

Do Large Corporate Relocations Benefit Growing Cities They Impact?:

A Comparative Analysis

By: Brianna R. McGowan, Jessica Tran, and Murtatha Ali

Abstract

The purpose of this paper is to analyze the effects that large corporations have when establishing their headquarters in defined growing cities in order to conduct a comparative analysis on another city that is expected to experience a similar shock. Initially, the logical assumption seems to be that it is beneficial for a growing city to invest in attracting a large corporation to relocate there. Our goal is to analyze the public data in order to make a claim against or for this assumption. An essential component of our project is outlining how we define certain terms within our analysis and how we address them. We defined a “growing city” as a city that has outpaced the national average in growth in a given period, and a “large corporation” as a publicly traded company. Furthermore, we adhere to our research methodology in order to come to an accurate conclusion about the effects a large corporation has when it moves to a growing city: Our methodology encompasses regressing average rent on relevant variables that will explain the effects of the establishment of a large corporation in a growing city. By looking at a time-series of rent prices in multiple cities before and after a company moves in, it will help gauge the correlation and causal effects of the headquarter establishment. Specifically, we will use data on rent trends in multiple cities where a corporation has established their headquarters that yielded significant job creation. Observing these trends from case studies, we will isolate the shock the job creation caused and analyze its effects of rent prices in the respective city, incorporating the five axioms of urban economics.

Introduction

It is exciting news that Amazon has chosen to open a second headquarters, and recently narrowed the list from 238 to 20 cities. Austin, TX is a growing city with a lucrative economy and offers a vibrant atmosphere, so it's no surprise that Austin is one of the twenty cities still in the bid. The jaw-dropping 50,000 surplus in new job creation of high skilled labor Amazon will stimulate makes Amazon's second headquarters a highly coveted prospect. To predict the impact of Amazon opening their second headquarters in Austin on Austin housing prices, we observed data from a similar situation: ExxonMobil, another large corporation, that established a campus in Houston, a similarly growing Texas city. We conjecture that these two scenarios are similar enough that the resulting change of housing prices in one will accurately reflect the directional change of housing prices in the other. In 2015, ExxonMobil completed construction of its new campus in Houston bringing in 10,000 new jobs to the area. "But perhaps the biggest boost for the city is what ExxonMobil's campus has done to heat up the real estate markets in city's north and northwest sectors. While the primary job centers grew close to the city's center, the northern part of the city had attracted its fair share of growth over the years. But the arrival of ExxonMobil supercharged the region. Dozens of new projects and real estate deals were spawned by it and by the accompanying northward growth of the city."¹ It is well known that ExxonMobil's move to Houston had a substantial impact on the city, namely on real estate prices. After finding multiple articles that support this claim, our team decided to conduct our own research on the effect of ExxonMobil's

1

<https://urbanland.uli.org/development-business/exxonmobils-new-campus-giving-houston-second-energy-corridor/>

move on housing prices in Houston in an attempt to compare and predict the effect of Amazon's move into Austin. We expect there to be a short-term spike in housing prices in the time-range of a ExxonMobil's move into a Houston and, therefore, with Amazon's move into Austin.

The second case we studied was Nintendo establishing its new North American headquarters in Redmond, WA. In order to understand the impact, we studied data on the Seattle-Tacoma-Bellevue metropolitan statistical area (MSA), which includes Redmond, WA. We analyzed the changes in housing prices and changes in rent; the former will address the change in property value in post-Nintendo Washington and the latter will reveal any rent growth. Furthermore, gathering these two sets of data provide further understanding of the house price-rent ratio of Seattle MSA, adding insight into whether Nintendo's relocation was more economical to rent or buy in Seattle MSA. We used quarterly housing price data from the Federal Housing Finance Agency that encompasses all housing data (sales price and appraisal data). As for rent, collecting more qualified data warrants a paid subscription to CoStar or Axiometrics, which are sources for high quality real estate data to aid developers and investors. Due to these conditions, we used readily available rental data from the Zillow Rent Index (ZRI), which is "a smoothed, seasonally adjusted measure of the median estimated market rate rent across a given region and housing type."² We analyzed data on the Seattle MSA from all three major housing types: single family residential, multifamily, and co-op/condominium. One problem we ran into when performing this analysis was the lingering negative impact of the 2008 recession. In order to isolate this and measure the resilience of our chosen MSA, we compared the percent changes in the Seattle MSA to the percent

