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Innovation Hubs as Importers and Exporters of Human Capital

The geographic distribution of productivity in the US is extremely unequal. In 2016, GDP per capita was $119,695 in the San Jose-Sunnyvale-Santa Clara, CA metro area and $77,502 in Boston-Cambridge-Newton, MA-NH metro area. In contrast, nationwide GDP per capita was only $57,467. These stark differences also show up in direct measures of innovation. San Jose-Sunnyvale-Santa Clara, CA had 7.4 patents issued per thousand residents, Boston-Cambridge-Newton, MA-NH had 1.2 patents issued per thousand residents, while the nationwide average was only 0.44 patents issued per thousand residents.

However, these dramatic spatial differences may overstate or understate the local area's contribution to aggregate innovation and productivity. If "superstar cities" are attracting the US's best talent such that the highest ability people migrate away from their state of birth to work in these cities, then these spatial disparities may overstate the true geographic differences in local productivity.[1] In contrast, the US's most productive workers could migrate temporarily to these innovation hubs to acquire unique human capital, but then may return to their state of birth or another part of the country to pursue their careers. In this scenario, many US cities would have workers "temporarily brain drained" to superstar cities, but ultimately these workers would return with knowledge and human capital, improving local productivity. Indeed, this would lead us to undervalue the contribution of these top cities to aggregate productivity and innovation. In addition to producing output, these cities produce human capital, which is exported to the rest of the nation through migration. Further, the ability of workers to export human capital from high productivity areas could help rationalize why these workers are willing to pay such high housing prices to live in these areas, since they are not only compensated by wages while living there, but by future higher wages due to human capital accumulation.

In this project, joint with Prof. Shai Bernstein and Prof. Tim McQuade, we will link the universe of issued patents (which contain data on inventors' names and city of residents) to a new panel data source that provides address-level migration decisions and housing characteristics for close to the universe of adults in the US, regardless of where they migrate. These new migration data come from the private data provider Infutor. Infutor pools data from many sources such as telephone books, real estate records, voter registration files, auto sales, and credit header files to create detailed address histories for all adults in the US. I have used these data in my previous work on rent control in San Francisco and found them to be extremely high quality. These data also contain demographics such as state of birth, age, and race. These linked data will provide the first analysis of the detailed migration decisions across the US and how current and previous geographic location influence patenting rates and patent citations. Further, we are in negotiations with the credit data provider TransUnion to purchase linked credit data information, which would allows us to observed annual detailed information into these inventors financial lives. This would provide us with additional measures of economic success.

[1] This point has been highlighted by previous research, and has found to only contribute a small amount to spatial disparities. However, this has been studied in the US using small samples of survey data (Glaeser and Mare (2001), Moretti (2011)).

We can harness the incredible detail of the patent data to measure narrowly defined industries and fields of patenting to quantify many dimensions of human capital. Further, our migration data allow us to measure exactly how long inventors lived in each city, regardless of whether they patent there. By combining the variation in which industries and which cities have particularly high patenting rates, along with the temporal variation in how long each worker is exposed to each city based on his migration, we hope to quantify his accumulated human capital and this human capital's impact on his subsequent patenting and financial outcomes in other cities. We can then calculate what share of patents issued can be partially attributed to the human capital acquired from inventors' previous locations of residences. Obviously, we have to be careful to disentangle the correlation of the relationship between migration and patenting with its causal effects. We plan to build on previous work by Chetty and Hendren (2016) who use the amount of time migrants are exposed to different areas as the measure of treatment.

Ultimately, this allows us to compute the aggregate and distributional effects of innovation hubs on the productivity in other cities. Some cities may predominately suffer from "brain drain," losing its best workers to top cities. However, other cities may gain on net because temporary brain drain can ultimately lead to more productive workers when they return. Further, the effects of local innovation spillovers on local workers' human capital is a previous unstudied mechanism through which agglomeration operates. Quantifying the economic importance of this type of spillover could help inform optimal place based policies that influence high skill firms geographic location choices.

I believe this project fits within the innovation grant's focus on scientific and engineering workforce issues. First, it will quantify how the migration of inventors enables all cities to benefit from the innovation hubs of superstar cities. This also helps inform how inequality across cities affects who benefits from innovation. Second, this has important macro implications if the productivity advantages of the most productive cities ultimately trickles down to improve productivity and output of all cities by exporting human capital. Finally, this study will help quantify the role of human capital accumulation beyond traditional education among inventors and how geographic location influences accumulating this type of human capital.

The budget from this grant will used towards research assistant support and/or the cost of purchasing credit data for these inventors.

Bibliography

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