation was added to all the values, to produce a minimum of one. The log of the result was then used in the model. In effect, the larger the dependent variables, the more the state prefers building to the hub over its local port.

$$\begin{aligned} \text{Log}(\text{HubPreference}) = & \alpha + \beta_1 \text{UrbanDensity} + \beta_2 \text{ManufacturingCapital} \\ & + \beta_3 \text{AgriculturalOutput} + \epsilon \end{aligned} \quad (2)$$

As with the first model, the three measures of urban density, manufacturing capital per capita, and agricultural output per capita are included in the model. The measures of density, manufacturing capital, and agricultural output provide insight into how the dispersion of interests within a state impact the state's infrastructure planning. For New York and Massachusetts, travel time to the hub and port is the same, since the same site served both purposes. In Georgia, the hub was Atlanta, while the local port was Savannah, resulting in different travel times to each point for Georgia.

Additionally, Table 5 contains results from collinearity tests on the dependent variable. The VIF (variance inflation factor) is $1/\text{tolerance}$. Tolerance is calculated by taking 1 minus the R^2 of the model that results from every other variable being regressed on a single variable. The closer the VIF is to 1 , the less correlation exists among the variables. Generally, VIFs larger than 10 are cause for concern. In this case, collinearity is not a factor.

Finally, to analyze the efficiency of local coordination, travel time comparisons between

federal road projects in the South and state-based rail projects are performed. The same projection system settings and travel times were utilized for the coordination quality test. Though only a rough comparison, relying primarily on descriptive statistics, the travel time differences offer insight into the differing strategies of central versus decentralized planning.

4 Results

4.1 Hub and Port Relationship

The first aspect of state coordination is whether state's pursue local development projects at the same time that hub connectivity is sought. To test the first hypothesis of whether states build concurrently to both local ports and regional hubs, a regression of changes in hub travel times was performed, measured against port travel times as well as other economic indicators. Not surprisingly, travel times to both hubs and local ports improved concurrently. Table 6 summarizes a series of regressions, treating the percent improved travel time to the regional hub in each decade, as compared to the baseline established in 1830, as the dependent variable measured against percent change in travel time to local port. The bale included effect and standard OLS results. Multiple measures of each state's urban density, manufacturing capital per capita, and agricultural output per capita in the state are also included.

In all of the models, changes in port travel time is statistically significant. Further, its relationship with changes in hub travel time is always positive. Figure 1 summarizes changes travel to port and hub for all the states across this time period, and prominently displays a strong preference for improvements in both systems, and for hubs in particular. The results support the claims of the first hypothesis, notably that hub and port infrastructure improvements occurred simultaneously. Table 6 also offers support of the

hypothesis that dense, commercial states avoided the hub, while manufacturing states actively pursued hub connectivity. Specifically, supporting the commercial activity claim, in all six of the models, the measure of urban density are both negative and significant. Additionally, reinforcing the positive relationship between manufacturing and hub connections, in models 1a and 1b, manufacturing capital per capita is positive and significant. While not significant, the manufacturing measure is at least positive in models 3a and 3b. However, the manufacturing capital measure is not significant in any of the other models, and even has a negative sign in models 2a and 2b, where urban density is measured by the proportion of resident living in cities of greater than 25,000 people. Thus, support for the hypothesis that greater manufacturing interests results in more hub connectivity is generally supported, but the conclusions remain tentative.

Agricultural output is only significant in model 1a, and it is negative. In the other models, though not significant, agricultural output per capital maintains its negative sign. While testing hypotheses against non-significant coefficients is problematic, the immediate conclusion suggested by the analysis is that, in a rejection of the current hypothesis, agricultural states preferred connecting with the local port over the regional hub. However, the main focus of the first model is testing the relationship between building to ports and hubs, and the model emphasizes that states undertook both projects at the same time. In a more direct test of how state characteristics influenced hub preference is presented in the next section.

To further test the hypothesis that port and hub networks were improved at the same time, an OLS regression of the same variables was performed with 1840 data only, the one change being a substitution being percentage of commercial works in a state for any measures of urban density. While problematic, because of the small sample size, the model offers a more direct test of the hypotheses by more directly measuring commercial

activity in a state. Summarized in Table 7, the coefficients mirror the results of the larger model. The signs on all the coefficients are the same, stressing that the basic intuition that port connectivity occurred with hub connectivity as well as echoing the finding that manufacturing states preferred hub connections while agricultural states sought access to local ports. However, none of these coefficients is significant, so not appropriate for rigorous hypothesis testing. The one coefficient that is significant is the number of commercial workers, which is once again negative and underscores the distaste of more commercial states for hub connectivity. In effect, while highly imperfect, the more limited model, with its direct measures, still supports the basic findings of the larger, pooled data set. In some cases, port and hub connection routes may have used the same infrastructure, making the results less surprising. Despite that limitation, the results still indicate that states were open to coordination, pursuing ties with their regional hub at the same time that pathways to the local port were also enhanced.

4.2 Varying Infrastructure Strategies

Though hub and local port access increased together over time, not all states engaged in the same railroad strategies. Understanding state railroad strategy demands moving beyond analyzing how port and hub travel times changed together, it requires analyzing the factors that contributed to states choosing greater rail or port connectivity. Table 8 contains regression analyses where the dependent variable is the difference in improved travel times from port to hub for 1840 through 1860. The larger the difference, the more the state improved local access to the port over regional connectivity. In all variations of the models, more urban states significantly preferred improved travel time to local ports over enhanced hub access: measures of urban density are always significant and positive.

Manufacturing capital is never significant, but is positive in the majority of the models,

implying that greater levels of manufacturing capital leads states to prefer hub connectivity. However, the negative value for manufacturing capital is again in the model where urban density is a function of the percent of the population living in urban centers with populations greater than 25,000. Agricultural output is also never significant, but consistently negative, again suggesting the preference of agricultural states for local development presented in the first model. Similar to the findings in the first model, the results of the second model suggest that densely populated states prefer local improvements to local regional efforts. The overall support for the second hypothesis is mixed. While the coefficients exhibit the expected signs, particularly population density and manufacturing capital, only population density is significant. Across both models, urban density seems to be the largest predictor of rail strategy for antebellum states.