² <https://www.zillow.com/research/data/>

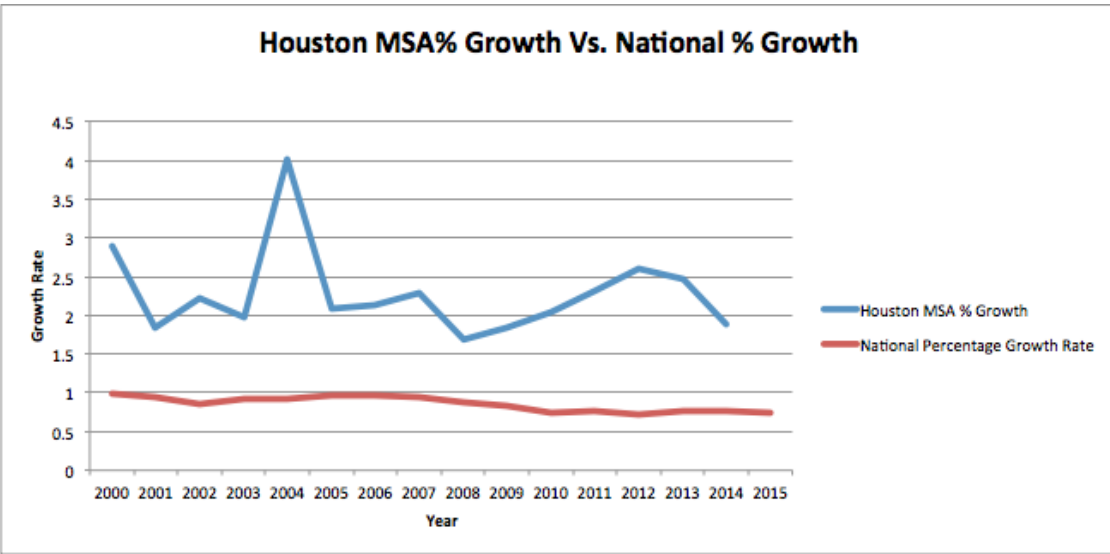
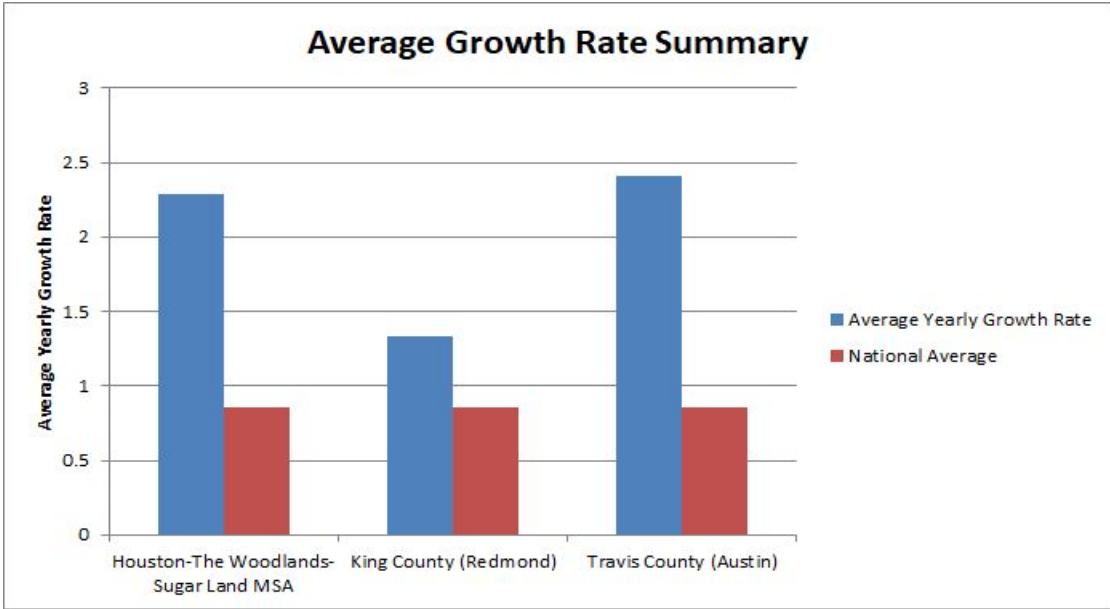
changes in the USA for the four quarters of 2010 (the headquarters were established in the second quarter).

