Transportation Construction Influences on the Pacific Northwest Technology Demand

Brian Kang *

Department of Economics, University of Washington

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1 Introduction

During the past decade, several urban cities in the Pacific Northwest, notably Seattle, WA and Portland, OR, have experienced rapid population growth and economic success by becoming the international hubs of the digital economy and engineering market. Global tech giants like Amazon and Microsoft have planted their roots in Seattle by occupying a large proportion of premier office space available in the city and by adding many jobs to the local economy. Same goes to Intel and Google in Oregon. This robustness of the Pacific Northwest economy only continues to attract more businesses and population migration in a seemingly exponential rate. Since a rising tide raises all ships, suburban communities like Spokane, WA and Salem, OR (Building Solutions 2017) have also experienced population growth and economic expansion by providing high amenities such natural landscapes, cheaper housing, and relatively short commutes.

However, the cities in the Northwest also face multiple issues as there are limited space and resources to quickly adjustable to satisfy the global economies' demand. Housing prices skyrocketed, homelessness crisis worsened, traffic congestion aggravated, and gridlocks at ports peaked (Adam Millsap 2018). In reaction to this, Seattle and Portland quickly increased transportation funding and introduced many ongoing construction projects to alleviate the transportation issues. Some of the cities' efforts include expanding the Seattle-Tacoma International Airport (Seattle 2017), establishing new bus stations, and establishing new light rail lines (Transit 2019). From now on, Seattle and Portland as a pair will be referred as metropolitan statistical areas, or MSAs, defined by the U.S. Office of Management and Budget as "a core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration with that core (Census 2010)."

In this paper, we will inspect in depth upon this phenomenon occurring in the Pacific Northwest MSAs to answer how the transportation system constructions appeal tech giants to move to the Northwest and affect the tech talent market. We will also empirically analyze its economic implications and qualitatively discuss the potential policy implications it may result in the Pacific Northwest. We will use large, spatially organized datasets to research and explain the current trends of both transportation construction and the tech market behaviors. We will also use historical data and previous research to link the two independent subject matters.

The remainder of the paper is organized as follows. Section two will involve introducing what previous academic literature as already been written on our related topic of transportation, construction, and high-tech jobs. Section three will present our collected data that was analyzed. Section 4 demonstrates our strategy; how we go about answering the relationship between construction and the tech demand. Section 5 describes the conclusion we reach through our data and previous literature.

2 Literature Review

The question aiming to relate transportation construction to the tech demand the Pacific Northwest was very narrow and there was difficulty finding any previous literature directly supporting our hypothesis. However, many research and academic journals have been done separately on transportation and the emerging tech market. From here we extrapolate a couple articles we use to support our hypothesis.

2.1 Amenities to High-Tech Jobs

Dorfman, Partridge, and Galloway 2011 implemented geographically weighted regression techniques along with a smoothed Bayesian spatial model to investigate the relationship between high-tech job demand and amenities present in urban or rural areas. They show that the high amenities in certain locations are not necessarily the drivers to attract high-tech workers and jobs, or rather that the natural amenities present significantly affect high-tech employment growth, especially in micropolitan locations outside of the MSAs. However, they do not deny the fact that it is hard for state and local policy to directly influence advanced tech firms' locations. They are often drawn to locations that happened to stress organizational and cultural aspects rather than public policy like Silicon Valley or incidentally spread their roots in cities like Seattle. Also, they acknowledge that "locations without access to pools of technical labour for R&D and production will not be conducive to attracting high technology firms."

2.2 Models of Transportation Projects

Weisbrod 2008 examines various types of predictive economic models made for accessing the nature of economic growth impacts of transportation projects from historical examples. Then, new methods of modifying the models are introduced to outline the assessment of transportation projects' impacts on business productivity, growth, and attraction. This critical examination of past models and developing them setback the inadequacy in transportation decision-making. Because transportation projects not only depend on economic benefit, time, and cost, but also "accessibility roles in the supply chain, labor market expansion, (and) global trade growth," improper use of computer analysis methods and tools used by the government and consulting firms are targeted in this literature. Such research make the significance of increased and well-used transportation funding clear when it comes to making a difference in economic growth and enhancing performance.

3 Data

The empirical data we found are collected from the St. Louis Fed's Federal Reserve Economic Database (FRED) and annual reports published by building material, real estate, and construction project management firms[1]. From the FRED we extracted multiple time series data that explained the general trend of the past total spending on nonresidential, commercial, transportation, and highway and street construction (Census 2019(c)). All data are in units of millions of dollars and seasonally adjusted annual rates. During the past decade, we see that total construction spending in the U.S. generally increased, but we observed the beginning of the slight decrease in spending starting January 2018. This behavior may be due to the possible start of a recession. Also, we observed that the total spending on highways and street construction was very erratic. We add on to this broad trend by focusing on the Northwest data.

3.1 Construction

Building material firm, CRM Americas' published forecast reports included a variety of constructional data and overviews of economic activity , which included U.S. forecasts based on regions, states, and MSAs (Intelligence 2017). As a whole. they speculated that national total construction would likely grow by 5% in nominal dollars, higher than the previous year. Of the 5% lies an expect 4% growth in non-buildings (roads, bridges, and infrastructure) and 4% growth in non-residentials (commercial, industrial, *et cetera*), all significant increases from the previous year. Now concentrating more to the Pacific Northwest, Washington experienced a 4 percentage point decrease from 5% to 1% while Oregon saw an increase from 5% to 7%. Speaking of our two MSAs in interest, Seattle saw an decrease from 4% to -2% while Portland maintained a stable 4%. According to this report, this is due to the predicted increase in labor and total materials cost of 4%, resulting an overall increase by 3%, following the previous year's 3% increase.