As before, to further test the relationship between commercial interests in dense states frustrating hub connectivity, a regression measuring the relationship between the number of commercial workers in a state in 1840 and regional coordination was performed. While the sample remain small and none of the coefficients are significant, the second test still allows a more direct examination of the theory. Similar to the pooled analysis, measures of commercial activity are negative while manufacturing capital remains positive. In this case, though, the sign on agricultural output does switch to positive. While not suitable for direct hypothesis testing, the smaller model does reinforce the basic findings of the pooled model, namely that commercial states avoided hub connections while manufacturing states established greater hub ties.

The impact of density and manufacturing capital on states' preference for regional connectivity is evident when graphing changes in travel times to hubs and ports against each other. Figure 2 presents travel times in the New England states.⁸ For the most part,

⁸In some cases, travels times appear to increase within each state, as travel time changes actually decrease from decade to decade. The negative slope occurs due to changing county boundaries, as new counties are

states pursue active policies increasing access to both the local port and the regional hub, Boston. New Hampshire, Maine, and Vermont actually build more aggressively towards the hub than towards local ports. In contrast, Rhode Island consistently prefers its own port over improving connectivity with Boston, though the difference is small. Connecticut is more complex, with the state strongly preferring local constructing to regional connectivity in the early years of rail development. In 1860, hub connectivity finally improves more than port connectivity, but only by a small margin.

Travel times for the Mid-Atlantic are presented in Figure 3. Pennsylvania, New Jersey, and Maryland each improve their connectivity to the hub relatively faster than their own local infrastructure to their respective ports. Later into railroad development, both New Jersey and Maryland begin to favor local ports over the regional hub in New York. In the Mid-Atlantic, Delaware actively builds towards its own port, while connections to the regional hub languish.

As presented in Figure 4, in the South, Alabama clearly improved its access to the hub in Georgia more than it focused on improving routes to its local port. South Carolina exhibits a more complex pattern, aggressively building to the regional hub early in its rail development program, but later favoring the local port. Georgia, where the hub and port are distinct sites, is also included, and displays an unsurprising preference for its growing hub city. Only a handful of states possess an ambivalent or disdainful approach to hub connectivity: South Carolina, Rhode Island, Connecticut, and Delaware. Figure 5 summarizes population density, per capital manufacturing capital, and agricultural output per capita for 1850 in the fourteen analyzed states. Rhode Island and Connecticut stand out in particular as states that are quite dense, and potential rivals to the local hub of Massachusetts. In the South, the evidence is similar: South Carolina is a clear cut rival

carved from existing ones.

to Georgia in terms of population density. In the Mid-Atlantic, Delaware is actually less dense than the other states. Pennsylvania or Maryland are more likely candidates to rival New York, based on their density and already possessing significant port cities. But on the whole, a state's decision to rival the hub and avoid hub connectivity flows from its density, and thereby commercial status. As displayed in Figure 5, the states that were dense and less likely to seek strong hub connections were also heavy manufacturing states. Rhode Island actually surpasses Massachusetts in terms of per capital manufacturing capital investment. Thus, commercial shipping interests in the states overcame manufacturing interests, pushing the non-coordinating states to focus on local projects rather than greater regional connectivity.

Significantly, the changes in hub connectivity should not be attributed to geography. Figures 6, 7, and 8 map 1860 railroad routes, mapped against population density, manufacturing capital per capita, and farms per capita at county level. Particularly worth noting is how in the North, where population and rail lines do not always grow together, rail lines and manufacturing capital are clearly positively related. The relationship between the number of farms per county and railroads is less clear, since farms are dense across the entire region. In the South, both manufacturing capital and population rise with a railroad's presence. With only a single map, causal arguments are not possible. However, presumably, as rails penetrated hinterlands, relocation increased the local populations and manufacturing became more viable as access improved. In some cases, due to rail maintenance, railroads themselves most likely directly contributed to an area's manufacturing productivity. In terms of hub connectivity, the maps underscore the large number of connections that existed between states. Especially in the North, by 1860 a veritable web of railroads existed, effectively connecting much of the region together.

For states that avoided hub connectivity, the map underscores that geographic expla-

nations, notably isolation due to location, are not responsible for connectivity decisions. Connecticut, Rhode Island, and South Carolina are not particularly geographically isolated and thereby restricted from greater hub connectivity. For instance, Connecticut has few east-west routes, which would improve its access to the hub in Boston. Western routes were possible, as noted by existence of a handful of western routes in the northeastern corner of the state. Similarly, South Carolina does not construct a northwestern branch into Georgia. Since states with similar geographic placement, such as Maine, Vermont, and New Hampshire, improved tied to the hub, geography alone is unable to explain railroad coordination decisions. Further, the willingness of states such as Alabama and Maine to pursue hub connectivity challenges arguments that ocean-based regional shipping hampered rail connectivity. The one exception is Delaware, a small state with a unique north-south orientation which makes increased hub connectivity more difficult. In accordance with the the second model, states with dense populations tended to be less concerned with hub connections. While the evidence on the role of manufacturing capital is less conclusive, the implications are that non-hub, commercial states avoided rail connections, while more manufacturing intensive states sought out greater hub ties.

4.3 Network Quality

While states engaged in some degree of coordination, the question remains: how effective is such decentralized action in national state building? Comparing the efficiency of the state-supported rail system against the federal post road cut through the region in the early 19th century allows a rudimentary analysis of decentralized coordination, albeit the analysis is limited to the Southern states (Southerland and Brown 1989). Though built while the region was primarily frontier, the federal road still reflects the a centralized state interests: though connecting routes would have been added to link major regional cities, any federal

route would be built around a direct line across the region, to hasten communication between the periphery and the core. The federal road was specifically designed to connect Washington D.C. with New Orleans, bisecting the region in a direct route across the states, as shown in Figure 9. If the federal route is used as a basis of comparison, and we assume that a federal railroad would have sought the same connectivity to the political center, the value of the local roads to regional connectivity and political centralization can be judged.