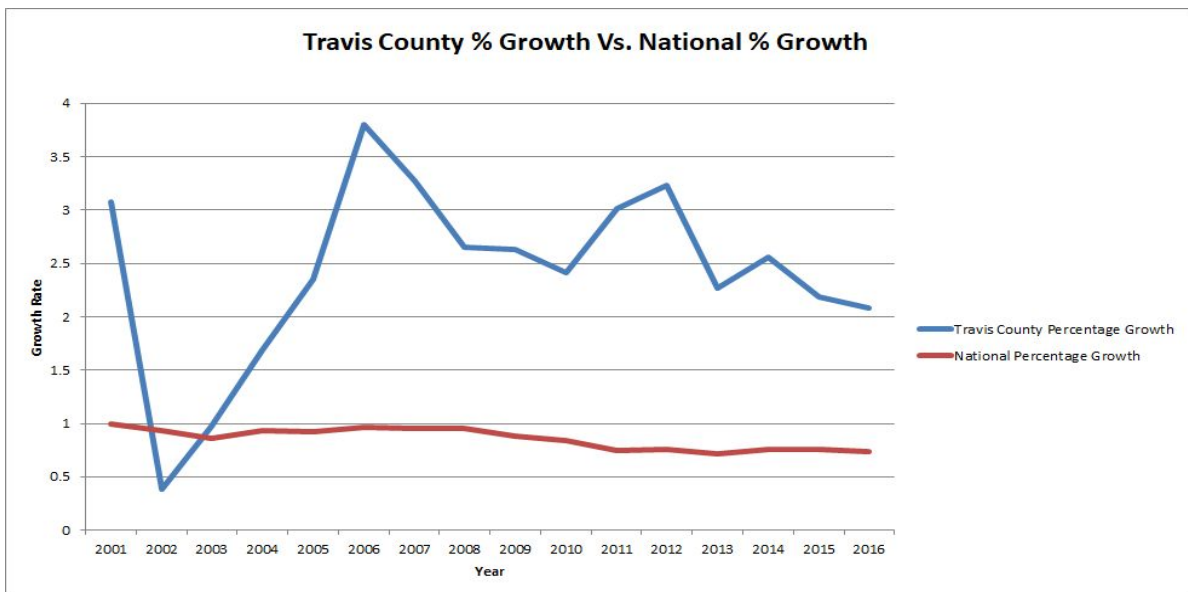
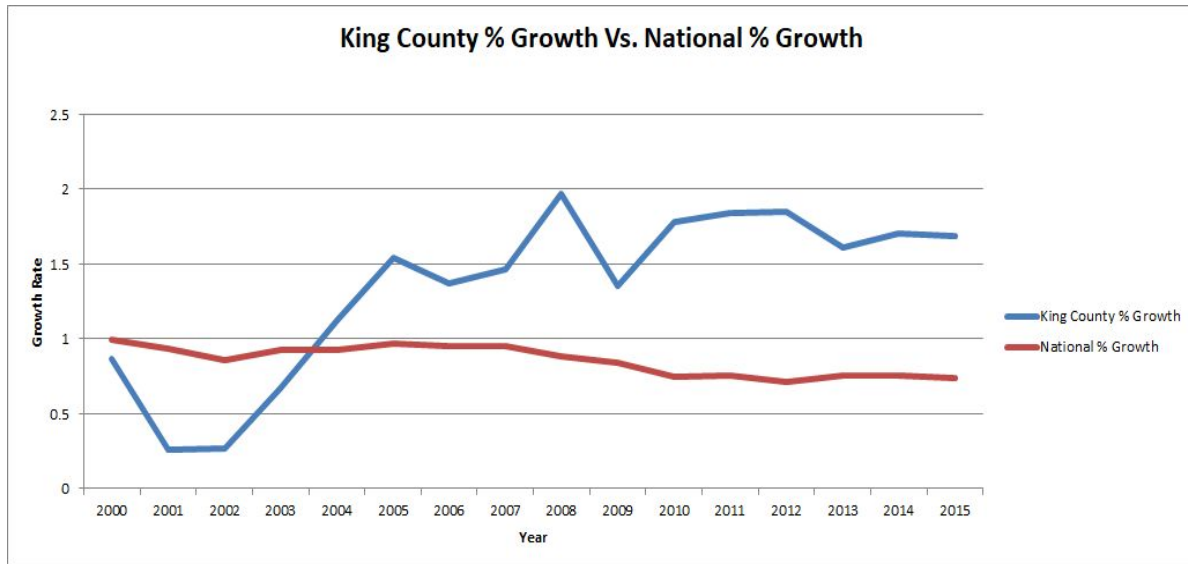
Growing cities

