

Proposed Future Research

I study how information and transportation networks affect economic organization. My work focuses on nineteenth-century America, when transport costs were of the utmost importance and fell dramatically. My focus stems from an interest in what causes vibrant regions. The drastic changes in connections between places in the nineteenth century provide many interesting analogies to the modern world, where communication and transportation technologies have continued to draw distant locales together. I have given particular attention to innovation as an outcome that is vital to growth, exploring how stronger connections between the periphery and the core affect both places.

On the methods side, I am particularly interested in how automated text analysis can be used to uncover historical patterns, since a wealth of historical data exists as prose. My job market paper explores such data but much remains to be investigated.

My job market paper, “Dense Enough To Be Brilliant: Patents, Urbanization, and Transportation in Nineteenth Century America,” examines changes in the geographical distribution of patenting in the nineteenth century United States in response to improvements in access to transportation. This has three distinct parts: the first, documenting that transportation improvements increased patenting activity; the second investigating the claim that this is due to transportation improvements facilitating access to larger markets; finally, the third, examining the effect of transportation improvements on information flows by measuring the appearance of new words and phrases in patents.

I measure innovative activity by the number of patents per capita at the county level from 1790 to 1900. I construct a database of patent locations for 1790-1836 by collecting and geo-coding data from a list of known patents from this period. I link this with a measure of local transportation access, the proportion of a county’s land area that is within a specified distance of improved transportation. All of the data used are archival.

In an OLS with county and year fixed effects, I find a positive and statistically significant impact of gaining local transportation access on patenting, with the size of the effect varying with distance to transportation. The effect is robust to the inclusion of state-year time trends, but is smaller when pre-existing county characteristics are included. This suggests some endogeneity bias, and to address I construct a time-varying “straight-line” instrumental variable to predict access. The IV coefficients are larger in magnitude than the OLS coefficients, but the standard errors are such that I cannot reject the hypothesis that the IV estimates and OLS estimates are the same.

In order to more directly test the effect of increases in the ability of an area to access larger markets, I calculate a cost-weighted measure of market access. Although market access is positively associated with patenting, the coefficient is not robust; in particular, if both market access and local transposition access are included in the specification, local transportation access retains a positive, precisely estimated coefficient, but market access does not.

The final part of the paper considers the impact of transportation improvements on information flows. Here I use the digitized text of patents. Using powerful text processing software, I construct a measure of the novelty of words and phrases that appear in a county's patents. To illustrate this, consider the word "vulcanization", which first appeared in a patent filed in New York City in 1848. I look across all patents filed anywhere after the first appearance for uses of the word, either within a given time frame (e.g., ten years) or until the end of the century. My list of novel words is constructed by a) looking for n-grams that did not appear early on but were common later, b) picking n-grams that are key to important patents of the nineteenth century as found in book that survey innovations of the nineteenth century (Brown, 1994; United States Patent and Trademark Office, 1981; van Dulken, 2001) both by hand and algorithmically, and c) finding synonyms of the concepts from the important patents in the Oxford English Dictionary's Historical Thesaurus. My analysis of the patents' text shows that the rate of patents mentioning newer technologies does not increase, and may weakly decrease, with increased local access to transportation. These results suggest that access to local transportation lowers the effective cost of patenting by forming a nexus around which local agglomerations occur, in a way that does not change pre-established information networks.

An importation question opened by my paper on the geographic distribution of patents, and which is unanswered in my proposed work above, is: Do inventors move to newly connected areas after they are connected, or were they previously settled there? I am actively working on exploring this question with Nicolas Ziebarth, by matching nineteenth century inventors with their census records.

Following on my job market paper, the question of how innovations change response to transportation improvements and urbanization is one I will explore in more depth. Preliminary results suggest that urbanization, rather than transportation, determines the type of innovations patented in an area. After a period of contact with the railroad, inventors in that county will start patenting improvements on technology related to the railroad, but will otherwise patent improvements on the same technologies they had previously improved. Perhaps areas outside the core are simply different from the core, or perhaps they are behind the core in a way that can be measured. I will examine the urban/rural divide in innovation, documenting the difference in movement between words that represent agricultural and non-agricultural inventions, and how they vary across time and space. This will allow a better picture of the innovation process, mapping information flows through text.

A detailed data set on the location of improved transportation in the nineteenth century United States will link word use in patents to transportation. Urbanization will be explored by using portage sites as an instrument for future urbanization. Portage sites are areas where boats carrying goods need to be unloaded and moved overland. Before the transportation revolution, these areas were foci for settlement. But after the initial wave of transportation improvement in the early nineteenth century, these areas were no longer important except through path dependence in settlement patterns. Thus, they are an excellent instrument for future urbanization.

This knowledge of how areas respond to the building of infrastructure and the development of urban areas will provided insight into the great invention wave of the nineteenth century. This invention wave represented the shift from the slow acceleration from the early industrial revolution to modern rates of innovation, improving our understanding of how newly developing areas become integrated (or do not become integrated) into a larger economy.

I also hope to study information flows and innovation more directly by combining data gathered from the text of patents with data available on Google Books and historical newspapers to see where the same phrases appear in general discourse. This will give a more accurate picture of how information networks evolve over time and what kinds of commutation is transmitting ideas. I hope to use a single event that made knowledge more widely available, like the 1851 World's Fair, and track information flows resulting from the event. This would make the specific geographic linkages between places apparent.

In addition to my work on patents I have three other projects I am excited to continue. The first takes a slightly different perspective on growth and the organization of society, Peter Sims and I argue in “Superstars and Scale: The Effect of Market Size on Top Income Inequality” that the superstar effect is far more pervasive—and has a much larger effect on income inequality— than it has been given credit for. This superstar effect is greatly enhanced by technologies that allow one person's skill to affect a larger area and is not limited to those at the very top of the corporate hierarchy, but rather pervades a large number of industries that provide services to firms (e.g., lawyers). The disruption in trade caused by the politics of the inter-war period provides a setting in which the scale of firms is externally reduced.

The final two projects are ones with Steven Sprick Schuster. The first of these looks at the institution of postal savings, a system implemented in 1911 and aimed at people whose savings were too small to be of interest to private banks. These postal savings system saw sharp increases in use after banking crises, and may have helped to lessen the impacts of these crises on local communities. The data on the use of the postal savings institution has been collected, and geographically matched with private bank balance sheet data. We are considering exploring several questions, including the impact of state level deposit insurance on the use of banks *vis a vis* postal savings.

The second of these project explores the effect of the introduction of Parcel Post, introduced in 1913, on the rural general store and the town centers they supported. The introduction of Parcel Post was strongly correlated with mail order sales, both anecdotally and as seen in Montgomery Ward's revenues. We are in the process of collecting data on mail order sales and rural general stores.

These projects will improve our understanding of how changes in the links between places effects overall economic organization. I am very excited about the information that text analysis will allow researchers to access, in particular giving us new ways to map information flows. In the next few years I plan to complete the projects I have described. I have no doubt that the process, and interactions with my peers, will reveal new questions and avenues that can be explored through textual data.

References

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