In this case, the speed along the federal road will be assumed to be equal to a railroad, with a speed of 25 MPH. Since railroads later became postal routes, the speed assumption is reasonable (John 1995). Moving across the region along the post road route, if it were a railroad, would have taken approximately 1600 minutes, compared to roughly 2400 on the actual state-built routes. In sum, the federal route's speed is 67% of the state-sponsored route. The results suggest that state-level coordination was a mixed affair. State-level coordination would have enhanced the capacity of the region, allowing goods and services to move fairly easily (Berk 1994). Local coordination is quite capable, serving citizens efficiently, though the structure of the system would address primarily local concerns in terms of schedule and stops. However, centralization would remain difficult under such a system. The state-based route would have been over 13 hours longer to move from the northern center of South Carolina to the southwestern county of Alabama. The estimated difference is over half a day's travel, and a considerable distance when considering defense or even the rapid movement of information.

But, in contrast to arguments that state railroad systems were poorly conceived and inefficient, these state-developed routes were actually quite capable of moving freight regionally (Nelson 1999). Returning to Figures 6 and 7, the small gaps - such as the lack of a northwestern connection in South Carolina to Georgia - underscore the minor weaknesses that undercut the efficiency of state-level planning. This lack of coordination does

not reflect a lack of capable planning on the local level. Rather, it is the result of local interests having a different set of needs than national actors. The apparent inefficiencies of the state rail system originate from the limited horizon of state projects, which focus primarily on local concerns alongside regional or national nodes. The resulting network was less efficient at connecting major national cities, and thereby resisted centralization schemes while still capably meeting local needs.

5 Discussion

States engage in coordination activities, despite competitive pressures that press states to advance their own causes at the cost of their neighbors and rivals. Interest groups, notably manufacturing interests that aim to export finished goods to other states or require raw materials that are obtained from outside their state's borders, influence local railroads to connect with regional hubs. However, while capable, decentralized coordination still has limits, notably its heavily emphasis on local needs. Therefore, while capacity is built, the central state is not necessarily greatly strengthened. In the case of infrastructure development, state coordination still leaves considerable lacunae. Local roads remain disjointed and imperfectly designed for continental endeavors. The shortcomings of state coordination stresses that capacity building is a distinct process from political centralization, which explicitly aims to limit political decision making to a single site compared to more robust notions of state empowerment implied by capacity building.

The exception to local coordination of railroads is in densely populated states, where growing commercial interests attempt to pull domestic traffic into local ports. Dense states are states with urban centers that seek to rival existing hubs, themselves major urban centers. In effect, local ports are competing with regional hubs, seeking to lift their own status from a local commercial site into a trading center of regional importance. Density

is actually the most consistent predictor of variation in railroad planning strategies. While other factors, such as manufacturing capital, approximated theoretical predictions, only population density was regularly significant in terms of statistical effect. The presence of coordination among states challenges the zero-sum notion with which local economic development policies are generally viewed. While states are competitive with one another, their actual policy behavior is more strategic and nuanced than previously predicted.

The presence of state coordination in development policy, such as infrastructure, has a significant impact on national state building theories. Local policies not only spread across states governments, but diffused policies are also configured to work effectively together. The process of state coordination builds national capacity, as the provision of local services becomes both widespread and uniform, allowing for greater efficiency. Hence, arguments that the early American state's "patchwork" policies were untenable overlook the capabilities of local governments (Skowronek 1982). In actuality, local governments are an important, but still overlooked, aspect of American state building. For instance, beyond infrastructure, local governments provided other decentralized goods, such as military support (Katznelson 2002).

The interaction between centralized and peripheral actors on constructing the modern American state is receiving increasingly greater attention. In particular, social movement analyses stress the interplay between local actors and national organizations - both with one another as well as with multiple levels of government (Clemens 1997). Decentralized coordination among states, as formal components of government, remains an area about which relatively little is known. Yet, states provided many important services in key areas of state building during this period, a role that states even continue into the present day (Novak 1996; Teaford 2002). The regional interaction of state and local policies is not counterproductive. Rather, local political institutions, taking up new political ideas and

integrating those programs with their neighbors, serve an important role in expanding national capacity, outside of central institutional growth at the national level.

Beyond its application in American political development, analyzing state level coordination expands current ideas in regards to institutional field interaction. In the institutional literature, increasing attention is turned towards fields, connected sets of institutions which share goals, structures, and norms (DiMaggio 1991). Interconnected fields can explain the transmission of new ideas, professional standards, and isomorphism through similar, joined institutions (DiMaggio and Powell 1983; Meyer and Rowan 1977). Linked by culture and legal structures, American states clearly constitute a field themselves. Recent developments in the field literature suggest that fields, notably federal system such as the United States, are multilevel structures (Schneiberg and Soule 2005). In such a system, field changes can stem from multiple sources, with pressure for change operating both vertically and horizontally. Yet, analysis of change within multilevel fields, much as with the diffusion literature, emphasizes solely the adoption of a new initiative.

In moving beyond isomorphism and analyzing both the presence and quality of coordination, a more complete view of field interactions is possible. In this case, rather than using the field as a means to explain institutional change, the field itself becomes an object of study. Through examining field coordination, the impact of small institutional changes on broader social and political process comes to the fore. While small coordinating changes may not be significant institutional changes, failing to deviate from current standards or practices in a meaningful way, their sum effects across many actors can be powerful. Hence, railroad policy coordination adjustments may maintain the current institutional logics of economic growth and industrialization. But in coordinating, states produce a transportation structure that is highly integrated and effective, altering external social and political events. In effect, similar to the Gestalt theory, small local changes, done in response to

lateral neighbors, generate much larger social returns.