As we investigate the effects of a large corporation moving into a growing city, we must ensure that the cities in question are in fact growing. In order to appropriately and accurately conduct our analysis, we define a growing city as one with a growth rate higher than the national average. Gathering the data from the United States Census Bureau³, we analyzed the population of the control cities, Houston-The Woodlands-Sugar Land MSA and Redmond (King County), since 2000, to measure growth through a significant time period prior to the development of the new headquarters in their respective cities (see attached excel)⁴. In regards to Redmond, we used the more readily available data of King County, as it essentially encompasses the Seattle-Tacoma-Bellevue MSA. After calculating the percentage growth rates for each city, we compared these rates to the national growth rate during the same time period. Taking the average growth rates of Houston and Redmond, we can see that these rates exceed the national average growth rate, and are indeed considered large, growing cities. In order to make our assumption on the effect of Amazon's new headquarters in Austin, using the same strategy and tools, we measured the growth rate of Austin since 2000 and calculated its average. It too, compared to the national average, qualifies as a growing city. Now that both our control cities and our test cities can be defined as growing cities, we can measure Exxon Mobil and Nintendo's impact on Houston and Redmond, and further hypothesize Amazon's potential impact on Austin.

³ www.census.gov

⁴ [Growing Cities Excel Spreadsheet](#)





Methodology

We collected quarterly data on seasonally adjusted housing prices for the Houston-Woodlands-Sugar Land metropolitan area from 1991 to 2017 provided by the Federal Housing Finance Agency. Afterwards, we calculated the quarter over quarter percent change in housing prices. This is the dependent variable in our regression.

ExxonMobil's campus was finished being built and all 10,000 employees were relocated by the end of 2015. Furthermore, according to Paul Takahashi from the Houston Business Journal, the effects of the transition into Houston was a “game-changer for the Houston real estate market in 2014”.⁵ The effect on real estate prices is expected to occur before facilities are completely built because land was purchased by ExxonMobil before the construction of these facilities. Furthermore, ExxonMobil brought in employees over time rather than all at once, so land was purchased by employees who started working in the Houston location before the office was complete. It is also reasonable to assume that employees who had not yet moved to Houston would have begun to shop for houses before doing so. For these reasons, we created a dummy variable to represent ExxonMobil's move into Houston and set this to one for eight quarters: from the first quarter of 2014 through the last quarter of 2015. We then ran a simple linear regression of the quarterly percent change in housing prices on this dummy variable giving us the equation:

$$\widehat{percentChange} = \hat{\beta}_0 + \hat{\beta}_1 \text{exxonMoveIn} + u .$$

5

<https://www.bizjournals.com/houston/news/2014/12/29/year-in-review-exxon-mobil-campus-changes-houston.html>