3.2 Tech Market

Real estate firm, CBRE's report included diverse panel data of rankings based on 13 metrics, market growth rates, cost of operation, quality of talent, and impact on commercial real estate of tech talent markets in the North America, including MSAs in the Pacific Northwest (CBRE 2017). According to this research, "the top-three markets are the San Francisco Bay Area, Seattle, and Washington, D.C. (Yasukochi, Russell, and Levy 2018)" Portland, OR ranked 21st. More specific data provided included population distributions in the market by age, average education levels, flux of immigration, diversity in the market, *et cetera*.

[1]Rider Levett Bucknall is not referenced in this paper.

4 Strategy

In this paper we want to study the phenomenon between transportation construction in the Pacific Northwest, or our MSAs, and the change in demand of the tech in this area. That is, we plan to explain why many tech giants today want to expand into the Pacific Northwest and why the tech labor market was able to be wanted globally all in terms of the recent increase in transportation construction in our region. Ultimately, we aim to illustrate that transportation construction is directly related to the partial increase in tech demand in the Pacific Northwest, or at least that the two are positively correlated. To study this, one would use empirical data for construction spending over time in the Northwest and the data indicating the measurement for tech demand index with the same type of panel data. One would then use either OLS regression, IV estimation, or the LASSO to estimate the partial causal effects. However, unfortunately, the data for tech market indices or "demand of tech market" is very vague, elusive, and nor widely available. Then, there are no concrete continuous or discrete variables that would allow us to define a model, and we cannot answer our hypothesis with an econometric approach. This led us to use quantitative data that individually explains the trend and behavior of both construction spending and tech market growth. We will then incorporate past literature to support our hypothesis through qualitative analysis between the two individual phenomenons.

To elaborate more in detail, let us first agree that high-amenities, excluding natural amenities, are normal goods and as income level increases the demand for these amenities increase. Let us also agree upon the assumption that transportation is an amenity available in the Pacific Northwest MSAs and these MSAs, as the core of the tech economy, generally have higher income. Thus, the MSAs demand more of the transportation goods. Under these assumptions, we will be using data from CBRE 2017 to analyze the tech market in Seattle and Portland and Intelligence 2017 with Census 2019(d) to analyze the behavior of transportation development. Then, previously researched articles will qualitatively connect the construction trend to the tech demand. As we better explain the causal or correlated relationship, we say that better modeling available in the MSAs lead to better transportation available to members of the tech labor market as amenities, and these laborers take advantage of it and so attracts the overall tech market to these MSAs, including the tech giants.

5 Result

We now reach the verdict for whether transportation construction attracts tech workers to locations in the Pacific Northwest where the tech employers or giants will follow. First we report the individual specifications for transportation construction and the tech talent market. Our data shows that total construction has grown by a large factor as a whole the past few years in the U.S., especially for non-residential construction, including commercial and roads

and bridges (Intelligence 2017). However, state-wise, Washington experienced a large decline and Oregon saw a mediocre growth of 2%. MSA-wise, Seattle experienced a 6% decrease and Oregon saw no change. Nationally, we also see a consistent increase in construction cost of about 3% and seasonally adjusted total construction spending on transportation has increasing by about 42% since the past decade (Census 2019(d)). Despite the ever growing spending on transportation and other construction, as a whole, we do not observe much growth nor activity in the Pacific Northwest. On the other hand, we observe a staggering prosperity in tech talent demand and growth in the Pacific Northwest MSAs (CBRE 2017). Seattle is the second best tech talent market and Portland is 21st out of 50 largest markets in North America. Seattle and Portland respectively experienced a staggering 19.4% and 25.4% growth increase in the tech labor market. Both MSAs had one of the highest educational attainment rate, high-tech jobs added, and total influx of tech-labor migration in the nation, implying the exceptional vitality of the demand for tech in the Northwest. Such markets naturally entice potential employers, the tech giants.

Using the data that illustrate the behaviors of the two seemingly independent phenomena, we explain the possible correlation between them. Assuming that transportation is a high-amenity normal good and MSAs have higher demand for such goods due to higher average income, we expect the Pacific Northwest economies to experience labor-pooling effects and more specialized inputs. That is, advanced technology firms and its employees will be clustered around the Seattle and Portland MSAs (Dorfman, Partridge, and Galloway 2011). Such clustering of firms and increased demand for the MSAs' tech talent cause population density to gradually increase and incentivizes people to take advantage of the transportation good. When this amenity is properly evaluated and developed, it "enables new forms of trade among industry and locations, reduces cargo loss and enhances reliability of existing trade movements, expands the size of markets and enables economies of scale in production and distribution, and increases productivity through access to more diverse and specialized labor, supply and buyer markets" according to Weisbrod 2008. Seattle and Portland has exactly experienced all the benefits of their developed transportation system; thus, by the transitivity law, we can conclude that the transportation constructions positively influence the Pacific Northwest technology demand, to some degree.

On the issue of relating our two factors, our results are unfortunately weak and non-concrete. While we expected the Pacific Northwest construction to be growing rapidly, it turns out to be stale and even slowly declining. We did not see a very strong increasing trend like the tech talent market, the correlation of the two factors weakens. Also, because we could not access concrete data of the tech demand, as opposed to qualitative analysis using past literature, developing a econometric model was infeasible. For more accurate analysis and reaching a reasonable causal inference, surpassing simple correlation between transportation construction and tech demand, we conclude that concrete data becomes critical.

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