Finally, state level coordination is a field with numerous future research possibilities. The present analysis fails to fully consider the impact of topography on railroad planning. Further, the method that states used to identify rail hubs remains obfuscated. Finally, since the data collected is broken down by decade, it fails to fully explain when states identify hubs, and the rate at which they adjust their policies. In fact, the analysis is only a minimal identification of the possibility of coordination. Beyond the limits of the current study, coordination offers opportunities for expansion into other policy areas, particularly other economic development policies. Professional standards, education, job training, and economic incentives are all developmental policies with implications that spread beyond local borders, as companies engage in trade across state lines and individuals relocate from one location to another. While each developmental policy area possesses its own unique features and problems, the overarching problem of states meeting their own needs while also developing programs that operate well with other states as a necessary component of local success remains salient across policy areas. Coordination is a generalizable principle that requires further investigation, in order to both build the general concept and distinguish adaptation processes in distinct policy programs.

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Table 1: Local Antebellum Ports

State ^a	Counties
Maine	Penobscot Cumberland
New Hampshire	Rockingham
Vermont	Chittenden
Rhode Island	Providence
Connecticut	New Haven Fairfield Middlesex
Pennsylvania	Philadelphia
New Jersey	Essex Middlesex Burlington
Delaware	New Castle
Maryland	Baltimore
South Carolina	Charleston Georgetown
Alabama	Mobile
Georgia	Chatham

^aLocal ports are sites of entry and export for goods and people. Major ports were developed from historical sources, and no state was given more than three. Each port's location was defined as the geographic center of the county in which it was located, as displayed in Historical United States County Boundary File.

Table 2: SummaryxData of State Transportation Times, by Hub and Port, 1830-1860

State ^a	1830			1840			1850			1860		
	Port	Hub	Port	Hub	Port	Hub	Port	Hub	Port	Hub	Port	Hub
Alabama	1352.29 [37]	N/A	1428.91 [49]	1700.41	1478.10 [52]	1343.79	1218.80 [52]	1015.15	3.33/2291.39	391.58/1792.038		
Connecticut	377.64 [8]	N/A	0.00/2251.14	728.71/2720.79	7.65/2623.29	511.44/2384.65	3.33/2291.39	391.58/1792.038	119.14 [8]	179.87/470.21		
Delaware	0.09/1134.44	1156.22	0.01/461.30	625.48	118.91 [8]	398.017	0.00/225.90	801.27	0.00/225.90	179.87/470.21		
	474.13 [3]	1464.98	414.94 [3]	943.33	291.66 [3]	863.75	127.44 [3]	801.27	0.00/225.90	179.87/470.21		
Georgia	0.61/839.39	990.63/1830.65	0.10/750.86	544.84/1271.07	0.02/565.98	572.09/1138.09	0.02/263.32	673.83/937.15	823.35 [132]	673.83/937.15		
	1208.80 [77]	1523.98	962.28 [95]	922.84	840.46 [95]	526.057	823.35 [132]	564.21	0.00/1313.90	0.84/1516.48		
Maine	2.41/2154.038	0.12/2616.36	2.25/1940.11	0.00/1990.96	0.12/1711.53	0.32/1555.61	0.00/1313.90	0.84/1516.48	346.78 [16]	732.67		
	563.70 [10]	4676.29	454.77 [13]	1387.66	379.97 [13]	986.58	346.78 [16]	732.67	0.00/1097.00	247.05/1762.93		
Maryland	0.00/1484.00	3763.29/5539.29	0.00/992.82	431.94/2719.94	0.00/1063.00	280.78/2280.90	0.00/1097.00	247.05/1762.93	508.00 [22]	1021.80		
	1323.21 [19]	2297.29	585.23 [20]	1075.49	403.59 [20]	98.56	508.00 [22]	1021.80	0.00/1017.11	739.66/1376.97		
Massachusetts	0.08/2498.84	1256.65/2496.61	0.03/1225.93	637.89/1795.78	0.00/877.67	601.65/1513.60	0.00/1017.11	739.66/1376.97	236.98 [14]	236.98		
	958.70 [13]	958.70	396.44 [14]	396.44	221.61 [14]	221.61	236.98 [14]	236.98	21.68/485.11	21.68/485.11		
New Hampshire	0.00/4029.29	0.00/4029.29	0.04/1336.81	0.04/1336.81	0.00/502.92	0.00/502.92	0.00/502.92	21.68/485.11	239.87 [10]	305.27		
	825.047 [8]	3723.90	506.63 [8]	613.72	319.46 [10]	356.13	239.87 [10]	305.27	0.09/554.21	137.38/607.75		
New Jersey	5.60/3134.78	1337.46/4232.54	0.02/848.02	241.47/928.94	0.00/668.98	173.41/745.97	0.09/554.21	137.38/607.75	170.063 [21]	377.31		
	316.93 [14]	647.19	233.20 [18]	382.61	247.056 [20]	411.68	170.063 [21]	377.31	0.00/432.97	109.25/739.54		
New York	0.71/816.64	169.19/1318.31	0.00/684.20	135.92/872.51	0.00/738.78	139.48/899.75	0.00/432.97	109.25/739.54	579.67 [60]	579.67		
	1426.92 [56]	1426.92	1209.68 [58]	1209.68	739.32 [59]	739.32	579.67 [60]	579.67	0.03/1141.67	0.03/1141.67		
Pennsylvania	0.00/3159.49	0.00/3159.49	0.00/2274.63	0.00/2274.63	0.00/1251.01	0.00/1251.01	0.03/1141.67	0.03/1141.67	855.82 [65]	906.73		
	1375.37 [51]	1951.49	905.93 [54]	1130.40	724.73 [62]	946.35	855.82 [65]	906.73	0.00/1966.60	302.71/1996.61		
Rhode Island	0.08/2545.68	622.47/3263.10	0.00/2026.79	340.51/2283.78	0.00/1620.59	0.00/1603.49	0.00/1966.60	302.71/1996.61	127.20 [5]	201.92		
	525.89 [5]	661.82	160.68 [5]	262.23	149.62 [5]	238.37	127.20 [5]	201.92	0.01/230.47	166.66/293.30		
South Carolina	1.56/1602.56	427.53/1447.53	0.03/243.87	228.58/306.74	0.00/263.71	195.34/317.10	0.01/230.47	166.66/293.30	461.039 [30]	859.26		
	804.74 [29]	N/A	705.51 [29]	1279.85	609.88 [29]	911.84	461.039 [30]	859.26	0.41/830.77	528.30/1280.43		
Vermont	0/1667.93	N/A	0.00/1363.78	814.75/1801.36	0.00/1227.36	483.084/1463.18	0.41/830.77	528.30/1280.43	259.28 [14]	517.67		
	1052.60 [13]	2788.56	1040.17 [14]	1698.00	294.24 [14]	544.52	259.28 [14]	517.67	0.00/469.57	354.69/661.30		
	0.00/3003.76	1434.16/4895.29	0.03/3011.72	890.91/2313.17	0.00/573.00	385.07/713.68	0.00/469.57	354.69/661.30				