Given that the effect of ExxonMobil moving into Houston is relatively recent, we thought it would be interesting to see the linear percent change in real-estate prices into 2020q4. Therefore, we ran a separate regression using time (t) as the independent variable, and populated more yearly and quarterly data points in order to forecast our estimate to 2020q4:

$$\widehat{percentChange} = \hat{\beta}_0 + \hat{\beta}_1 t + u.$$

Building off the estimates to create a time-series forecast, we took the moving average (MA) to smooth the percent change data points. Because we have an even number of data points, 108 initial observations, we centered the moving average (CMA) to further smooth the time series data, getting rid of seasonality and irregularities. This yields the annual average, assuming 4 quarters per year. Decomposing the time series into components that are applicable with the model we desire, we decided to simplify the formula as: $Y_t = T_t + S_t + \varepsilon_t$ in which Y_t is the sequence of values for the percent change in prices, and $T_t + S_t + \varepsilon_t$ are Trends, Seasonality, and Irregularities, respectively. After a few algebraic manipulations, we can solve a forecast model using both the regression estimates and the time-series standard formula (see attached Excel).⁶

Our thought process was if we can ascertain future real-estate percentage change in prices based off of current regression estimates, then we can calibrate the effects from the ExxonMobil shock, and use it as a comparative analysis with what may happen with real-estate prices in the Austin, TX area, should Amazon open their mammoth-sized headquarters there. While analyzing the trends, we took into account the natural differences between Amazon and ExxonMobil, Austin and Houston: 1) Amazon is a tech giant while ExxonMobil is oil & gas. 2) Amazon is creating 50,000+ jobs, while ExxonMobil surplused 10,000. 3) Austin's infrastructural limitations may have,

⁶ [Book1ExxonMobil](#)

on average, marginal negative implications on the city; whereas Houston has a more robust infrastructure system that can support extreme job creation. 4) The impacts of ExxonMobil to Houston are more distributed because of the scale of Houston city size, whereas the effects of Amazon on Austin will have a larger impact. 5) Austin, TX has zoning laws, whereas Houston, TX does not.

In the case for Nintendo's new headquarters in Redmond Washington, we collected data from the Federal Housing Finance Agency on property value changes for the USA and the Seattle MSA in order to compare the effects and to essentially hold the negative impact of the 2008 recession fixed. For rent, we used the aforementioned ZRI in order to analyze rent growth in Seattle. The analysis for the new headquarter move could be simply analyzed in Excel, through percent change calculations and an appropriate comparative analysis.

We first analyzed housing price data to see if the headquarter establishment had any effect on it. Once we performed our analysis, it was evident that we would need to assess rent growth, given our explanation in the introduction. By using comparative analysis of housing price data with the US and understanding rent growth for Seattle, we gained valuable insight into the effect of the headquarter establishment. Although Nintendo establishing its new North American headquarters does not seem to be as large or comparative to Exxon's move or a potential Amazon move, its inclusion is intentional. If the findings from an analysis on Nintendo are positive, it is a fair assumption that the Amazon move will have similar positive effects but incredibly larger in magnitude.

Conclusion

Nintendo:

From the data, it is clear to see that property value in the Seattle MSA seems to have decreased at a larger rate than it has in the USA on average:

Region	Year	Quarter	HPI	% Change
USA	2010	1	267.17	-1.49%
USA	2010	2	264.83	-0.88%
USA	2010	3	268.27	1.30%
USA	2010	4	267.13	-0.42%
Seattle-Bellevue-Everett, WA (MSAD)	2010	1	214.08	-1.67%
Seattle-Bellevue-Everett, WA (MSAD)	2010	2	211.83	-1.05%
Seattle-Bellevue-Everett, WA (MSAD)	2010	3	211.34	-0.23%
Seattle-Bellevue-Everett, WA (MSAD)	2010	4	207.35	-1.89%

However, it is important to note that the housing market post-Recession has been broadly defined by the shift to renting rather than buying. Consumers lost faith in housing as a safe asset for long-term investment, and consequently resorted to renting a home rather than buying one. Furthermore, Seattle's house price-rent ratio is among the ten highest in the nation, suggesting that it is more economical for Seattle consumers to rent rather than buy.⁷ Consequently, this further supports our assertion that an analysis of rent changes may provide a more complete picture of how Nintendo establishing its new North American headquarters impacted real estate in the Seattle MSA.