^aFor each state, the first row reports the average travel time to port or hub for that year. In the port column, the value in brackets is the number of counties in the given state for that decade. The second row in the minimum and maximum county travel time for each state in the given time period. Data is derived from network analyses.

Table 3: Correlation Between Commercial Workers and Measures of Urban Density, 1840

Density Measures ^a	Proportion of Commercial Workers
Population Density	0.86
Urban Population, >25k	0.43
Urban Population	0.16

^aCorrelations display the relationship between multiple measures of urban density and proportion of commercial workers in a state. All measures are developed from historical census data for 1840, ICPSR Data Set 2896. State-level totals for each variable are divided by total population in the state.

Table 4: Correlations Between Measures of Urban Density, 1840-1860

Variables ^a	Population Density	Urban Pop. >25k	Urban Pop
Population Density	-	0.64	0.91
Urban Pop >25k	0.64	-	0.76

^aTable presents correlations between multiple measures of urban density. Data developed from historical census data (ICPSR Data Set 2896), for the years 1840-1860. All variables are state-level totals, represented as a percent of the total population.

Table 5: Collinearity Test for Hub Connectivity Models

Variables ^a	VIF	VIF	VIF
Population Density	1.99	-	-
Urban Population, >25k	-	1.05	-
Urban Population	-	-	5.21
Port	1.99	1.95	2.05
Manufacturing Capital	4.88	2.72	3.89
Agricultural Output	1.92	1.72	2.53

^aVIF scores provide a test for collinearity. The VIF measure is a measure of variance inflation factor, analyzing the degree to which inflation of the standard error is caused by collinearity. The tolerance is 1 minus the R^2 that results from the regression of the other variables on each variable. VIFs larger than 10 are usually a cause for concern.

Figure 1: Percent Summary Changes from 1830 in Rail and Hub Access, 1840-1860

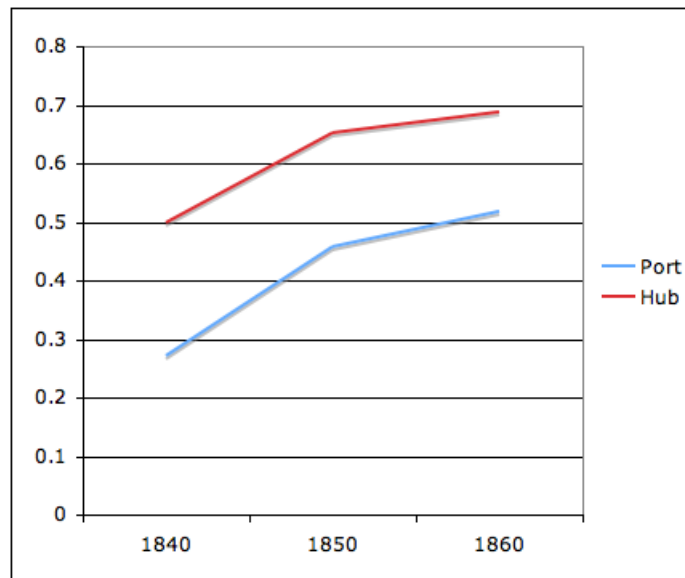


Table 6: Linear Regression Coefficients, Log of Hub Connectivity On Change in Port Connectivity, 1840-1860

Variables ^a	Model 1a	Model 2a	Model 3a	Model 1b	Model 2b	Model 3b
Port	0.51 ^{***} (0.12)	0.49 ^{***} (0.12)	0.49 ^{***} (0.13)	0.53 ^{***} (0.11)	0.53 ^{***} (0.12)	0.53 ^{***} (0.12)
Population Density	-0.0038 ^{***} (0.0012)	-	-	-0.0038 ^{***} (0.0012)	-	-
Urban Population >25k	-	-0.60 ^{**} (0.25)	-	-	-0.44 ^{**} (0.22)	-
Urban Population	-	-	-0.73 ^{**} (0.31)	-	-	-0.57 ^{**} (0.29)
Manufacturing Capital	0.0026 (0.0014)	-0.00079 (0.0012)	0.0011 (0.0013)	0.0027 (0.0013)	-0.000035 (0.0010)	0.0014 (0.0012)
Agricultural Output	-0.0022 ^{**} (0.0020)	-0.0031 (0.0023)	-0.0043 (0.0027)	-0.0017 (0.0017)	-0.00098 (0.0018)	-0.0022 (0.0021)
Constant	-0.32 ^{***} (0.14)	-0.28 [*] (0.16)	-0.20 (0.18)	-0.36 ^{***} (0.11)	-0.43 ^{***} (0.12)	-0.35 ^{**} (0.13)
Fixed Effects (Year)	Included			Not Included		
Observations	40	40	40	40	40	40
R ²	0.55	0.45	0.46	0.50	0.42	0.42
F(4,33)	8.85	7.28	7.08	-	-	-

* denotes significance at the 0.10 level.