Through an analysis using the ZRI, we find that during all four quarters of 2010, rent was increasing at a fairly healthy rate. In order from Q1 to Q4, Seattle monthly rents were \$1200, \$1395, \$1495, and \$1500 respectively. As previously noted, the new headquarter establishment occurred in May of 2010, midway into the second quarter. Interestingly, the highest increase in rent occurred during the second quarter with about a 16.25% increase in rent from the previous quarter. Q2 is

⁷ http://money.cnn.com/real_estate/storysupplement/price_to_rent/

evidently the largest contributor to rent growth out of any other quarter in 2010, possibly suggesting that the move from Nintendo either artificially or sustainably increase rent. However, it is evident, through analysis of rent in years 2011 through 2018, that rent in Seattle never returned to 2010 Q1 levels, further suggesting that the headquarter establishment had a long term positive impact on rent in the area. Overall, in 2010 Seattle experienced rent growth of about 25%.

The Seattle MSA area has been compared to the Austin-Round Rock MSA for their unique similarities, namely their employment makeup, quality of life, popularity, property value growth, etc. Both areas are known for a strong technology sector and progressive amenities unmatched in most other urban areas in the US. Additionally, they both have similar median household incomes and comparable population and median home value growth rates. Our analysis of rent in the Seattle MSA lends insight into what may happen if Amazon were to move to Austin for their new headquarters. With the establishment proposed to bring 50,000 jobs, there is supporting evidence that this will have a wide scale affect on rent and housing prices in the immediate and surrounding area.

Exxon:

The results of the regression of percent change in housing prices on ExxonMobil moving into Houston are as follows:

Source		SS		df		MS		Number of obs	=	108
-----+								F(1, 105)	=	3.21
Model		4.45835616		1		4.45835616		Prob > F	=	0.0763
Residual		146.057225		105		1.39102119		R-squared	=	0.0296
-----+								Adj R-squared	=	0.0204
Total		150.515581		106		1.41995831		Root MSE	=	1.1794

percentChange		Coef.		Std. Err.		t		P> t		[95% Conf. Interval]
-----+										
exxonMoveIn		.7760982		.4335071		1.79		0.076		-.0834662 1.635663
_cons		.9910574		.1185357		8.36		0.000		.7560229 1.226092

The coefficient on the “exxonMoveIn” dummy variable is 0.776 and the p-value is 0.076. This means that the effect of ExxonMobil moving into Houston is an increase in the quarterly percent change in housing prices by 0.776. The average quarterly percent change over the entire period is 1.05%, so a 0.776 increase appears to be a large difference. This is statistically significant at the 10% level but not the 5% level. Therefore, the results may not be conclusive, but still seem to suggest some level of increase in the change in housing prices as a result of the new ExxonMobil campus opening in the Houston area.

The regression used to build a forecast model is below:

```
. regress percentchange t, vce(robust)
```

Linear regression	Number of obs	=	108
	F(1, 106)	=	4.15
	Prob > F	=	0.0442
	R-squared	=	0.0351
	Root MSE	=	1.1747

	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]
percentchange					
t	.0071227	.0034973	2.04	0.044	.000189 .0140564
_cons	.6511879	.1615629	4.03	0.000	.3308737 .9715021

Noticing immediately that our data was heteroskedastic, we decided to robust the standard error terms to normalize the data (as shown above). Though the time variable (t) is statistically significant, it only attributes to an increase of 0.007 in the quarterly percent change in real-estate housing prices. Meaning, to use time as proxy to gauge how it attributes to percent changes in prices isn't necessarily relevant according to our data. However, it is important to discern a general trend in order to forecast.