** denotes significance at the 0.05 level.

*** denotes significance at 0.01 level.

^aThe dependent variable is log of percent change in travel time to regional hub, as measured from 1830 baseline and developed through network analyses. The independent variable of interest is the percent change in travel time to the local port, also derived from network analysis. Additional variables are developed from historical census data for the years 1840-1860, found in the ISCPD Data Set 2896. All values are state-level totals normalized by the total population of the state. Both fixed effect linear regressions by year and standard ordinary least squares regressions are performed. Each variation on the model alters the measure of urban density.

Table 7: Linear Regression Coefficients, Log of Hub Connectivity on Percentage of Commercial Workers in the State, 1840

Variables ^a	Coefficients
Port	0.41 (0.30)
Commercial Workers	-68.75 ^{***} (18.90)
Manufacturing Capital	0.0034 0.0024
Agricultural Output	-0.0051 (0.0047)
Constant	0.14 (0.32)
Observations = 12	$R^2 = 0.59$

^{***} denotes significance at the 0.01 level.

^aThe dependent variable in the log of percent change in travel time in 1840 to the regional hub, as compared to the 1830 baseline. The independent variable of interest is percent change in travel time to the local port in 1840 from the 1830 baseline. Both values are derived from network analyses. The remaining variables are per capita state-level values, developed from 1840 census data found in ICPSR Data Set 2896.

Table 8: Linear Regression Coefficients, Log of Hub Preference On State Features, 1840-1860

Variables ^a	Model 1a	Model 2a	Model 3a	Model 1b	Model 2b	Model 3b
Population Density	-0.0016 ^{***} (0.00048)	-	-	-0.0016 ^{***} (0.00047)	-	-
Urban Population >25k	-	-0.23 ^{**} (0.10)	-	-	-0.21 ^{**} (0.086)	-
Urban Population	-	-	-0.30 ^{**} (0.13)	-	-	-0.27 ^{**} (0.11)
Manufacturing Capital	0.00074 (0.00055)	-0.00069 (0.00044)	0.000075 (0.0013)	0.00064 (0.00049)	-0.00055 (0.00035)	0.00012 (0.00046)
Agricultural Output	-0.00034 (0.00079)	-0.00063 (0.00095)	-0.0012 (0.0011)	-0.00053 (0.00066)	-0.00030 (0.00070)	-0.00089 (0.00082)
Constant	0.21 ^{***} (0.053)	0.22 ^{***} (0.063)	0.25 ^{***} (0.072)	0.22 ^{***} (0.044)	0.19 ^{***} (0.045)	0.23 ^{***} (0.053)
Fixed Effects (Year)	Included			Not Included		
Observations	40	40	40	40	40	40
R ²	0.37	0.28	0.28	0.32	0.22	0.23
F(3, 34)	6.38	4.18	4.20	-	-	-

** denotes significance at the 0.05 level.

*** denotes significance at 0.01 level.

^aThe dependent variable is state preference for hub connectivity, as compared to port connectivity, developed from network analyses. The metric is developed by subtracting percent change in port from percent change in hub. One plus the smallest value from the subtraction is then added to the data, and the log taken. The independent variables are state-level historical census data for 1840-1860, derived from ICPSR Data Set 2896, and divided by total state population. Both fixed effect linear regressions by year and standard ordinary least squares regressions are performed. Each variation on the model alters the measure of urban density.

Figure 2: New England Changes in Travel Times from 1830 to Port and Hub, 1840-1860

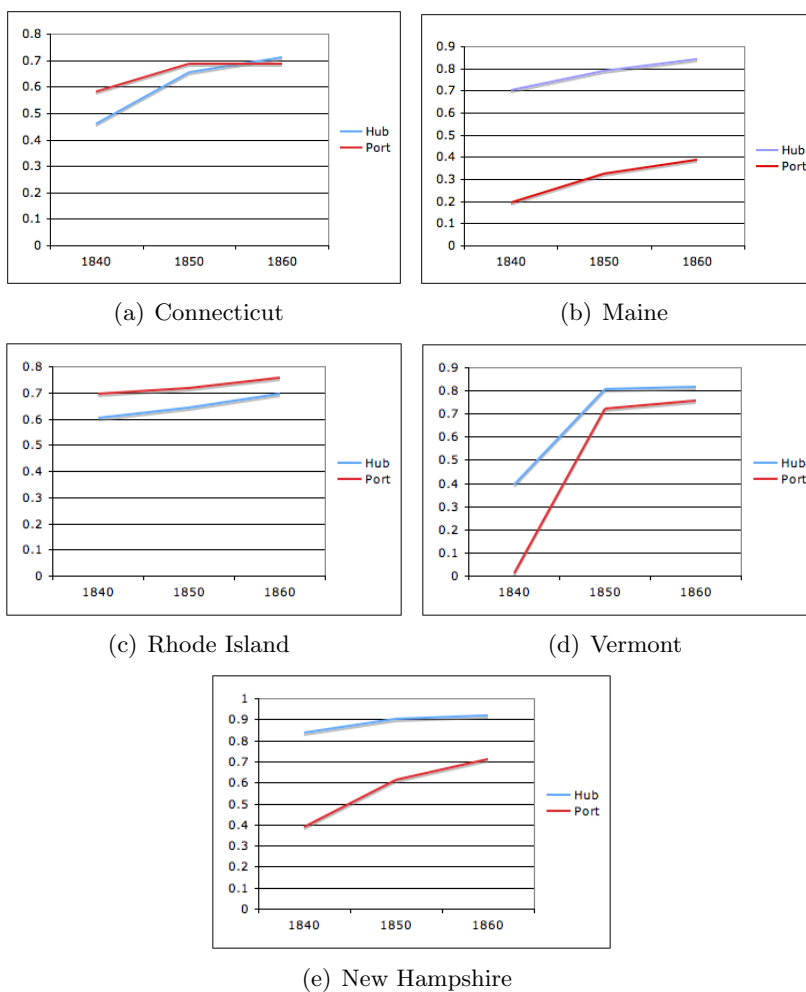


Figure 3: Mid-Atlantic Changes in Travel Times from 1830 to Port and Hub, 1840-1860