As a result of the forecast model heteroskedasticity⁸, we are unable to include it into our official analysis, as it leads to biased standard errors in the OLS. In the future, we would like to use a more refined data set, account for seasonality and irregularities without losing data points, and use a variable with a more relevant coefficient. However, just by observing the trend, we can note that the housing prices were affected in the years 2014-2015 ($t=93$ to $t=100$), when ExxonMobil moved into Houston, and the price trend has increased on average post 2007-2008 housing market crisis.



Real-estate prices are increasing nationally, which directly affect rent-prices and MLS. “New research from Apartment List, a site that catalogs apartment rentals across the country, forecasts an annual rent increase of up to 2% per year in the city that houses HQ2. That's on top of organic price increases that already occur from year to year.”⁹ Concurrently, Amazon moving to Austin will attract a higher skilled labor pool, and establish Austin as a tech hub in the exponentially increasing technological world. This self-reinforcing effect generating extreme outcomes, formally known as the second axiom of urban economics, also occurred in and around the Houston area due to

⁸ [Book1ExxonMobil](#) Sheet 3: Graphics

⁹ <http://money.cnn.com/2017/10/27/technology/amazon-hq2-housing-costs-seattle/index.html>

ExxonMobil headquarters moving in. Therefore, a larger labor pool comprised of high skilled workers is attractive for a growing city and would make Amazon a worthwhile and highly lucrative investment for Austin. It would be remiss to not further analyze that the 50,000+ workers potentially have families they also have to relocate. Assuming the average Amazon wage is higher than the average Austinite income, it is reasonable to conclude that 50,000+ people looking for a place to live in limited areas, will increase the average real-estate prices, making Austinites less competitive in the housing market. However, as the city grows, the benefits on the margin can outweigh the marginal costs.

Relatively speaking, ExxonMobil pales in comparison to Amazon on several fronts. When ExxonMobil moved into Houston, creating a surplus of 10,000 jobs for a 385 acre campus, Amazon will stimulate 5x that of Exxon in job creation, and nearly triple the campus acreage. Therefore, we can infer that there will be both an aggregate and marginal increase on real-estate prices should Amazon choose Austin, TX. “In its request for proposals, Amazon said it was looking for a metropolitan area with more than 1 million people that had an international airport, lots of tech talent, good mass transit and a business-friendly environment.”¹⁰ Furthermore, what makes Texas, in general, so attractive for any company’s bottom line is the low tax and loose legislation for corporations compared to other states. This allows for significant economies of scale in production for Amazon, satisfying the fourth urban economic axiom, as the low taxes and loose legislation reduce regulational frictions that contribute to production costs. Understandably, out of the 20 current cities across the United States that are still in the bid for Amazon’s HQ2, Austin and Dallas

10

<https://www.dallasnews.com/business/amazon/2018/01/18/amazon-lists-20-finalists-hq2-two-texas-cities-make-cut>

remain strong competitors. It would be very interesting to analyze the ultimate characteristics of a city that Amazon will choose and how those characteristics may be heightened or lost post HQ2 establishment.

Both Nintendo and ExxonMobil had increased the average rent prices in Seattle MSA and Houston, respectively. Furthermore, they have established headquarters that seem to solidify and validate the cities as popular hubs in their respective industries, generating a self-reinforcing effect which contributes to the increasing densities and economic growth of the cities as well. After our analysis and comparisons, we can justly conclude that Amazon moving their massive second-headquarters to Austin will increase the average real-estate and rent prices, making it more expensive to live. It is highly probable that this can shift the dynamics of the Austin demographics and unique characteristics of the city away from a small and organically growing region, to a large and highly populated tech hub dominated by high skilled labor. If this is the direction that Austinites wish to go forth in rapidly expanding growth and production, then it is worth the investment to incentivize Amazon to establish there. However, the caveat is that the city will confirm itself on the map with a different identity than it is currently known for, and must brace itself for the tour-de-force that Amazon's second headquarters will incite on the growing city. In the future, we would like to compare more cities, refine our forecast, include more relevant independent variables to truly ascertain the effects on real-estate and housing prices, use interaction variables in the regression analysis, and possibly see if it is even formulaic as to how a corporation decides on establishing their headquarters in an urban area rather than a suburb, or vice versa.