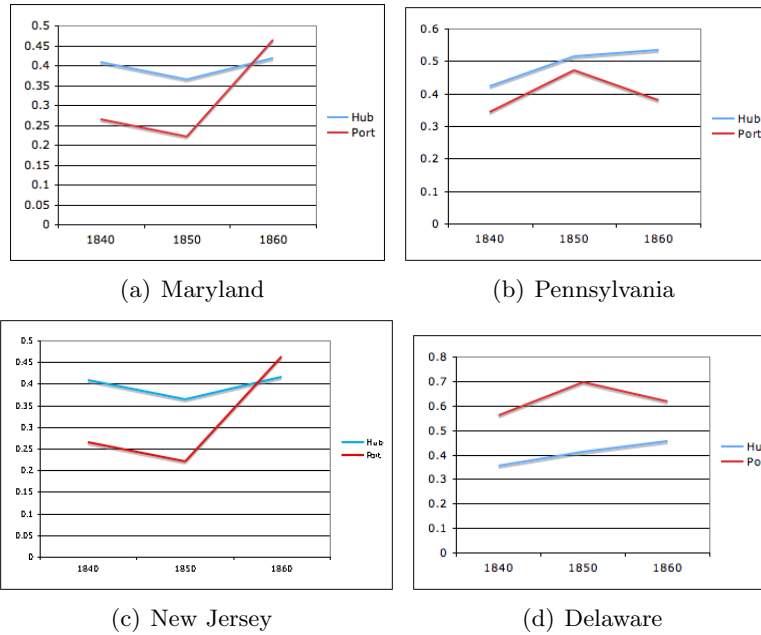
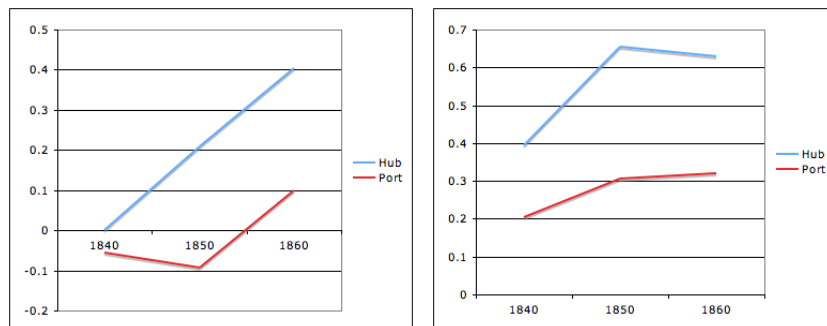


Table 9: Linear Regression Coefficients, Log of Hub Preference on State Features, 1840

Variables ^a	Coefficients
Commercial Workers	-7.50 (9.14)
Manufacturing Capital	0.00053 (0.0011)
Agricultural Output	0.0026 (0.0018)
Constant	0.022 (0.11)
Observations = 12	$R^2 = 0.14$

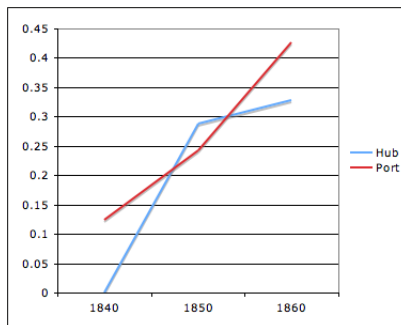
^aThe dependent variable is state preference for hub connectivity, as compared to port connectivity, developed from network analyses. The metric is developed by subtracting percent change in port from percent change in hub. One plus the smallest value from the subtraction is then added to the data, and the log taken. The independent variables are state-level historical census data for 1840, derived from ICPSR Data Set 2896, and divided by total state population. The regression is ordinary least squares.

Figure 4: Southern Changes in Travel Times from 1830 to Port and Hub, 1840-1860



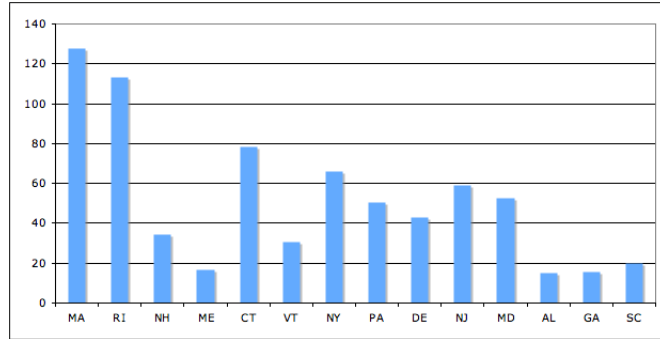
(a) Alabama

(b) Georgia

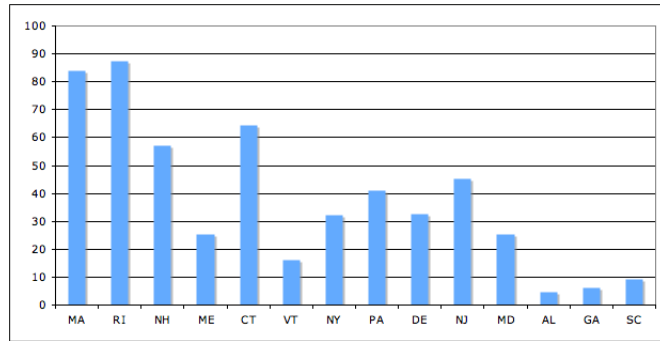


(c) South Carolina

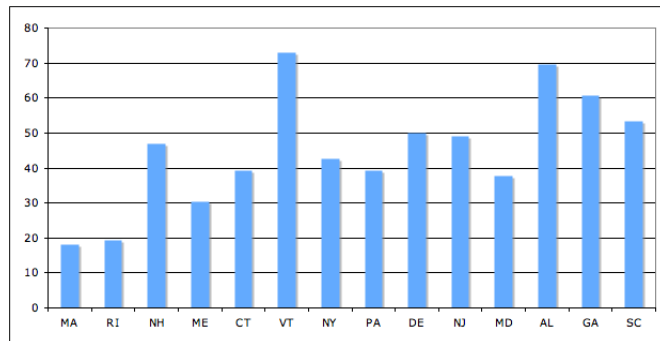
Figure 5: Resource Distribution at the State Level, 1850



(a) Population Density, 1850

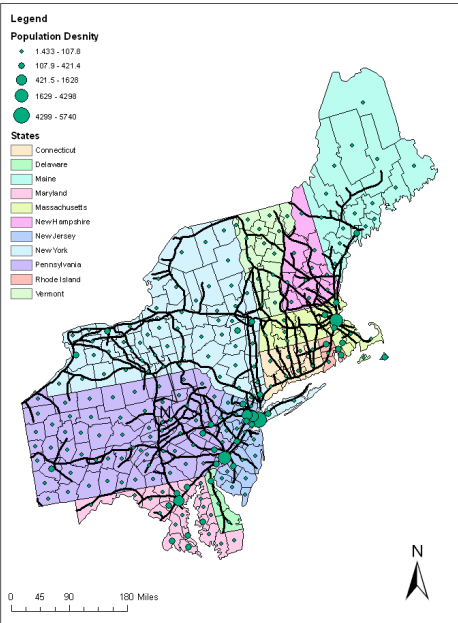


(b) Manufacturing Capital, Per Capita, 1850

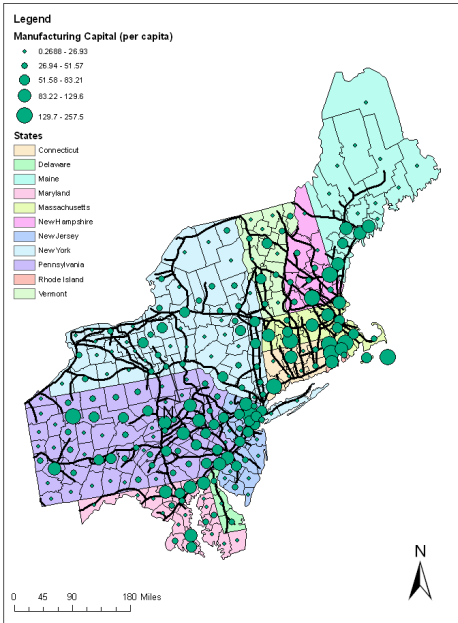


(c) Agricultural Output, Per Capita, 1850

Figure 6: Northern Railroad Coordination by County Level Variables, 1860



(a) Population Density



(b) Manufacturing Capital

Figure 7: Northern Railroad Coordination and County Level Farm Distribution County Level, 1860

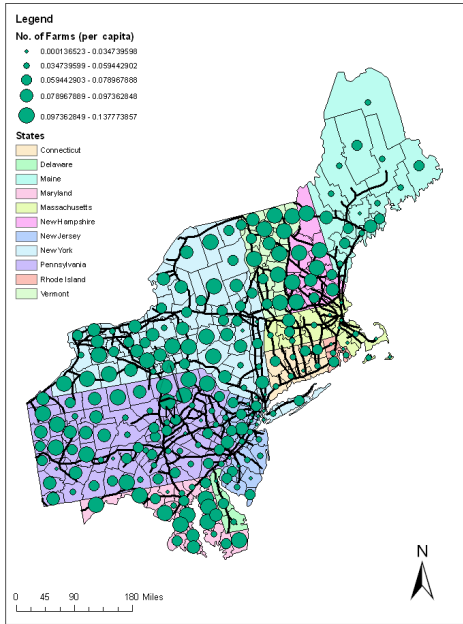
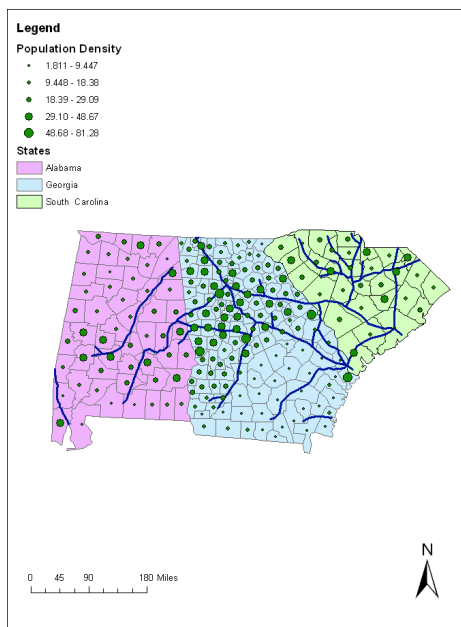
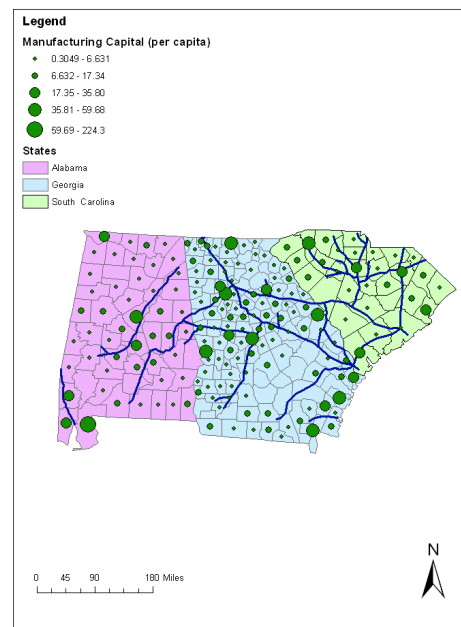


Figure 8: Southern Railroad Coordination at the County Level, 1860



(a) Population Density



(b) Manufacturing Capital

Figure 9: Federal Road from Washington D.C. to New Orleans, 1806

